Teachers' experiences of using differentiated curriculum approaches in teaching fractions in Grade 3

By

Sibongile Patricia Mngomezulu

A thesis submitted in fulfilment of the academic requirements for the degree of Master of Education

to the

College of Humanities, School of Education

at the

University of KwaZulu-Natal

Supervisor: Dr Blanche N. Ndlovu

December 2019

DECLARATION

I, Sibongile Patricia Mngomezulu, declare that this research project is my own work. It is being submitted for the Degree of Masters in Educational Psychology at the University of KwaZulu-Natal. It has not been submitted for any degree or examination at any other University. This thesis did not contain other persons' data, pictures, graphs, or other information unless specifically and acknowledged as being sourced from other people.

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Signature of Candidate

.....

Date

Signature of Supervisor

Date: 30/10/2019

THE SUPERVISOR STATEMENT

I, the candidate's supervisor, **agree/~~do not agree~~** to the submission of this thesis.

Signed :  Dated: 17 February 2020

ACKNOWLEDGMENT

Foremost, I would like to that God Almighty for giving me the strength, knowledge, ability and a great opportunity to undertake this research study and able to complete it satisfactorily. Without His Grace, this achievement would not be possible.

In my journey towards this Degree, I have found a mother, mentor, philosopher, role model and a pillar of strength, my supervisor- Dr Blanche Hadebe-Ndlovu. She has been there for me from day 1 providing her heartfelt, professional support and guidance. Without her forceful personality, this thesis would not have been completed. “I salute you”.

A special thanks to my former principal Dr M.B Ngema for encouraging me to pursue this journey.

I would like to express my gratitude to the principal of Kangikho Primary Mrs L. Kunene for understanding and allowing me to fulfil my dream. I humbly extend my special thanks to all school principals and teachers who made it possible for me to complete this project.

To all my colleagues especially Zweli, Sizwe and Zime for your generous attitude and friendly behaviour.

My acknowledgment would be incomplete without thanking the biggest source of my strength, my extended family and siblings, Londiwe, the love and care you continuously provide, I am so thankful.

To my nephew Thuthu and students from the UKZN who assisted with academic writing, you have made a tremendous contribution in helping me to reach this stage.

I sincerely thank my parents who taught me to be patient and humble during difficult times. To my dearest husband who never let things fall apart, your support and prayers. I adore you. I owe a deep sense of gratitude to my late father-in-law (Rev. Mngomezulu) for his unconditional love and strong prayers (Msuthu!). I am extremely grateful to my sons, Siyabonga and Cebolenkosi for being supportive and excel in understanding my attitude towards my journey.

Lastly, my dear friends who kept me going on my path to success and assisting me as per their abilities in whatever manner.

DEDICATION

This thesis is dedicated to my parents Abeon and Esther Mahlobo whose dreams for me resulted in this achievement, and with their loving upbringing and nurturing me. My husband Wiseman Mngomezulu, my two sons Siyabonga and Cebolenkosi who understood the situation and lastly my siblings who always play a role during hard times.

ABBREVIATIONS AND ACRONYMS

Abbreviation	Description
FP	Foundation Phase
DBE	Department of Basic Education
CAPS	Curriculum and Assessment Policy Statement
NCS	National Curriculum Statement
C2005	Curriculum 2005
RNCS	Revised Curriculum Statement
DoE	Department of Education
TiE	Technology in Education
ToE	Technology of Education
UKZN	University of Kwa-Zulu Natal
KZN DoE	Kwa-Zulu Natal Department of Education
UNESCO	United Nations Educational Scientific and Cultural Organization
LSEN	Learners with Special Educational Needs
NTCM	National Council of Teachers of Mathematics

ABSTRACT

The aim of this study was to explore teachers' experiences of teaching fractions to Grade 3 learners using the differentiated curriculum approaches in the Ngwelezane Circuit. It was a qualitative study that utilised the case study approach. Three mathematics teachers were purposively chosen as participants, using convenience sampling to select those who were the utmost accessible. Furthermore, these teachers were able to reveal teachers' experiences. Data were generated through semi-structured interviews, classroom observations and document analysis. The curricular spider-web was used as a conceptual framework for data analysis. The findings of the study revealed that teachers' experiences were influenced by factors such as rationale, content, teaching activities, teachers' roles, materials and resources, grouping, time, learning environment and assessment. The rationales for teaching were based on (self-experience, informal and formal) and found to be the most influential component in teachers' experiences. Where teachers were guided by the personal or self-experience rationale for teaching, they demonstrated a conceptual understanding of what they were teaching. On the other hand, teachers whose experiences were influenced by the societal or informal rationale for teaching did not make decisions that contributed to the successful teaching of fractions. Teachers who were guided by the content or formal rationale for teaching believed that being knowledgeable about fractions guided them to teach fractions effectively. It is recommended that teachers must be guided by rationales that will influence them for teaching fractions using differentiated curriculum approaches. In addition, the study recommends that there is a need for on-going professional development for Mathematics teachers so that they keep abreast of current and innovative teaching approaches, particularly for teaching fractions.

TABLE OF CONTENTS

i
DECLARATION ii
THE SUPERVISOR STATEMENT iii
ACKNOWLEDGMENT iv
DEDICATION v
ABBREVIATIONS AND ACRONYMS vi
ABSTRACT vii
CHAPTER ONE 1
ORIENTATION OF THE STUDY 1
1.1 Introduction 1
1.2 The Focus of the study 1
1.3 The location of the study 1
1.4 Background of the study 2
1.5 Motivation to embark on the study 3
1.6 Statement of the problem 4
1.7 The rationale of the study 4
1.8 The significance of the study 5
1.9 Objectives of the study 6
1.10 Critical research questions 6
1.11 Limitations of the study 6
1.13 Conclusion 8
CHAPTER TWO 9
REVIEW OF RELATED LITERATURE 9
2.1 Introduction 9
2.2 Teachers' experiences 10
2.3 Technical experiences 11
2.4 Practical experiences 11
2.5 Critical teachers' experiences 12

2.6 Different forms of curriculum **12**
2.7 The intended versus Implemented versus, Attained curriculum 14
Figure 2.6.1 the three representations of curriculum **14**
2.6.2 Intended (formal) curriculum **15**
2.6.3 Implemented (perceived) curriculum **16**
2.6.4 Attained (learned) curriculum **17**
2.7 Defining differentiation **17**
2.8 Understanding learner diversity **19**
2.9 Basic principles guiding differentiated instructions **20**
2.9.1 Elements of a differentiated classroom **21**
Figure: 2.9.2 Source: Strickland, C (2005). Tools for high quality differentiated instruction **23**
2.10 Constitutional, Legislative and Policy context underlying Curriculum Differentiation **23**
2.11 Implementation of the differentiated curriculum in South African schools **24**
2.12 The role of curriculum differentiation in teaching and learning **30**
2.13 Guidelines relating to teaching and learning of fractions **30**
2.14 Conclusion **31**
CHAPTER THREE **32**
THEORETICAL AND CONCEPTUAL FRAMEWORKS **32**
3.1 Introduction **32**
3.2 Theoretical framework **32**
3.3 The constructivist theory **33**
3.4 Conceptual framework **33**
3.5 Curricular spider web **34**
Figure 3.5.1: Curriculum spider web framework for teachers' experiences (Van den Akker, 2004) **34**
3.6 The concept of fractions **35**
3.7 Rationale for teaching fractions **37**
3.7.1 Personal **37**
3.7.2 Societal reasons **38**
3.8 Goals (Towards which goals are you teaching?) **39**
3.8.1 Aims **39**
3.8.2 Objectives **40**
3.8.3 Outcomes **40**
3.9 Content **41**
3.10 Learning activities for teaching fractions **42**
3.10 The role of the teacher when teaching fractions **44**

3.10.1Teachers as mediators 45
3.10.2 Teacher as an instructor 45
3.10.3 Teacher as a facilitator/mentor 46
3.10.4 Teacher as a manager/leader 46
3.10.5 Teacher as an assessor 47
3.11 Materials and resources (With what are they learning?) 48
3.12 Grouping (With whom are they learning?) 50
3.13 Time and learning environment for teaching fractions 50
3.13.1 Learning in the classroom 51
3.13.2 Computer laboratory 51
3.14 Assessment 52
3.14.1 Assessment for learning 52
3.14.2 Assessment of learning 53
3.15 Conclusion 54
CHAPTER FOUR 55
RESEARCH DESIGN AND METHODOLOGY 55
4.1 Introduction 55
4.2 The critical research questions 55
4.3 Research paradigm 56
4.4 The Research design 57
4.5 Research methodology 58
4.6 The Population and Sampling 59
4.6.1 Purposive sampling 60
Thus, in this case, the sample of this study was formed as indicated in Table 4.6.2 61
4.6.3 Convenience sampling 61
4.7 Data generation methods 62
4.7.1 Reflective activity 63
4.7.2 One-on-one (semi-structured interviews) 63
4.7.3 Classroom observation 65
4.7.3 Analysis of documents 65
Table 4.2 Data generation plan 66
4.8 Trustworthiness 69
4.8.1 Credibility (truth value) 69
4.8.2 Transferability (applicability) 70
4.8.3 Dependability (consistency) 70

4.8.4 Conformability (neutrality) **71**
4.9 Data analysis **71**
4.10 Ethical issues **72**
4.11 Limitations to this research **73**
4.12 Conclusion **74**
5.1 Introduction **75**
5.2 Presentation of findings **76**
5.2.1 Theme 1: Content **76**
What are you teaching in fractions? **76**
5.2.2 Theme 2: Teaching activities **79**
How do you teach fractions? **79**
Formal activities versus informal activities **79**
5.2.3 Theme 3: Teacher role **82**
How do you facilitate learning in fractions? **82**
5.2.4 Why do teachers have particular experiences of teaching fractions using differentiated approaches in Grade 3? **84**
6.1 Introduction **93**
6.2 Conclusions on this research **93**
6.3.1 Content knowledge of teaching Fractions **93**
6.3.2 Teaching activities **94**
6.3.3. Teacher's role **94**
6.3.4 Rationale **94**
6.3.5 Resources **95**
6.3.6 Grouping **95**
6.3.7 Time and learning environment **95**
6.3.8 Different types of Assessment **95**
6.4 Implications for further research **96**
6.5 Recommendations for this research **96**
6.5.1 Recommendation 1 ..... **96**
6.5.2 Recommendation 2 ..... **97**
6.5.3 Recommendation 3 ..... **97**
6.5.4 Recommendation 4 ..... **97**
6.5.5 Recommendation 5 ..... **97**
6.5.6 Recommendation 6 ..... **97**
6.5.7 Recommendation 7 ..... **98**

6.5.8 Recommendation 8 ..... **98**
6.6 Conclusion **98**
References **99**
APPENDICES **136**
Appendix 1 ..... **136**
Appendix 2 ..... **139**
Interview schedule for teachers **139**
Appendix 3 ..... **140**
Appendix 4 ..... **142**
Informed consent declaration **144**
Appendix 6 ..... **149**
Appendix 7 ..... **150**
Turn-it-in Report **150**
Appendix 8 ..... **151**
Ethical clearance **151**
References **153**

CHAPTER ONE

ORIENTATION OF THE STUDY

1.1 Introduction

This chapter intends to give a broad overview of and the orientation to the study. The purpose of this research study is to explore teachers' experiences of teaching fractions in Grade 3 using differentiated curriculum approaches. Thus, this chapter firstly provides an overview of the background to the study, followed by motivation to embark on the study and a statement of the problem. Then, the rationale of the study is provided, followed by the significance of the study, objectives and the critical research questions. The limitations of the study are also given.

1.2 The Focus of the study

The focus of the study is on curriculum differentiation approaches Grade 3 teachers use to teach mathematics. It is alluded in the title that experiences of grade 3 teachers will be explored in teaching fractions. Research shows that learners are different therefore allowing teachers also to use different approaches in order to suit different learners' conceptualisation of mathematics.

1.3 The location of the study

This study will be conducted among FP teachers who are teaching Grade 3 Mathematics in the Ngwelezane Circuit, at King Cetshwayo District. The Ngwelezane Circuit is one of 22 circuits in the district and has 19 primary schools that are located in rural areas. These rural areas are impacted by the high rate of poverty, lack of rural development facilities, including school infrastructures and overcrowded communities. Thus, these problems result in health risks to elders and learners, and overcrowded classrooms are also a concern.

1.4 Background of the study

There is substantial evidence that differentiation is an integral part of teaching and learning and of the schools' curriculum as a whole. Seemingly, it is fair for different learners to be learning at different levels in one classroom; it is unfair to have some learners struggling with tasks that are too difficult (Blackburn, 2018). Just as it is unfair to see other learners waiting to learn something new. Fairness means matching learning experiences to needs (Butler, 2017).

One of the objectives of free public education in a democracy is to provide equal opportunity for all learners in order to develop their potential abilities to the fullest. In attempting to reach this objective, teachers should give learners optimal learning support irrespective of their differences (Naicker, 2018). Therefore, equal opportunity does not mean equal opportunity. However, differential learning is what now known as differentiated curriculum or instructions (Ward, 2013). Likewise, differentiation is making sure that each learner gets the right tasks at the right time in order to learn. However, looking at the Department of Basic Education points out that Education White Paper 6 made it imperative that the education and training system change to accommodate the full range of learning needs, with particular attention to strategies for instructional and curriculum transformation. Therefore, it is possible that all learners should be provided with opportunities to participate as far as possible in all classroom activities through differentiated approaches.

The Curriculum Assessment Policy Statement (CAPS) was introduced as a new curriculum but built on the NCS to improve curriculum implementation and assessment in the situation, therefore, for the curriculum to be accessible and thus, inclusive for all learners, it needs to be differentiated. Curriculum differentiation refers to the change that relates specifically to instruction or curriculum content (Banks, 2015). The Department of Education emphasises that the curriculum that is differentiated deals with adaptation, modification of any adjustment to learning, teaching, and assessment. Therefore, in practical terms, it can be seen as a process of modifying the curriculum according to the learner's different levels and needs in one classroom (Hardy & Woodcock, 2015). This implies that the curriculum should provide opportunities for adaptation to individuals through the implementation of different approaches for different learners.

For this to be realised, learners need optimal learning support from teachers as they are in direct contact with them. There is, however, a general lack of proper implementation and to adapt the

curriculum to the differentiated needs of learners, as various studies show (UNESCO, 2005). In this case, 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 full potential (UNESCO, 2004) Therefore, this recommends that for teachers to succeed in supporting all learners to reach their potential they need to be equipped for the task – they need to improve their knowledge and teaching skills. By teacher, improvement refers to the provision of the essential resources and materials that allow them to teach learners competently as well as tools that are required for effective teaching (Nwufor, Izuagba, Adaku, & Ifegbo, 2017).

Seemingly, it is at the Foundation Phase, most importantly in Grade 3, where support for different learners, particularly in Mathematics, is utmost needed. In fact, this grade is about to exit the phase and move to the Intermediate phase. Thus, teachers need to put more effort through differentiation as an approach and ensure that all learners of all levels are being catered and reach their full potential (Imbeau, 2018). Smith (2015) articulates that through the use of differentiated curriculum approaches or strategies, teachers can meet the needs of all learners and help them to exceed the established standards while Molbaek (2018) argues that the objectives are accomplished when teachers choose appropriate teaching methods that match each learner's needs. As a Foundation Phase teacher, I am looking forward to playing integral roles in terms of being a learning mediator, interpreter, and designer of learning, phase specialist, lifelong learner, assessor, and researcher. Furthermore, in conjunction with these roles, I have a desire to explore other teachers' experiences of using the differentiated approaches in the classroom through CAPS.

1.5 Motivation to embark on the study

South African schools, including other countries experiencing education reform that requires the implementation of the national policy on inclusive education (Henson, 2015). According to Slee (2018), central to this policy is the view that allows all learners to learn together despite their diverse backgrounds, different abilities, and diverse needs. Therefore, the policy suggests that differences existing among learners concerning any disabilities, capabilities, needs, and interests should not exclude them from participation in the classroom situation. Likewise, for this to be possible, the curriculum should be differentiated in another way or another.

Thus, the researcher's preliminary study reveals the sets of challenges connecting to the current curriculum. The first challenge that is being revealed is how to transform the curriculum that is adaptable to learners with diverse needs and different abilities. The second challenge relates to the lack of teachers 'knowledge to engage fully in performing the task. Seemingly, the majority of teachers in South African schools are still struggling to be engaged in the National curriculum, which is CAPS that emphasise the implementation of the curriculum that is differentiated for the benefit of all learners. I also experienced the challenges Foundation Phase teachers experienced when CAPS was introduced. Therefore, teachers need to be engaged in the changing curriculum and apply new techniques and methods in order to meet the needs of diverse learners (Imbeau, 2018).

1.6 Statement of the problem

As a Foundation Phase teacher who has been in the teaching environment for 23 years, I have realised that teachers are faced with more change than ever before in education. Several decades ago, teachers came into the profession with a desire to work with learners, a knowledge base, and good intentions. Foundation Phase teachers are faced with multicultural classroom diversity, and changing curriculum in education. Therefore, teachers are faced with learners of different abilities, lack of parental involvement, and poor performance of learners, especially in Mathematics in Grade 3. In fact, including different approaches, as learners are quite different, and they learn differently, thus, using the differentiated curriculum would assist teachers in reaching out to almost all the learners in the classroom.

1.7 The rationale of the study

As a Foundation Phase teacher, the curriculum changes from time to time in the South African School system since 1994. CAPS was introduced as a new curriculum built on the National Curriculum Statement (NCS) to improve curriculum implementation and assessment in the classroom environment. As a modification of what to teach (curriculum) and not how to teach (teaching methods), CAPS (Green & Condy, 2016) has strengthened by the specific guidelines for responding to learner diversity in the classroom. One of the critical sections presented in the

guidelines, by the policy in respect of responding to learner diversity, is the implementation of the differentiated curriculum regardless of their strengths and weaknesses. Therefore, teaching multicultural classrooms, learner diversity, and responding to learner needs is a norm to every teacher, especially in the Foundation Phase. Thus, this study has been motivated by my experience of teaching at a Foundation Phase in Grade 3, where different learners need different instructions in one classroom.

Furthermore, the topic is drawn from my experience of teaching Mathematics in the Foundation Phase in Rural schools. In fact, as a teacher who understands the CAPS as the policy to be followed, I am eager to explore and understand the teachers' experiences of teaching using the differentiated curriculum approaches in a classroom situation in order to meet the needs of diverse learners. Therefore, I am interested in focusing on Grade 3 teachers, who teach Mathematics in Rural schools, under the topic Fractions.

1.8 The significance of the study

The purpose of this study is to explore teachers' experiences of using differentiated curriculum approaches in the teaching of fractions in Grade 3. Moreover, the researcher intends to understand how teachers are engaged in the implementation of the curriculum, which is differentiated and deal with the diverse learners and meet their different needs in one classroom.

This study may be useful to close the gap among teachers and how the curriculum differentiation should be implemented in order to meet the different needs of diverse learners as well as learner performance in Grade 3. Furthermore, this study will contribute to the curriculum developers, designers, and department of education in developing new abilities to understand the curriculum and challenges faced by rural schools. Shange (2015) reveals that the lack of support, professional development for teachers and resources in rural schools is the main challenge to deliver the content successfully. Therefore, in light of the statement problem presented above, this study intends to answer three questions and to achieve the aim by pursuing the specific objectives below.

1.9 Objectives of the study

- To explore Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions
- To explore how Grade 3 teachers experience differentiated approaches in teaching fractions
- To understand why Grade 3 teachers experience the differentiated approaches in teaching fractions the way they do

1.10 Critical research questions

- What are Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions?
- How do Grade 3 teachers experience differentiated approaches in teaching fractions?
- Why do Grade 3 teachers experience the differentiated approaches in teaching fractions the way they do?

1.11 Limitations of the study

Greener (2018) asserts that limitations are potential weaknesses of a study, and they incorporate all the factors that are impossible to avoid and which thereby affect the internal validity of the research. Nuijten, Hartgerink, Van Assen, Epskamp, and Wicherts (2016) declare that limitations are matters that arise in a study and which are out of the researcher's control. Moreover, Creswell (2013) defines limitations as shortcomings that the researcher identifies in a study. The limitations of this study were time and context. Interviews were conducted during breaks and after school hours in their spare time. Therefore, conducting interviews during breaks interfered with the teachers' time for her lunch. The interviews that were conducted after school interfered with their time for their personal stuff. In this case, some teachers indicated that they had family commitments and meetings after school. In terms of context, there had previously been robberies and hijackings at the school, and some teachers were afraid to stay after school hours. Therefore, to address these issues, arrangements for a neutral venue and time for conducting the interviews were negotiated with the participants. The fact that I am a teacher at this same school was also a limitation as the participants thought that I was evaluating their teaching practices. As a result, one of the

participants postponed taking part in the interviews. In order to address this, I explained to them that the study was for the fulfilment of my degree requirements and not for the DoE.

1.12 Outline of the study

The chapters for this study have been arranged as follows:

Chapter one: Introductory of chapters

This chapter serves as the background and contextualisation of the study and provides the reader with the study. The introduction and the justification for the study are included.

Chapter two: The Literature review

This chapter reviews the literature on teachers' experiences under three educational levels; technical, practical, and critical. The chapter also covers the intended curriculum within the implemented curriculum.

Chapter three: Conceptual framework

This chapter presents the theoretical and the curriculum spider-web as the conceptual framework that underpins the study.

Chapter four: Research design and methodology

This chapter discusses the methodology and research design to give details about the reasons for choosing the research method. This study used a qualitative case study under an interpretive paradigm to understand teachers' experiences of teaching using differentiated curriculum approaches in Grade 3 fractions. Purposive and convenience sampling were used in order to select participants. Methods to generate data were semi-structured interviews, classroom observations, and document analysis. The authenticities of the study (credibility, transferability, dependability as well as conformability, including ethical considerations, were used during the data generation.

Chapter five: Data analysis and discussions

This chapter presents the findings and discussions of the data generated from the case study of three mathematics Grade 3 teachers in the Ngwelezane Circuit. The data was framed by curriculum spider-web concepts as a conceptual framework. Therefore, the findings of the study are presented thematically using concepts.

Chapter six: Summary, conclusion and recommendations

This chapter presents the general conclusions and recommendations for further studies.

1.13 Conclusion

This chapter focuses on the general orientation of the study and the overview. Then the background of the study and motivation to embark on the study, rationale, problem statement, the purpose of the study are also addressed. The research questions and critical questions on exploring teachers' experiences of using differentiated curriculum approaches in the teaching of fractions in Grade 3 are discussed. The next chapter reviews the literature on teachers' experiences under the three educational levels: technical, practical and critical. It also addresses the different types of curriculum, intended implemented curriculum and attained. The chapter argues the reviewed literature on differentiation as an approach to teaching and learning environments. The study focuses on the implementation of the curriculum differentiation approaches in classrooms.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The previous chapter presented the overview and introduced the aim of the current study which is to explore Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions. The chapter orientated the reader to the background, location, motivation, statement of the problem, rationale and the research objectives that are in relation to critical questions to the study. The significance of the study is also clearly discussed.

The interest in conducting this study basically in semi-rural schools is powered by my interest in exploring teachers' experiences of using the differentiated curriculum as an approach to teaching fractions in Grade 3. Secondly, the study is looking forward to exploring how Grade 3 teachers experience differentiated approaches in teaching fractions in one classroom. Moreover, and to understand why Grade 3 teachers experience the differentiated approaches in teaching fractions the way they do. The critical question for this research will be answered with valid evidence during the data generation process, and that will empower me with more knowledge and understanding of the phenomenon. In this case, most importantly, teaching learners with different needs is challenging, and as for Mathematics as an important subject in learners' lives, teachers are expected to teach learners differently so that learners will attain their full potential.

This chapter presents the literature review on different studies concerning the teachers' experiences and the using differentiated curriculum instructions as well as gaps identified. In this chapter, the reviewed and compared previous literature was more relevant to the phenomenon. Literature review connects different kinds of materials such as journals and articles and reports into the meaning of the research and encourages arguments and identifies the gaps in the research filed (Hart, 2018). Furthermore, Sani, (2017) states that the literature review is the abstract of particular research questions that underpin the classification of the study. Therefore, in this chapter, I will be talking about the curriculum differentiation by discussing the aspects of learner diversity, key principles, and elements of a differentiated classroom. Despite that, I will start by defining the aspects of teachers' perception by using three levels of educational experiences. It also reviews literature related to the implementation of the intended, implemented, and attained

curriculum. Further, the constitutional, legislation and policy that underlying curriculum differentiation is also discussed.

2.2 Teachers' experiences

According to Bakkenes, Vermunt, Wubbels, and instruction (2010), educational experiences are the experimental ground upon which our knowledge is constructed. While, Kardos and Johnson (2010) state that teachers' experiences are the conflict within themselves on the teaching strategies to use, content to teach, resources to use on the design of the lesson that will draw learners' attention, and how to meet the requirements of the standardized tests. This suggests that the differences within the teachers and educational policies can help the teachers to learn from their experiences so that they can reflect on what they have experienced during their teaching processes. Therefore, experiences can enable teachers to change their teaching strategies and select the suitable resources that will best promote learners' interest in the lesson. In addition, Youngs (2007) states that interactions between mentor and mentee, school policies and differences in their opinions are also perceptions. The way teachers communicate with one another and how they comply with the school policies describes their perception.

Spooner, Flowers, Lambert, Algozzine, and Ideas (2008) reveal that good communication between the mentor and mentee, school policies and procedures, provide the students with valuable teaching abilities and that their professionalism is further developed. Therefore, teachers' perception is affected by the way the teachers communicate with their colleagues, their management and the curriculum they implement. Experiences can help teachers to learn from their behaviour and use the knowledge learned from their former encounters. In order to explore the previous experiences, teachers' reflection is used by Van Manen (2016) in the form of three levels of experiences: technical, practical and critical experiences.

2.3 Technical experiences

In this stage, the interest is on the application of knowledge and the approach they use (Van Manen, 2016). In this level, teachers are more concerned with the results of their abilities. Furthermore, Yost, Sentner, and Forlenza-Bailey (2000) argue that the technical level is about strategies used in the classroom. Teachers are more concerned with the use of teaching equipment as well as teaching methods when delivering the lesson. According to (Yost et al., 2000) teachers are concerned about their daily encounter in terms of teaching methods and teaching tools they used in the classroom. This is an indication that the relevant teaching method can produce good results even though there are no technical tools available in the school (Delamont, 2016). Most importantly, what is happening in the classroom is vital for the teachers to reflect on their perception. Generally, the correct use of technical resources will be determined by the teaching method (Delamont, 2016). This suggests that Mathematics teachers should use teaching methods that will accommodate different learners' abilities. The technical experiences are determined through classroom practical experiences.

2.4 Practical experiences

Van Manen (2016) alludes that the most concern for teachers is based on classroom situations. Teachers are concerned about the content they teach within the curriculum even though they have not much control of it. Consequently, this is a piece of evidence that teachers are more concerned with daily planning and that they fail to think critically to their daily activities because they are more concerned with the theory to use during the teaching process. Their routine is concerned about analysis, objective, beliefs, and measurement of the results (Guerriero & Education, 2014). Apparently, at this level teachers are concerned about the objective to be obtained (Van Manen, 2016). In addition, Swart, de Graaff, Onstenk, Knezic, and Teaching (2018) states that practical experiences define subjective understanding or responsibility that is different from the theory or method used. Practical experiences include the reasoning skills, actions, and modification of progress exercises based on how the teaching is conducted. This suggests that teachers thinking skills are connected to the way they teach. Nevertheless, cognitive thinking in Mathematics seems to be very important. Therefore, it is evident that practical experiences may help the teachers to develop their critical experiences too.

2.5 Critical teachers' experiences

Whipp (2013) defines this level as an action where teachers examine their thought by looking back on their achievement and how they got their information (Van Manen, 2016), argues that critical experience deals with making conclusion on external factors that might influence classroom exercise, which will include the individual' socio-historical and politico-cultural environment. According to Saric and Steh (2017), critical experiences include self - criticism with the aim of improving your practices. The above studies indicate that self - criticism, and introspection in educational experience is needed to make sound decisions. Based on this study professional introspection within the socio-political issues will be vital to see if the curriculum produces the intended outcomes since the curriculum is affected by political issues (Hoadley, 2012). South African education is influenced by the teachers union and ruling political party since CAPS as an intended curriculum was introduced to rectify the criticism of the C2005, NCS and RNCS. Therefore, teachers' critical experiences on teaching Mathematics, using differentiated curriculum are needed for classroom practices in order to accommodate learners' social needs and political effects on the curriculum (Van Manen, 2016).

2.6 Different forms of curriculum

Tyler, (2013) defines curriculum as a plan of learning this means that it is a combination of the intended curriculum as a plan for learning and attained curriculum as their learning (Khoza, 2015). Hence, Hoadley and Jansen (2012) define curriculum as the set that prescribes what is to be taught in the classroom. This suggests that what is taught and learned in the classroom must be part of the curriculum. Van den Akker et al. (2009) state that the curriculum should be differentiated into five levels: Nano (leaner), Micro (teacher), Meso (school), Macro (national) and Supra (international). This can mean that at the Nano level, the curriculum would be the product of the learners focusing on their personal planning and their individual way of learning. The different levels of curriculum indicate that there are role players in any level of the curriculum. The Micro-level would mean that the curriculum is the product of the teachers planning for their teaching through the use of materials, modules, and textbooks. According to Van den Berg (2014) curriculum at this level should be planned, implemented and evaluated in order to make changes to the planned lessons. Hence, the Meso level curriculum would be the product of the school program and examination program. Lastly, in the Supra level, the curriculum would be the product

of international countries (Van den Akker, 2006). This suggests that curriculum should meet the standards of international countries. Therefore, learners of all levels including those who are having barriers to learning should compete up to the national level. In this case, teachers who are capable of the implementation of the curriculum which is differentiated for different learners will definitely enable learners to meet this level.

"Curriculum is defined as either a plan for teaching and learning (defined from intended position-designers' level) or a plan of teaching and learning (defined from the implemented or attained position-teachers or learners perceptions" (Khoza 2018, p.21). He further articulates that curriculum may be represented by three main layers. The first layer is intended which is planned, described, formal or official curriculum which deals with a written policy of ideas as well as intentions of curriculum designers and developers (Van den Akker et al. 2009). The second layer representation is the implemented, practised curriculum also known as curriculum in action, which is the interpretation of the intended curriculum as perceived by teachers and the actual process of teaching in operation. The third layer is attained, achieved or assessed curriculum which is basically the learning experiences perceived by learners through their achievement of learning outcomes (Van den Akker et al. 2009). Therefore, defining the curriculum in the first layer, it becomes a plan for teaching and learning, and defining it from the or third layer, it becomes a plan of teaching and learning. This suggests that for this current study these concepts are very important for the researcher to understand and explore teachers' experiences of teaching using the differentiated curriculum as an approach for learning. Furthermore, the table below indicates the connection between the three forms of curriculum designed for teaching and learning.

2.7 The intended versus Implemented versus, Attained curriculum

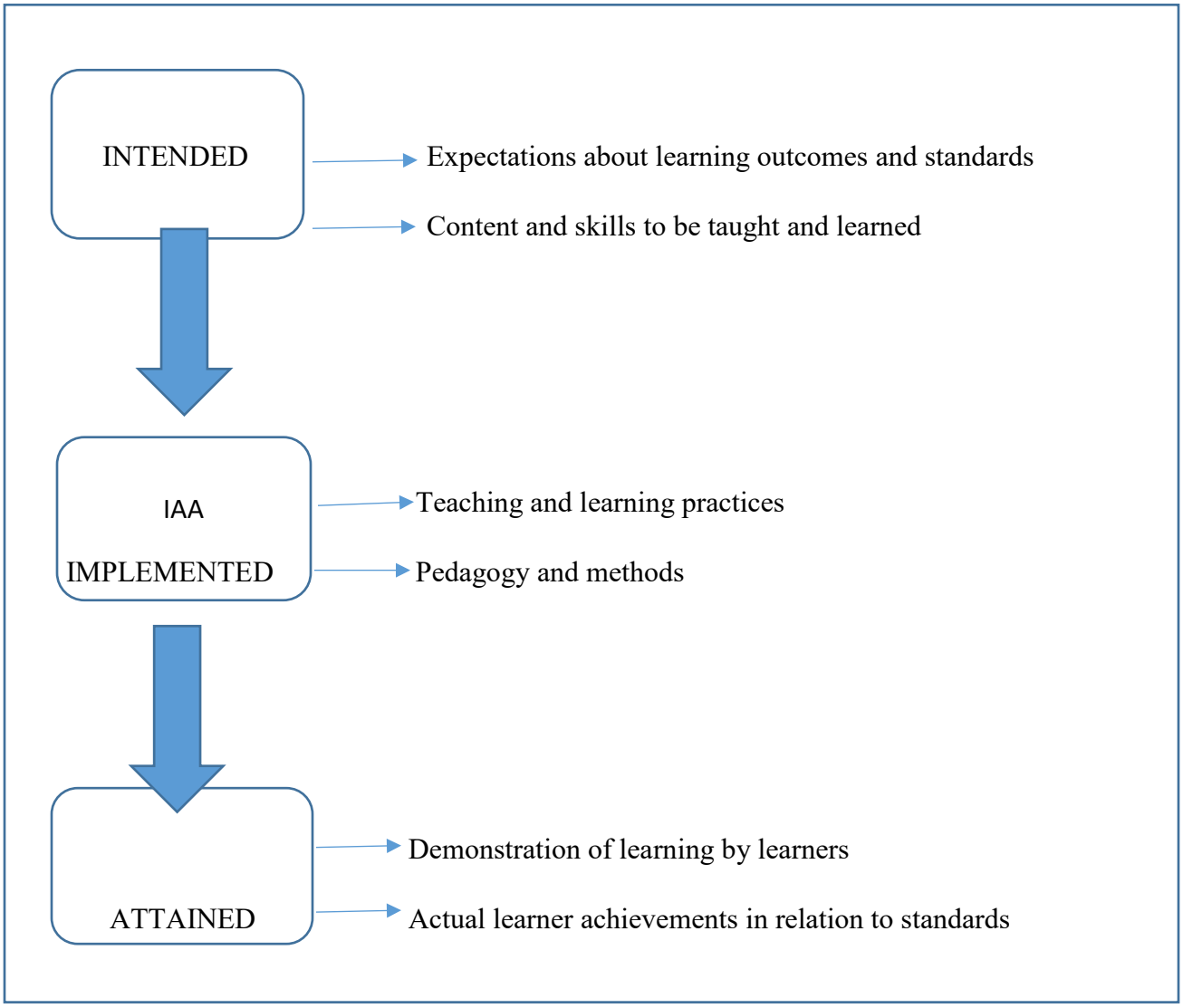

Figure 2.6.1 the three representations of curriculum

2.6.2 Intended (formal) curriculum

Intended curriculum assists to give a direction to the teachers with the least information, competency, and principles that the curriculum designers think are major for the human being and the world (Hoadley, 2012). The study indicates that the intended curriculum determines the knowledge within the defined school subjects. While Bantwini (2010) articulates that the intended curriculum must take place contemporarily with other changes in the education system in order for the teacher to have a major and long-lasting effect. Thus, it agrees with Porter, McMaken, Hwang, and Yang (2011) who argue that an intended curriculum should properly express the common core standards of the curriculum designed. Therefore, the above studies indicate that curriculum policy should state simply the goals and good ideas that will help teachers to work according to the ideas and goals of the intended curriculum. Thus, this implies that teachers should be well trained before the implementation of the curriculum in order to produce learners that are scientifically literate, and intended to restore the skills needed for mathematics for this case (Bantwini, 2010). For that reason, Hoadley (2012) points out that the intended curriculum is in line with Tyler's objective approach driven by objectives. Thus, basically, the approach aimed at how those objectives are being obtained, how the school is prepared in order to achieve those objectives and to discover if the short goals are being achieved (Nwufor et al., 2017). This suggests that teachers should teach fractions and promote CAPS by developing spatial skill and solve a critical problem by using differentiated approaches (Dixon, Yssel, McConnell, & Hardin, 2014). Although the intended curriculum clearly states what should be achieved by the learners, it will be impossible for teachers to achieve those objectives if they are not trained to teach the intended curriculum.

In addition, as indicated by Porter et al. (2011) content for the intended curriculum should clearly reveal what the learners should learn in any subject such as Mathematics, and how the content should be taught. Therefore, the knowledge and skill of the intended curriculum are recommended that it should be practised during the implemented curriculum and apply releVant teaching strategies. CAPS (2011) allows teachers to teach the content and prepare the lesson according to the documents in a specific time, but it doesn't specify the approach to use. Teachers used a method that works better in the classroom. Therefore, the intended curriculum compels teachers to teach and cover the matter that is going to be an assessment for learners, and the intended curriculum focus is on standardised tests (DoE, 2011). Burden and Byrd (2015) articulate that teachers should use the different methods and approaches in order to meet the standards of the intended curriculum,

furthermore, the societal values, norms, beliefs and customs should be included. Curriculum designers of the intended curriculum should consult and involve all stakeholders during the development of the curriculum so that the curriculum will be effective for implementation. (Clementi & Terrill, 2017) then the involvement of all stakeholders in the development of the curriculum will help in developing the school knowledge and improve society, individual and educational needs as well as learners' interest (Van den Akker et al, 2009).

2.6.3 Implemented (perceived) curriculum

Implemented curriculum as defined by Van den Akker, (2004) is the actual process of teaching and learning. However, this indicates that the perceived curriculum defines how the intended curriculum is interpreted by teachers, meaning the actual practice during the process of teaching in the classroom situation. Hence, Gvirtz and Beech (2004) state that the implemented curriculum is interpreted and communicated by the teachers and also gives equal opportunities to the learners and respects their cultural issues by giving equivalent respect to their social upbringing. For the teachers to be able to interpret the curriculum, professional development needs to be improved. Penuel, Fishman, Yamaguchi, and Gallagher (2007), proclaim that teacher development needs to be detailed than attending a one-day workshop where the facilitation, group studies take place. Technical support is important to teachers in order for them to practice the implemented curriculum in their classroom, and teachers' understanding of the curriculum they teach, must be in line with skills needed for that curriculum. One of the skills CAPS wants to develop from the learners is critical thinking. For the implemented curriculum to be successful, teachers must be trained to explore new ideas and teaching methods in-depth, then the curriculum will be practicable if professional knowledge is given support to accommodate different learners' abilities.

As a result, Grade 3 teachers must understand the concepts of the intended curriculum together with the implemented curriculum in order to bridge the gap between prescribed and practised curriculum, because they communicate the ideas of the policy through implementation (Gvirt & Beech, 2004). Therefore, Grade 3 teachers should teach the fraction lesson that will produce creative and critical thinkers to achieve the principles of the implemented curriculum by using different approaches. In this case, for this stage which is the teaching and learning process, teachers

are expected to design the lesson that will be meaningful to the learners, meet their different needs and promote the aims and objectives of the curriculum (Chisholm, 2003).

2.6.4 Attained (learned) curriculum

The achieved curriculum is concerned with what is learned between the intended and implemented curriculum (Hoadley & Jansen, 2012). This curriculum is divided into the implicit and hidden curriculum. The explicit curriculum defines what is official and actually planned. Hence implicit curriculum defines what is learned through the environment exposed and is not officially planned and how an individual perceives the world (Hoadley & Jansen, 2012). The hidden curriculum is questionable because it teaches outdated and questionable ideas about the world, and teachers are not critically assessed on what they teach. These ideas are often taught as natural and cannot be questioned.

An attained curriculum deals with what the learners had learned that can be used in other educational contexts irrespective of their environment (Howie, Scherman & Venter, 2008). For this study, during the attained curriculum, learners should acquire all skills that are needed in their lives irrespective of their differences. Handal and Herrington (2003), state that the way the learners learn Mathematics in the classroom is influenced by teachers' opinion and their experiences. It is clear that learning outcomes are influenced by what has been taught. The way learners learn is impacted by their teachers' belief, it can be personal or pedagogical experiences.

2.7 Defining differentiation

Tomlinson, Moon, and Imbeau (2015) define differentiation as a philosophy, not a set of instructional strategies, and it is a way of thinking about teaching and learning that holds a set of principles. Hence, Roberts (2008) states that differentiation is tied to the match of the curriculum and learning experiences to learners, not a strategy, but rather a way of teaching that accommodates differences among learners so that all are learning on an ongoing basis. The term's delineation is particularised to each domain as it is in education where differentiation essentially means tailoring teaching to attend to a specific learner's needs and the way they teach (VanTassel-Baska, 2013). While Tomlinson et al. (2003) state that, differentiation is a way of thinking about teaching. The

premise is that schools should not affirm to students achieving prescribed norms, but should aim to enable them to maximise their full potential.

However, learners should be facilitated to develop as promptly as possible, not only learn vital content but to undertake responsibility as well for their own lives as learners. The intention is that by complying to the individual needs of each learner will allow them to progress at or beyond a predictable standard (McNamara & Moreton, 2016). This can be attained by differentiating learning materials, activities and how the learner is being taught (Mills et al., 2014). While this may appear a straightforward process, an array of definitions, methods of implementation, misunderstandings and the incidence of criticism among educators have concentrated differentiation a contested concept (Cochran-Smith et al., 2009). At its origin is the conflict between traditional approaches to teaching and the concept of differentiation (Erickson, 2010). While conventional teaching places teachers at the centre of the classroom, differentiated philosophy locate the learners in this position. Similarly, it is the role of the teacher to direct learning; under differentiation, the teacher expedites learning.

Differentiation can be interrelated back to Vygotsky's (1978) intervention theory (Brown, 1992), which centres on the importance of focusing on learners as individuals and support for their speculative achievements rather than on the curriculum (Fleer, 2013). This child-centered approach, as opposed to a generalised curriculum focus, is the serious dimension that supports the theory of intervention (Vygotsky, 1978). In this situation, facilitating more or improved intervention is not necessarily the best strategy (Vygotsky, 1978). Instead, there should be more focus on assisting learners' assimilation of classroom practices, participation, and contribution to their individual development (Taylor, 2017).

Vygotsky's (1978) beliefs have been reinforced by Gardner (2000) theory of multiple intelligences. Hence Gardner (2000) ideas emphasise that there should be a greater focus on 'individual-centered education', tailored to meet the needs of each child with specific (Taylor, 2017) focus on weaker areas of intelligence. Compering to Vygotsky's and Gardner's theories, differentiation in the contemporary classroom seeks to promote greater scaffolding of teaching and learning based on learners' target grades rather than being used as a supportive approach basically concerned with individual needs and abilities (Hertberg-Davis, 2009). Moreover (Tomlinson & Murphy, 2015) claim that differentiation is no longer viewed as the individualised approach as intended in the

1970s. The improbability has been improved, as both themes are often used interchangeably, further exacerbating the misinterpretation of the key notion of differentiation.

In contemporary education, differentiation is presented as a technique for facilitating learners as unique individuals, providing the opportunity for optimal learning (Petty, 2004). However, Terrell and Education (2005) refer to differentiation as streaming, tracking or grouping learners according to their abilities. The main purpose of differentiation is to strengthen a greater understanding of the requirements of Learners with Special Educational Needs (LSEN), and, thus, tailoring the curriculum to fulfil them. This shows inconsistency and misconception of the actual purpose of differentiation. To support mentioned above statements, various recognitions of differentiation and its approaches indicate the need to question its uses and evaluate whether successes in learners' performances really can be connected to differentiation or whether it is due to other intrinsic or extrinsic factors. Furthermore, the objective of differentiation is to encourage teachers to vary their teaching, learning and assessment practice (Vickerman & Education, 2009). Hence, Naicker (2018) insists that teachers must adapt teaching to respond to the strengths and needs of all pupils as per departmental policy on inclusive education. This includes knowing when and how to differentiate a curriculum appropriately by means of using different approaches, which enable learners to be taught effectively and to fulfill their potential.

2.8 Understanding learner diversity

According to Tomlinson (2008) understanding, learner diversity just means understanding learners' characteristics and differentiated needs as informed by three important dimensions, namely, their prior learning experience, interests and learning profile. Tomlinson (2008) states that one central 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 well than other people and their special needs. Therefore, Tomlinson (2008) warns that lack of teacher-learner connectedness may result in poor academic achievements. This is because learners cannot succeed in attaining their potential from learning if they are separated from those who are supposed to provide such learning. This statement indicates

that teachers should understand learner diversity when teaching fractions as a lesson, as well as dealing with their weaknesses and strengths within the classroom environment.

2.9 Basic principles guiding differentiated instructions

There are three key principles guiding differentiated instruction, and seemingly, these principles are more considered as any policy in the teaching and learning environment. Therefore, for this study teaching of fractions, considering of principles that guide differentiated instructions is vital.

Tomlinson (2008) describes these principles as follows:

a) Respectable tasks: This implies to learners work that is designed by the teacher and should be more appreciated by all learners as valuable and meaningful to them. In this case, the learners should find the classroom activities and tasks given to them interesting and understandable and providing them with a sense of learning. Therefore, in other words, learners should not be given work to keep them busy.

b) Flexible grouping: Flexible grouping comprises the creation of conditions in the classroom where learners have freedom of choosing the groups they want to be part of it during the teaching and learning process. Basically, the teacher modifies and adapts the size of a group depending on the teaching and learning activities, learners' interests as well as sitting arrangement in the classroom.

c) Continuous instruction-linked assessment and adjustment: This principle includes an on-going formal and informal assessment for learners, as well as identify differences that involve learner's weaknesses and strengths. Thus, the knowledge gained from such assessment enables the teacher to adjust teaching to the learners' abilities to maximize their self-confidence. Therefore, when teachers providing choice, respectful tasks and shared responsibility for learning, they will be enabled to respond to learner diversity.

2.9.1 Elements of a differentiated classroom

Tomlinson (2008) confirms that the differentiated instructions for the effective classroom are based on the modification of four elements: content, process, product as well as affect or learning environment. As a result, this modification is guided by the; teacher's understanding of learners' needs, readiness, interest and learning profile (Ismajli & Imami-Morina, 2018). The statements above explain the modification of four mentioned elements of differentiated instructions in the classroom as:

a) Content means the knowledge, understanding, and skills that learners learn through instructions given by a teacher (Tomlinson & Imbeau, 2010). The learning goals mentioned should always remain the same for all learners in the differentiated classroom. Actually, what teachers can differentiate in terms of content are the methods learners use to access key content. Tomlinson & Imbeau (2010) further articulate that, to address individual learner needs, teachers also provide appropriate scaffolding when working with content. In this case, scaffolding allowing advanced learners to move ahead of the class, or changing the content for those individuals.

b) Process refers to the manner on how learners come to understand and make sense of the content (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 come to demonstrate their knowledge, understanding, and ability to do after an extended period of learning (Tomlinson & Imbeau, 2010). 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.

d) The learning environment refers to the effect of learners' emotions and feelings on learning. Thus, this is considered as another element of differentiated instructions that

modify the learning environment to meet learner emotional needs. For example, a teacher differentiates by learner effect when a learner needs a little bit of attention to be able to stick with the given task.

Therefore, content, process, product, and affect/learning environment are key elements that form classroom instruction. In this case, for teachers to address learner's needs, they should strive to make these elements flexible in the use of teaching fractions in Grade 3. Seemingly, what drives the modification of these elements is a teacher' assessment of learners in terms of the three characteristics mentioned earlier: readiness, interest, and learning profile. This table below shows the suggestions on how teachers should assess learner's variance.

Readiness	**Interest**	**Learning Profile**
• Attitude toward school, subject or topic • Experience with the topic or an aspect of it • Knowledge, understanding, and skills in topic prerequisites or related topics • Misunderstandings about topics or discipline • Overgeneralizations about the topic or discipline • Sophisticated use of related vocabulary • Evidence of skills in the discipline • Insightful connections between the current topic and other topics in the discipline	• Passions • Hobbies • Family interest • Affiliations or after school clubs, extra-curricular activities • TV viewing preferences • Vacation destinations • Music • Choice of friends • Elective choices	• Learning styles: visual, kinaesthetic, whole-to-part versus part-to-whole, concrete versus abstract, sequential versus random • Intelligence preferences • Environmental preferences: temperature, light, availability of food and drink • Gender or culture-based preferences: competition versus collaboration, individual versus group • Group orientation: work alone or with others

• General communication, thinking and other pertinent skills		• •

Figure: 2.9.2 Source: Strickland, C (2005). Tools for high quality differentiated instruction

2.10 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 impacted 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, 2011).

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

It is evident that there are a couple of key policies regarding curriculum differentiation. They are specifically the National Education Policy on Inclusive Education (DoE, 2001) and the National Curriculum Statement Grades R-12 (DoE, 2011).

Basically, the National Education Policy on Inclusive Education arises from White Paper 6 on Special Needs Education (DoE, 2001). As per the policy classification of inclusive education, three issues that are most vital in my study into curriculum differentiation are noted. The first issue is the recognition and respect for the differences existing in learners. This is rooted in the belief that "no two learners are the same" (UNESCO, 2001, p. 7). Secondly, issues arising from the first is the acknowledgment that interprets these differences, the learning environment, teaching methods,

curriculum, attitudes and behaviour should change to meet the learner's different needs. The last issue is the maximization of learner participation in the curriculum as a whole.

In this case, this study is being supported by these policies and the National constitution itself, and it is hoping to close the gaps identified so that policies should be reviewed if there should be a need.

2.11 Implementation of the differentiated curriculum in South African schools

Since the Curriculum Assessment Policy Statement (CAPS) was introduced and designed in 2011, as a modification of what to teach (curriculum), and build on the NCS (Ramatlapana & Makonye, 2012), aims to improve curriculum implementation and assessment in the classroom situation, and its guidelines for responding to learner diversity. Thus, those guidelines strengthen CAPS implementation. Therefore, learners with different cultural backgrounds and different experiences, interests, learning styles, and multiple intelligences are the norm (Gregory & Chapman, 2012).

According to Weber (2013), there are three factors to be considered with the implementation of differentiation in South African schools, these are: support teachers need to enhance their confidence in the approach, enhance ways in which classroom practices contribute to the execution of differentiated techniques and attributes that may improve or impede the introduction and development of differentiation. In this case, the central to effective implementation of differentiation is collaboration and cooperation (McNamara & Moreton, 2016). This requires guidance, support, and leadership of experienced and highly skilled practitioners, who are essential to ensure efficiency of the strategy across all curriculums, Therefore, differentiation is regarded solely as the responsibility of teachers who are not always supported or guided by school leadership in applying differentiated approaches, and, too often, there is limited knowledge by management on how to provide effective provision for differentiation (Munro, 2012). Furthermore, for differentiation to be successful, Pinar, Reynolds, Slattery, and Taubman (1995) suggest that senior managers should restructure the way staff and students organise their work. In fact, senior managers should initiate in-depth planning and provide ongoing support for teachers as part of its differentiation technique in all schools level (Mills et al., 2014).

Thus, lack of supervision means failing of the implementation of a differentiated curriculum as an approach in our schools. McNamara and Moreton (2016) argue that this is because teachers require extra time and effort, particularly, as differentiated instructions, tasks and assessments are very complex. Therefore, considerations such as class sizes, planning time, resources, increased teacher responsibility and arrangement for collaboration with colleagues must be taken into account for consistent application and effectiveness of differentiation (Brighton et al., 2005). All school leadership must also consider intervention, assessment, time and involvement outcomes in support of differentiated techniques (Barthorpe & Visser, 1991). However, a lack of direction has led to limited coherency among teachers and infrequent and largely unsuccessful attempts at the implementation and use of differentiation (Munro, 2012). This means that even though teachers may be able to provide an in-depth explanation of differentiation, they struggle to execute it in daily practice (West, 2016).

Thus, in this case, it is noticeable and advisable for this study that this philosophy of differentiation enables teachers to plan strategically in order to meet the needs of the diverse learners in a classroom environment, by means of support given (Gregory & Chapman, 2012). A teacher in an effectively differentiated classroom pursues to develop increasing insight into learners' readiness levels, interests, and learning profiles. Despite that, to develop instruction that increases each learner's opportunity for academic growth, the teacher must differentiate and modify the content, process, product, and affects (Tomlinson et al., 2015). They continue to define the content as the knowledge, understanding, and skills the teacher taught a learner. Therefore, the way a learner interprets and come to understand or make sense of the content in the process. Furthermore, the product shows the learner's personal interpretation of what he or she knows, understand and able to do after an extended period of learning. Similarly, an effect usually described as emotions and feelings originated in the brain based on past experiences and reactions to current experience, in that way, affect is vital to, rather than apart from the curriculum. Therefore, when a learner has a positive effect regarding learning, the doors to academic growth are widely open for him or her. In addition, as a result, respecting diversity implies a belief that all learners have the potential to learn.

Gregory and Chapman (2012) agree that, teachers should also strive to differentiate assessment tools, performance tasks, and instructional strategies in order to reach the needs of the diverse

learners in the classroom. Therefore, a teacher must provide a blending of formal and informal tools for ongoing assessment, and learners demonstrate their knowledge in many different ways when learning fractions (Gregory & Chapman, 2012). In supporting the above statement, using differentiated instructional strategies in one classroom, help learners to learn content appropriately, get more information, and able to develop the necessary skills. Therefore, teachers who deploy differentiated learning strategies attempt to reach everyone in the class at the same time. Apparently, at the same time, teachers still understand that everyone is on a different level.

Adcock (2014), supporting Howard Gardner's Theory of Multiple Intelligences, argues that all people have different kinds of "Intelligences." Hence learners come to school from diverse backgrounds and some come with multiple intelligences that make them be able to work with numeric symbols and operations, identify patterns and recognise logical connections used for data. Among these learners, there are those with average intelligence, learners with disabilities and those with barriers to learning, resulting to be accommodated in one classroom. In this case, that is when an effective teacher is expected to implement a differentiated curriculum and reacting responsively to learner's needs (Tomlinson & Murphy, 2015).

Furthermore, some students have the ability to acquire and apply knowledge and skills in one area, whereas others may demonstrate strengths in several bits of intelligence (Tomlinson & Murphy, 2015). In supporting that, the role of an effective teacher is to identify highly gifted learners and those that have barriers to learning and give full support in that identified area. Every teacher should differentiate instructions in one way or another, by giving a learner more time to finish an assignment, allowing them choice in what to read, or giving different types of assessments. However, a teacher can make the classroom more responsive to learner needs with a systematic approach to differentiation (Levy & Ideas, 2008).

Differentiated instruction means that teachers create different levels of expectations for task completion, and emphasize the creation of environments where all learners can be successful, it addresses the "how-to" question for teachers and calls upon educators to be responsive to learners (Tobin, Tippett, & Education, 2014). Hence, McFadden, Hiller, and Tyre (2011) specifies four important major principles of differentiated instruction that focuses on the essentials (manipulate the complexity of activities and expectations), links assessment and instruction, involves

collaborative learning between the teacher and learners, and all students participating in respectful work. It is teaching with learner variance in mind to maximize the capacity of each learner by bridging gaps in understanding and skills and helping each learner grow as much as quickly as he or she can (Cox & Cox, 2008). Therefore, differentiated instruction for learning fractions in Grade 3 is also be regarded as an effective learning tool or approach which is tailored to meet the diverse academic needs of learners (Adams, Olsen, & Ware, 2017).

Further investigation demonstrates that when students are regarded as individuals and their learning being supported, their attitudes and academic achievement improves (Adams et al., 2017). On the other hand, Hawkins, Jones, and Santi (2019) proclaim that to understand the importance of differentiated approaches in the teaching of Mathematics, the teacher has to understand the context in which the curriculum is delivered and responsiveness to that context which is basically of inclusive education. Thus, in South Africa, Inclusive education is highly prioritized in the Curriculum and Assessment Policy (CAPS) for Mathematics, in conjunction with guidelines for teaching and assessing learners according to their diversity (DoE 2011). Seemingly, for this study to adhere to this policy teaching fractions in Grade 3, using differentiated approaches is a concern.

Hence the differentiated approach in teaching fractions in Grade 3 is crucial and acts as a strategy that involves modification, adaptation and extension of methodologies, instructional and assessment strategies and curriculum content, placing special emphasis on learners' abilities, interests and backgrounds, and it should be placed into practice by teachers (Dixon et al., 2014). Furthermore, Spaull and Enterprise (2013) affirm that in South African school's poor learner achievement in Mathematics linked to poor subject knowledge and poor teaching competencies. This suggests that to improve learners' performance in mathematics, in particular, teachers require more skills on how to teach (Mathematics content area), how to differentiate instruction and how learners learn.

Data from studies conducted in previous research also reveals that learners in South African schools are performing poorly in Mathematics and Languages due to the lack of differentiated instructions, especially in comparison to learners in other countries. This report confirms that there are gaps among learners, teachers and the curriculum implementation that need to be closed. Therefore, their findings suggest the need for teacher professional development that will equip them with knowledge, skills, values, and attitudes for the effective education of learners (Yusuf,

Wekke, & Sciences, 2015). Although the lack of pedagogical is an issue in South African schools, the CAPS aims to encourage and promote active teaching and learning. In addition, CAPS aims to ensure that learners acquire and apply knowledge and skills in ways that are meaningful to their lives. In this regard, the other crucial importance of teaching and learning which seems to be effective, are moulded by elements of differentiated classrooms, instructional process, content and learning product (Van Hover, Hicks, Sayeski, & Education, 2012).

Likewise, Tomlinson and Murphy (2015) suggested a number of subject-specific differentiation strategies that teachers can use to differentiate instruction. The most important strategy they presented is a teacher working with a small group of earners. With 6 or 8 learners sitting closely with the teacher and ask individual questions such as where learners are stuck and when they are ready to move on. In addition, this strategy promotes effective inclusive education, particularly in Mathematics. Other differentiation strategies include "tiered activities," allowing the teacher to keep concepts and skills the same for each learner and at the same time provides "routes of success" and make progress. This is considered as a fair way to differentiate learning. In addition, to guarantee learners' access to curriculum, the following examples of strategies should be applied in the teaching of fractions by using differentiated instructions (Scott-Webber, 2012).

Compacting: It refers to a differentiation strategy that incorporates content, process, products, classroom management and teacher's personal commitment to accommodating individual and small-group differences. Substantially, this strategy involves (i) defining the goals and outcomes of a particular division of instruction. (ii) Determining and recording which students have already mastered all of the particularized set of learning outcomes and (iii) equipping replacement strategies material already mastered in conjunction of instructional options that allow more challenging and fruitful use of the learners' time. For example, in a Grade 3 lesson on fractions of a continuous whole, a learner who already knows how to divide a single item up into parts of equal sizes in one way or another in order to find its fraction parts such as 1/8, must be excused from the lesson. Apparently, the learner should be given a task of finding 1/8 of 32 beads which are 4. This learner will be able to divide the beads into 8 groups of equal size, then each group will have 4 beads inside, which is the answer. Curriculum compacting is an effective strategy was designed to eliminate already-mastered content and to provide students with enrichment activities

in the time saved (Tomlinson et al., 2015). It is clear that a major problem facing our schools is the lack of curriculum differentiation and academic challenge for many of our most learners.

Tiered lesson and assignment: It denotes as a method used to learners at different levels but using the same tasks, and is also called tiered instructions. However, Tomlinson and Murphy (2015) define tiered as another strategy used for differentiated curriculum and instructions that based on challenge level, complexity, resources, outcome, process or product, and eventually, suggests the use of Bloom's taxonomy as a guide to develop various challenge levels. As for tearing by complexity, he recommends the provision of various tasks that address the learner's level of readiness, from less level to more abstract. For tearing by resources, this is when learners engaged in the same activity using materials at various levels (Allen & Turville, 2014). Thus, an example of this strategy is when a Grade 3 learner is given an instruction to shade 1/5 from a diagram, while other learners finding 1/5 from the list of proper and in proper fractions.

Anchoring: When learners are given work to do whilst waiting for more instruction from the teacher. In a Grade 3 Geometry lesson on 3D-objects, learners who have completed listing their objects may be asked to compare their size using rulers with centimeters, while the teacher is busy helping those who are struggling with the task. Apparently, this strategy can be used in any subject, by the whole class, in small groups or individuals, it is particularly allowing the teacher to deal with learners that are stuck or having problems with the specified content area (Riccomini, Smith, Hughes, Fries, & Quarterly, 2015).

Flexible grouping: This is also described in (2.6.4) Involves establishing learning groups of different sizes either randomly or being allowed to join a particular group of their choice to complete the task. For example Grade 3 learners can form groups to colour and cut their scrap papers of same fraction part of the whole during pasting geometrical patterns on Algebra lesson. Given the picture presented above, it is important to note that learners that are in the Foundation phase especially in Grade 3 come from different backgrounds with different needs, thus, she or he may be given opportunities of their choice.

2.12 The role of curriculum differentiation in teaching and learning

Differentiation in teaching and learning of fractions in Grade 3 assists teachers in addressing the issue of dealing with learners of varied abilities and responding to their individual needs (Konstantinou-Katzia, 2013). Effective use of differentiation has been associated with increased learner motivation, higher academic achievement and greater collaboration among students with the similar ability (McNamara and Moreton, 1997; Gentry and Owen, 1999; Hertberg-Davis, 2009). Educators are increasingly recognising the use of effective differentiation to fulfill the needs of each learner. Moreover, successful differentiation can fulfill the varied needs and abilities of students in the same classroom (Haelermans et al., 2015).

It is argued that differentiation can play an influential role in developing identified talent in gifted learners (Hertberg-Davis, 2009). Moreover, differentiation allows students to progress at a pace suitable for them regardless of their knowledge, skills or previous understandings (Wu, 2013 and Valiance et al., 2011). Differentiation, it is held, can provide a platform for innovation and ongoing reflection that boosts teaching and learning that would not be readily available in the form of 'one size fits all lessons (Valiande et al., 2011). However, studies conducted from other countries revealed that failing to differentiate the curriculum resulted to lack of participation, interest and confidence may drop in learners in the classroom. Therefore, this may affect the effective teaching and learning, as well as poor academic achievements of learners.

2.13 Guidelines relating to teaching and learning of fractions

With curriculum change currently underway in South Africa and continuing recognition learner diversity, a need arises for maximizing focus on effective teaching and learning of fractions in Grade 3. Thus, if all learners are to benefit from curriculum delivery be included in the lesson by using different approaches. 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, 2011) and subject-specific CAPS for the various grades. These guidelines lay emphasis on how to teach and assess learners according to their differences.

2.14 Conclusion

This chapter provides an overview of literature releVant to the phenomenon in the context of the teaching using curriculum differentiation as an approach.

Hopefully, this study may help the teachers to develop their content knowledge which may help learners to benefit more as teachers revealing their daily encounters of teaching fractions in Mathematics using differentiated instructions for different learners. The following chapter addresses the theoretical framework and conceptual framework that underpin the current study. The review of the conceptual framework as framed by ten curriculum concepts will conceptualize teachers' experiences of teaching using differentiated curriculum approaches in the teaching of fractions in the classroom.

CHAPTER THREE

THEORETICAL AND CONCEPTUAL FRAMEWORKS

3.1 Introduction

In chapter two, I initially discussed the perception of educational experiences as well as the different layers that represent the curriculum. Secondly, I explored existing literature related to the current study and reviewed the gaps identified in the implementation of differentiated curriculum instructions in the classroom environment. Furthermore, I have discussed the constitutional, legislation and policy that underlying curriculum differentiation in the South African schooling system.

Therefore, this chapter engages with theory and concepts that will be useful to analyse, interpret and discuss the research findings of the current study. Actually, in this case, the theories and concepts will impact on how the study conceptualizes teachers' experiences of teaching using differentiated curriculum approaches in teaching Grade 3 fractions. Thus, the curriculum spider web components for teaching and learning will be used as the conceptual framework of the study.

3.2 Theoretical framework

A theoretical framework is the combination of the same concepts, like a theory that guides research, determining what things the researcher will measure, and what statistical relationships the researcher will look for. A theoretical framework is critical in deductive, theory-testing types of studies (McMillan & Schumacher, 2010). Thus, there are two purposes for why a theoretical framework is important. Firstly, the researcher has a preconceived notion even if he does not have much knowledge on the topic. The second reason is that the framework gives guidelines to what the researcher notices in an organization, and what the researcher does not notice (McMillan & Schumacher, 2010).

Theories are constructed in order to explain, predict and master phenomena, such as relationships, events, or behaviour. Despite that, in many cases, we are constructing models of reality. Anfara Jr and Mertz (2014) define a theory as a set of interrelated constructs, definitions, and propositions that presents a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting phenomena. Therefore, it is vital for this study to adopt a

theory that will construct knowledge for both teaching and learning in order to understand, explain and predict the phenomenon.

3.3 The constructivist theory

According to the constructivist theory, knowledge is not external to learners' minds, but learners assisted by teachers use their interpretation skills or explanation of something presented to them to create knowledge. The construction of knowledge is transformed through a teacher's experiences (Hadebe-Ndlovu, 2016). In this case, the key concepts of constructivism being that knowledge is not passively received from others but it is constructed as the learner makes meaning of the world for them. The teachers' experiences and knowledge for teaching using curriculum differentiation as an approach play a substantial role in learners, in order to obtain the skills of understanding their world.

Thus, teachers are there to guide and support learners towards achieving their goals and as a result, constructivism is a suitable tool to transmit knowledge since constructivists view knowledge as theoretically constructed**.**

3.4 Conceptual framework

A conceptual framework is defined as a network of linked concepts (Jabareen, 2009). The conceptual framework that underpins this study is framed by a curricular spider- web of (Van den Akker, 2004), according to which, a curricular spider-web can be divided into 10 concepts that speak to specific elements of the teaching process: rationale; aims and objectives; content; teaching activities; the teacher's role; material and resources; grouping; time; location; and assessment. Within this context, the concept is defined as "theory that gathers together all isolated pieces of empirical data into a coherent framework of wider applicability" (Cohen et al., 2011, p. 9). On the other hand, a study by Rowley and Slack (2004) states that a conceptual framework is a constructive instrument used in promoting an understanding of the meaning of concepts about the phenomena in the research study. The above study identifies that a conceptual framework is necessary to generate understanding from the study conducted. According to this, Rowley et al (2004) conceptual framework should drive the whole study and give meaning to the finding of the

current study. Therefore, a conceptual framework must communicate theory into practice (Gay, 2018).

To add, on the above studies, (Nieveen & Plomp, 2017) reveal that the spider web concepts display the susceptibility of the curriculum, and if there is nothing done until the web breaks, the curriculum will lose its consistency. Hence, the case study by Khoza (2013b) deduces that teachers do not know the theory that underpins subjects in CAPS. This suggests that for this study, in particular, spider web concepts are useful in understanding teachers' experiences of teaching fractions as content in Mathematics using differentiated approaches within CAPS as a document to be followed.

3.5 Curricular spider web

The learning concepts, referred to as the ten components of a curricular spider web according to Van der Akker (2010) allow teachers to understand their practice with different learners. This promotes both the community understanding and the subject understanding of teachers' practices. The table below presents the spider web concepts and its propositions that speak to specific elements of the teaching and learning process. In this case, these concepts within the conceptual framework must communicate theory in practice, so that the researcher will be able to understand and explore Grade 3 teachers' experiences of teaching fractions using differentiated curriculum approaches in the diverse classroom.

Figure 3.5.1: Curriculum spider web framework for teachers' experiences (Van den Akker, 2004)

Rationale or Vision	Why are you teaching? (Personal, Societal, and Content rationale)
Aims and Objectives	Towards which goals are you teaching? Aims, objectives and outcomes
Content	What are you teaching? /What are they learning?
Learning activities	How are you teaching?

	(Formal, informal activities)
Teacher role	How is the teacher facilitating learning? (Instructor, facilitator, manager and assessor)
Materials and resources	With what are you teaching?
Grouping	With whom are they learning?
Time	When are you teaching?
Assessment	How to measure how far learning has progressed?

Curricular spider web as defined by (Khoza, 2015) are descriptive mode to imagine the connection between the different aspects of the curriculum, hence Van den Akker et al. (2009) describe the spider web as the clarifying approach of looking for the connection amongst various curriculum angles. The teachers' experiences will be explored using the spider web concept rationale as the major guiding component. Rationale serves as the link between all other curriculum concepts such as goals, content, learning activities, teacher role, materials and resources, location, time, assessment and accessibility. In this case, the rationale is described as "the reply to the question of why a subject is taught at school or why learners are learning this subject"(Van den Akker, 2004). Basically, each concept will use a proposition to help in understanding teachers' perceptions in teaching fractions in Grade 3 using the differentiated curriculum approaches.

3.6 The concept of fractions

In this study, the concept of fractions will be defined shortly aiming to make a connection between the importance of teaching fractions in lower grades and the implementation of curriculum differentiation to the diverse learners. The using the differentiated curriculum approaches is vital to all learners in the classroom and is an organised plan to modify the curriculum in terms of the content, process, product and affect as mentioned in the previous chapter. Furthermore, all learners should acquire more skills on how to solve different fraction problems in different situations in their entire lives.

According to Kong and Education (2008), the concept of fractions can be understood in five ways: part-whole, measure, operator, ratio and quotient. "Part-whole" describes the relation of a part of

a quantity to its total amount (Bailey et al., 2015). For example, in the fraction 3/5, the numeral 5 shows how many parts it is divided into and the numeral 3 shows how many fifths (pieces) are taken. On the other hand, Roesslein and Codding (2019) argue that the concept of "fraction" denotes to common fractions and not related concepts in working with decimals, percentages, ratios or proportions (Berch, 2017). "Common fractions" are quantities that can be represented as a fraction of integers for example 3/4 (Gabriel, 2016). While, (Jordan, Resnick, Rodrigues, Hansen, & Dyson, 2017). Hence, Chamane (2016) defines a faction as "a number that expresses a part of the whole as a quotient of integers (where the denominator is not zero)". Therefore, (Jordan et al., 2017) further states that another way to describe a fraction is "a division expression where either the dividend or top number is not zero". A fraction can also be defined as a part of a whole, a place on the number line, an answer to a division calculation, or a way of comparing two sets or measure (Van Steenbrugge, Remillard, Verschaffel, Valcke, & Desoete, 2015).

Looking at the above definitions, it is evident that most teachers find it difficult to teach fractions as the learners also struggle to understand the concepts, especially at Grade 3 level. In this case, this implies that the teaching of fractions is complicated for teachers to interpret and then teach. Therefore, the concept of fractions in Grade 3 Mathematics classroom, should firstly be understood by teachers and then learners through the use of curriculum differentiation. Basically, it is evident that the lack of conceptual understanding by teachers leads to the poor performance of learners' infractions.

Harvey (2015) investigated the fraction content knowledge of prospective teachers in New Zealand and their ability to use this knowledge in the classroom situation. The findings showed that this knowledge was extremely poor, which implies that the teachers encounter problems when teaching fractions. As for Young-Loveridge and Bicknell (2015) conducted a study in six different schools. Participants were foundation phase learners, aged between six and eight. Participants were given a challenging task that involved the addition to fractions. The findings showed that only a few learners in each school found the correct answer to the problem. Some of those who managed to solve it used procedural knowledge instead of a deep understanding of fractions. The findings indicated that, basically, learners' knowledge of fraction concept was limited and only a few learners have a deep understanding of fractions. Therefore, for this study knowing the fraction

concept is very important for both teachers and learners before content knowledge and thus, this knowledge should be acquired through the use of differentiated curriculum approaches within the framework of the curriculum spider web.

3.7 Rationale for teaching fractions

The rationale is the major guiding component, while the other nine components listed above are ideally linked to the rationale and also consistent with each other. Thijs and Van den Akker (2009) stress the importance of the consistency of the curriculum components in the drawing of a curricular spider-web. However, Chamane (2016) state that rationale helps the teachers to understands the reasons for teaching fractions in their classrooms. This suggests that teachers who teach fractions in Grade 3 should have a rationale for teaching them, and why learners learning fractions. Pella (2015) states that the rationale for teaching should be based on three rationales: personal (pedagogical); societal; and content knowledge.

3.7.1 Personal

All teachers have a personal rationale for teaching. Sanz, Molt, and Puerta (2015) state that content, pedagogy, and society are the areas that should be given priority in order to provide a consistent education. Adler (2015), states that teachers teach Mathematics because of interest, irrespective of the skills that enable them to teach Mathematics. This suggests that personal experiences can play an important role in teachers' rationales when teaching fractions in Grade 3.

Olsen (2015) states that the personal rationale is what makes a successful teacher and guides him or her to do what needs to be done differently in order to prepare students for the 21st century. The personal rationale encourages teachers to expand their mathematical knowledge in order to teach fractions effectively (Hill, Rowan, & Ball, 2005). This suggests that teachers' mathematical knowledge must become part and parcel of their everyday practices (Shaughnessy, Garcia, Selling, & Ball, 2016). Therefore, in other words, the personal rationale appears as the most influential in driving teachers to teach fractions. Likewise, probably as for personal reasons to teach Mathematics, some teachers are influenced by the society in their teaching of Mathematics and its content areas including fractions.

3.7.2 Societal reasons

Mathematics is taught by teachers who understand Mathematics as a subject, but have little knowledge of fractions and other mathematics content areas because they are a product of a post unfair Apartheid curriculum. Therefore, some teachers were taught by the teachers who lack knowledge due to their teachers as well (Hill et al., 2005). In addition, some teachers teach Mathematics because of the qualifications they have, irrespective of the knowledge they have for the content subject (Ball, 2003; Ensor, 2001; Hill et al, 2005). The above studies indicate that some teachers experienced challenges when teaching fractions because they were not trained to teach Mathematics, they teach because they understand Mathematics as a subject, or they obtained pass results for Mathematics at their Senior Certificate level. The above study suggests that qualifications are of concern in teaching fractions, even though the teachers are not able to promote the goals of the intended curriculum. Teachers should learn more about fractions so that they will pass the knowledge to the learners and be able to unpack mathematical knowledge to accommodate learners with different learning barriers (Gravemeijer et al., 2017). According to the studies, teachers teach Mathematics in their schools because there is a shortage of Mathematics teachers. In this case, they are influenced by societal reasons. Therefore, dealing with the societal reasons, a teacher must ensure that every learner should benefit equally irrespective of different backgrounds.

On the other hand, learners need to be taught Mathematics in a meaningful way so that they will see their relevance to everyday transactions and other meaningful contexts (Gravemeijer et al., 2017). Supporting the statement above, learners belong to society and their learning is influenced by societal issues. Certainly, Gutstein (2018) claims that Mathematics should be a weapon for learners to deepen their understanding of the socio-political contexts (the societal rationale) of their lives, through the process of studying their realities. This suggests that Mathematics is important for learners in understanding their socio-political contexts. Further, Gutstein (2018) conducted a qualitative study on teaching and learning Mathematics in an urban Latino school with respect to social justice and the role of the standards-based curriculum of the National Council of Teachers of Mathematics (NTCM). The findings of the study revealed that students had begun to read their world (understand complex issues involving justice and equity) which helped them to improve mathematical skills and change their orientation, attitudes and behaviour towards

Mathematics. Therefore, in this case, teaching Grade 3 fractions is vitally important for learner's everyday lives, at some good reasons, because they relate and contribute to society profitably.

3.8 Goals (Towards which goals are you teaching?)

Aims/objectives and outcomes state what is actually anticipated from the teacher and the learner at the end of the lesson. Seemingly, aims are a broad general statement of teaching intention, and objective is usually a specific statement of teaching intention, and outcomes are statements of what learners are expected to know, understand and/or be able to show after learning (Shange, 2015). Goals can clarify what learners are to learn and can "reflect what society, academic, community or subject group find important" (Berkvens et al., 2014, p. 13). The study indicates that educational goals are important for the teacher and learners during the teaching and learning process. Yet, Khoza (2013b) insists that teachers' teaching should be parallel with aims, objectives, and outcomes to do fairness to the learners.

3.8.1 Aims

According to Chamane (2016) and (Khoza, 2015b), their aims are broad statements of teaching the purpose and are written from a teacher's point of view. In addition, these authors further elucidate that aims are written to show the general content and direction of a lesson, while objectives are specific statements of teaching the purpose and are written to show one specific area that the teacher intends to have covered by the end of the lesson. However, Galane (2016) points out that aims and objectives in education could monitor decisions on the content of subjects, which need to reproduce the subject knowledge that is important to the core of the subject.

The importance of aims in the implementation of the curriculum has been emphasised by Krathwohl and Anderson (2009) who consider that the aims dictate the purpose of subjects like mathematics. This indicates that the way the subject is taught is dependent on the stated aims of the subject. According to CAPS (2011), aims are called "general aims" and the objectives are called "specific aims". However, aims and/or objectives as specified in Mathematics documents are general aims of the planned curriculum and the implemented curriculum. These aims and/or objectives are not specific to the teacher's intention when teaching a certain topic or content. For

example, the CAPS document does not state specific aims for any teacher of fractional concepts. Therefore, a teacher who is capable of differentiating a curriculum should have clear learning goals that are rooted in content standards that will engage all learners.

3.8.2 Objectives

"Learning objective is an objective which is formulated in such a way that is clearly spelled out the expected learning profits on the part of the learners, in other words, that which the learners should be able to do or know at the end of the lesson" (Shange, 2015, p. 27). Hence, Dean (2019) argues that objectives are educational standards that establish curriculum, standards are similar to traditional goals, objectives, and outcomes. This indicates that objectives are what teachers want to achieve at the end of the lesson. Some teachers design their teaching and put their focus on objectives to be achieved (Ramirez, 2017). It is noted that the objective-driven lesson comes from a teacher-centered approach (Schweisfurth, 2015). While U Hoadley and Jansen (2013) state that objectives-driven teaching is in line with Tyler's approach. In this case, when the objectives are properly designed, the learning will be effective. Therefore, for this study differentiated learning objectives for fractions lesson should be of inclusive and aiming to develop a position that potential learners see as unique (Thomas, 2018).

3.8.3 Outcomes

Outcomes are what the learners can demonstrate in the world as a result of the learning process (Prøitz, 2015). Outcomes-based education in South Africa was introduced to redress the injustices of apartheid education (Shroff, Brown, & Deneen, 2015). The study by Khoza (2013) concludes that facilitators should operate in parallel to aims, objectives and outcomes in order for them to do justice to their students. This suggests that learning outcomes and subject content should be measured according to the topic taught and what it is intended to be learned. According to this study, each module has its own learning outcome to be achieved. This suggests that teachers set learning outcomes according to the subject they are teaching, and fraction topic has its own learning outcomes. Those learning outcomes set for assessment should be in line with Blooms' levels of taxonomy namely: knowing, comprehension, application, analysis, synthesis and evaluation (Trigwell & Prosser, 1991). The studies suggest that learning outcomes should promote

the learners' reasoning skills as a process and be able to apply all the levels of the cognitive domain.

Likewise, it is suggested that when teachers set any form of assessment for learners, questions should be at different levels as the learners are different too. In that case, Kumar and Hamer (2013) emphasise that some questions must be in high order for those who are highly gifted and some should be in a low order to accommodate learners with barriers to learning. In this case, a learning outcome might be achieved to different degrees of success depending on learner's prior knowledge and skills.

3.9 Content

Content is the subject topics that need to be covered and should be at a suitable comprehension level for the learners of that grade designed for (Illeris, 2016). The content should be fair, well organised and purely structured (Carl & Strydom, 2017). As for this study, Fractions is a vital concept of Mathematics as it will improve learners' thinking (Tian & Siegler, 2017). Furthermore, fractions help learners to understand the nature of numbers and their interactions, yet if a Grade 3 learner does not understand how fractions work, it will interfere with his ability to learn algebra later. This suggests that for this study content taught infractions should be of the curriculum modification, that involves the knowledge, understanding and skills that learners need to acquire Prast (2018).

Erickson (2010), further asserts that the use of different methods for learners to access the content is vital. He further mentions the following methods to access the content in a differentiated classroom: independent reading of instructions, partner reading, text on tape, text with images, online research, group demonstrations, and group instruction, rather than change the content at all.

Curriculum Assessment Policy Statement (CAPS) as a policy document presents five main content areas: numbers; operations and relationships; measurement; space and shape; patterns; and data handling, learning fractions progresses annually with an increase in number ranges, as well as changes in calculation techniques. According to the CAPS, document learners should be capable of recognising fraction parts from fraction diagrams of unit wholes, to solve practical problems and explain solutions involving fraction parts by the end of Grade 3. This suggests that teachers

must know all the methods and different approaches should be used in order to teach fractions productively.

Furthermore, Gregory and Chapman (2012) articulate that teachers can strategically and effectively differentiate content. One way to differentiate is to provide different content to meet the varying needs of all learners. As for this study, the using of differentiated approaches is the main focus, it is noticeable that content that is being taught in fractions teaches the standards and meets the needs of the particular learner in a diverse classroom. The using of different genres, levelling materials, using of a variety of instructional materials, providing a choice of learning, and using selective abandonment is advisable in the teaching of the content Gregory and Chapman (2012).

Ball (2017) conducted a study on what mathematical knowledge is needed to teach fractions and geometry in the USA. He further proclaims that teachers need to understand the content and be able to implement the curriculum effectively. On the other hand, Ndlovu, Amin, and Samuel (2017), state that teachers' pedagogical content knowledge may have an influence on the poor performance of learners in Mathematics throughout South African schools. According to Ndlovu et al. (2017) teaching mathematical content such as fractions through content area numbers, operation and relationships depend on the teachers' content knowledge they have. In this case, this suggests that teachers' content knowledge helps in improving learner's spatial reasoning and intellectual development S. J. Ball (2017). When teachers have a good understanding of the content, they will be able to use methods and different approaches that will accommodate learners' needs, and choosing the relevant strategies to be used Gregory and Chapman (2012).

3.10 Learning activities for teaching fractions

Teaching activities are activities designed by the teacher to bring about the conditions of teaching (Bakkenes et al., 2010). On the other hand, Berkvens et al. (2014) state that, in order to be consistent, learning activities must be in line with the vision of education and the main goals and objectives. They further state that learning, and teaching and learning materials, can be used for prolonged periods to demonstrate sustainability. In addition, Van den Akker et al. (2009) argue

that, at the classroom level, it is important to consider the best activities for attaining the subject aim, because this cannot be considered at the macro level. This suggests that teachers must choose the different activities that take learners through fractions in order to attain the subject aims at a micro-level.

Nevertheless, Amir, Hasanah, and Musthofa (2018) affirm that mathematics requires problem-solving activities, which challenge the ability of the learner to understand Mathematics. Teaching activities are not specified in CAPS; instead, teachers are given topics to cover every week. Therefore, this implies that teachers decide on the activities after looking at the topic. Hoadley and Jansen (2013) state that the adopted curriculum approach will determine whether or not the activities are learner-or subject-centred. Therefore, different teachers use different teaching activities because learners are different in their ability to grasp fractions.

Teaching activities are used during the teaching and learning process where the lesson should be designed in different ways which are: group activity, teacher-led activity and whole class activity Bakkenes et al. (2010). This implies that teachers should experience the use of different teaching design that will be of interest during teaching. Using different forms of teaching activities will help to draw learners' attention and participation during the teaching process.

On the other hand, learning activities are a class activity, projects, group discussions, assignments and presentations designed by a teacher for the learners. Therefore, teaching itself should be part of active learning activities (Arends & Castle, 1991). The case study by Khoza (2013a) states that teaching activities represent the way the teaching is facilitated and that learning activities are unstructured and structured. This means that designing teaching by using different teaching activities is needed in order to accommodate learners' needs. Hence, teachers who experience the use of unstructured teaching activities promote learners' reasoning skills and abilities. Therefore, learners become active participants, and teachers avoid using structured learning activities because it needs more time to prepare. This suggests that it is important for teachers to use different teaching activities for different learners. Teaching activities are used during the teaching and learning process where the lesson should be designed in different ways which are: group activity, teacher-led activity and whole class activity Arends and Castle (1991). This implies that teachers should experience the use of different teaching design that will be of interest during teaching.

Using different forms of teaching activities will help to draw learners' attention and participation during the teaching process.

However, Van Manen (2016) states that the fact of teaching is to apply teaching methods in the classroom that involve all learners in challenging activities and of all levels. Hence, (Lai, Hwang, & Education, 2016) argue that using hands-on activities helps teachers make lessons interesting and fun. They further concluded that hands-on activities are good for both teachers and learners. This suggests that the application of knowledge in some learner activities forms the basis of active learning when learning fractions in Grade 3 classroom.

3.10 The role of the teacher when teaching fractions

According to Hoadley and Jansen (2013), the role of the teacher in the curriculum is determined by a teacher-centered (instructor), learner-centred (facilitator) and content-centered. Hence, DoE (2003) declares that the teacher role is the part played by the teacher in the classroom situation. According to DoE (2003) Norms and Standards, a teacher should full fill the 7 roles for teachers which are: facilitator, interpreter, mediator, leader, pastoral care, assessor, and life-long learner. Teachers should use different roles in their teaching to accommodate the diversity of learners' needs. (Dobber, Zwart, Tanis, & Van Oers, 2017), state that the teacher's role is when the teacher interacts with pupils in leading the lesson. This part needs a knowledgeable person to help the development of learners' knowledge and mathematical languages through the classroom discussion led by the teacher (Dobber et al., 2017). This suggests that the teacher's role determines the learner's mathematical development. Learners learn mathematical language especially fraction concepts through the way the teacher is teaching. The study by Klopfenstein (2005) found that the role played by the teachers as a learner's role model has an influence on the students' career choices. This indicates that teachers' role goes a long way in influencing the learners when choosing their path in the higher education levels.

This concurs with Khoza (2013) in that teachers must choose a releVant role in order to implement the curriculum. This suggests that teachers must know the roles in order to teach fractions in Grade 3 effectively. Hayes and Pridham (2019) state that a teacher is a facilitator (is learner-centered)

who creates a classroom environment that is full of opportunities for learners to make sense of the knowledge, skills, and values to be learnt. On the other hand, De Vries (2014) states that a facilitator must demonstrate a genuine interest in the learners and their learning so that meaningful learning occurs. Learner-centred education suggests that humans learn by actively constructing and assimilating knowledge rather than by passively adding discrete facts to an existing store of knowledge (Schweisfurth, 2015). In addition, Becuwe et al. (2016) define "facilitation" as developing knowledge and understanding in a learner whereby the communication is in the method and not the content. This suggests that the teachers are using learning outcomes to drive their lessons. Therefore, for this study, it is noticeable that teachers should choose the relevant approach to position their teaching role when teaching fractions.

3.10.1Teachers as mediators

A teacher's role is to mediate learning in a manner that is sensitive to the diverse needs of all diverse learners, including those with barriers to learning. Teachers also have to construct learning environments that are appropriately contextualised and inspirational and they have to communicate effectively, showing recognition of and respect for the differences of others. The challenges that arise from this role include accommodating a variety of learners in over-crowded classrooms where catering for diversity is almost impossible (Rosas & West, 2009). A lack of resources for teaching in diverse classrooms and eliminating environmental barriers, which are beyond the control of the teacher but are the responsibility of school managers and the Department, also hinder their effectiveness. The common reason for barriers to learning is based on diverse home backgrounds, ethnic groups, socio-economic statuses and language barriers all play a role in the behaviour of learners during teaching and learning opportunities. A lack of support and resources gives rise to stress among teachers as their working capacity is deprived.

3.10.2 Teacher as an instructor

According to Klieger and Oster-Levinz (2015), teachers should refrain from using instructional and adopt the approach that would encourage learners to participate in the learning. The study concludes that the testing system compels the teachers to use the instructional approach because they focus on the results that will judge their teaching. Hence, teachers who experience the use of

the instructional approach are driven by a teacher-centered approach, which promotes aims and objectives (Khoza, 2013). According to the study, the instructional approach does not yield the envisaged intended curriculum because learners tend to be passive and teaching and learning are driven by the teacher. Teachers should change from using the instructional approach and adopt the role that will promote learner-centered and facilitating.

3.10.3 Teacher as a facilitator/mentor

A case study by De Witt and Lessing (2013) reveals that teachers do not apply adequate meta-cognitive skills and abilities in their class. This is an indication that learners' development of cognitive skills is influenced by how the teachers facilitate the teaching. Teachers need to use the facilitation approach that will develop the reasoning skills of the learners (Van der Walt & Maree, 2007). This indication that teachers' experiences of using the learner-centered approach help learners to develop their mathematics cognitive skills, nature of numbers and their interaction, and the focus area on the outcomes of the intended curriculum. Further, teachers who use the learner-centered approach are driven by a content-based approach. Therefore, a learner-centered approach will help teachers to demonstrate their experiences of teaching learners using differentiated approaches in the classroom environment.

3.10.4 Teacher as a manager/leader

E. Lai, Cheung, and Leadership (2015) reveal that teachers as managers use the learner-centered approach, learners' knowledge, and learners' mistakes as the way of starting the lessons. Teachers give the learners the opportunity to attempt mathematics activities using their previous knowledge. Further, teachers use learners' mistakes to teach. This suggests that previous knowledge is important before introducing new knowledge, and this promotes a learner-centered approach. Moreover, LePage et al. (2005) state that teachers manage the proofs and theorems of fractions in the classroom, learners tend to do the theorems approved by their teachers. The above study suggests that teachers who experience teaching as managers tend to use learners to lead the lesson. This is an indication that teachers manage their teaching by selecting the theorems and proofs that will be done by the learners. This suggests that teachers should give the learners the freedom to choose the theorems to be taught, and must give the learners proofs and theorems that will promote the learners' spatial reasoning skills. Llinares (2019), conducting a study on teachers' experience

using reflective activity may give an in-depth understanding of how teachers full fill their roles as the manager in the classroom when teaching fractions. Teachers can also fulfil their role by being an assessor of teaching and learning.

3.10.5 Teacher as an assessor

Assessment is influenced by teachers' opinions of mathematics education, present opinions of assessment, assessment elements and school systems (Wiliam & Thompson, 2017). Hence, Adie, Stobart, and Cumming (2019) state that problem-solving assessment is valuable in assessing the learners rather than using teacher-centered approach because it promotes reasoning skills and therefore, teachers are experts in creating assessment tools for learners. This is an indication that the use of accurate assessment forms in teaching fractions using different strategies is necessary to meet learners' needs (DeLuca & Johnson, 2017). However, Alias, Masek, Salleh, and Sciences (2015) state that little is known by South African teachers on how to choose assessment tasks to link with their teaching and learners' needs. This suggests that teachers as an assessor should use different forms of assessment including, peer assessment, because it helps the learners to reduce their fear, promotes the love of working with other learners as well as a teacher (DeLuca & Johnson, 2017). However, for the teachers' role to be practicable in teaching fraction concepts, they rely on skillful materials that the educators can utilise to make it practicable for the learners to demonstrate their skills (Llinares, 2019). Fractions need to be practical to the learners rather than theoretically applied (DeLuca & Johnson, 2017). Therefore, consistent with the role of a teacher depends on how the teachers conduct his/her duties (da Ponte & Chapman, 2015). According to the study, 39 methods used during teaching should promote the development of mathematical content ideas and be more of learner-centered to obtain the intended outcomes of the curriculum (Chamane, 2016). Further, Baumert et al. (2010), states that for fractions to be releVant in primary school levels it must promote reasoning skills in learners. This suggests that teachers must be trained or given in-service training, in order to meet the needs of the changing world (Nortvedt, Santos, Pinto, & Practice, 2016).

However, CAPS does not specify where teachers should base their roles when teaching mathematics. This suggests that the approach (learner-centered, teacher-centered or content-centered) that the teachers must use when teaching is not clearly defined. Therefore, it can mean that the teachers' creativity and ability to think outside the box will be an added advantage to their success in the classroom (Chamane, 2016). It also means that teachers as class managers should manage the curriculum by means of using different strategies and use teaching time to engage learners in learner-centered activities using the CAPS document.

3.11 Materials and resources (With what are they learning?)

A resource as defined by Khoza (2012) is any person or thing that communicates learning. Hence, Chiu, Churchill, and Education (2015) define a resource as a teaching material that is used to plan a lesson, which brings the subject's content to the fore. This suggests that teachers teaching fractions must understand the issue of resources in education. Khoza (2013) conducted a case study with eight postgraduate students who used online resources while learning a curriculum module at a South African university. The data were generated using online document analysis, observation and semi-structured interviews. Khoza (2013) states that online teaching, and resources like off-line teaching and off-line learning resources, are divided into Technology in Education (TiE) and Technology of Education (ToE).

He further stated that TiE comprises any teaching and learning resource one can see and touch, while. ToE is any teaching and learning resource one cannot see and touch. In addition, TiE is divided into hardware and software while ToE is known as ideological-ware. The findings reveal that learning was promoted and that teachers used textbooks, calculators, the chalkboard and workbooks to teach Mathematics. This concurs with Pepin, Choppin, Ruthven, and Sinclair (2017) in that a curriculum demands more resources such as textbooks, stationery, wall charts, and photocopies. Therefore it is noticeable that teachers must use hardware, software and ideological-ware resources when teaching fractions (Chamane, 2016).

In addition, hardware and software resources play a measured role in the teaching and learning of fractions. This indicates that school principals should provide hardware and software resources for teachers to use for the implementation of the Mathematics curriculum. However, Gamoran, An, and Analysis (2016) argue that lack of resources is one of the major barriers to the smooth implementation of the curriculum in South Africa. Moreover, teachers must have lesson materials and resources when implementing the curriculum (Van den Akker et al., 2009). In addition, Martinie (2005) asserts that the primary instructional approach for teaching fractions is textbooks. This suggests that teachers should use textbooks to teach fractions. Remillard and Heck (2014), supported that textbooks are the most common teaching resource used throughout the world. However, Kelly (2009) indicates the importance of textbooks in determining the knowledge that the curriculum aims to convey.

The illustration of concepts in textbooks comprises the use of drawings and pictures. In this case Grade, 3 learners are capable of learning using drawings in order to demonstrate the meaning of something. However, Smith (2000) states that drawings do not speak for them in a textbook, there must be concreted objects too. This implies that, in order for learners to understand fractions, concrete manipulative material for supporting learners' Mathematics is appreciated (Pape & Tchoshanov, 2001). In addition, Swan and Marshall (2010) state that manipulative material includes "any object that can be handled by an individual in a sensory manner, to foster conscious and unconscious mathematics thinking". However, they indicated that teachers in Australia and New Zealand are using concrete manipulative materials to teach fractions. It shows that this approach will help learners to see that their learning is not restricted to rules and procedural computation.

Akker (2010) states that resources are mainly thought of at the micro (school) level of curriculum development, where teachers choose which materials to use and where to use them. This suggests that curriculum developers at the micro-level are silent on the issue of resources. Therefore, teaching activities require the resources that will suit the teaching environment and enhance the learners' achievements (Chamane, 2016). For this study, teachers must, therefore, know which

resources to use when teaching fractions using differentiated curriculum approaches that will cater for all levels of learners.

3.12 Grouping (With whom are they learning?)

Grouping can be either (homogeneous) learners of similar abilities being placed together or (heterogeneous) learners of mixed abilities being placed together (Morret, Machado, & Practice, 2017). This suggests that teachers can group learners either homogeneously or heterogeneously when teaching fractions. A study conducted by E. Thomas and Feng (2014) and presented at the Georgia Educational Research Association's annual conference, the purpose of the study was to examine the effects of homogeneous and heterogeneous groupings on the mathematical achievement of learners in third grade. To collect data, the researchers arrived at pre- and post-test assessments using a common formative assessment test. The results indicated that there was no statistically significant difference between the homogeneous and heterogeneous groupings on the learner's mathematical performance. This suggests that teachers can use both grouping types when teaching fractions in a classroom of diverse learners.

In addition, Rytivaara (2011) conducted an ethnographic study to observe the practice of flexible grouping as a classroom management strategy. The study was conducted in a medium-sized primary school in a suburban area of Finland. The participants were two teachers of the combined classroom. The data were generated by using observation and interviews. The results revealed that, at the classroom level, the teachers used different grouping activities as part of their classroom management strategies. Therefore, grouping learners by ability is adVantageous in most of lower grades classrooms.

3.13 Time and learning environment for teaching fractions

Formal time for teaching is often spent in school (Berkvens et al., 2014, p. 18). Hence, the time for learning in schools is guided by hours per week. According to CAPS Grade 3 fractions are taught in term two, term three and term four. According to the document, "Time allocated for Mathematics: 7 hours per week, each day is allocated 90 minutes. The specific time for fraction concept for Grade 3 in terms 2, 3, 4 are weeks 7 and 8 in each term.

3.13.1 Learning in the classroom

Learning environments define simply different places to teach (Freeman et al., 2014). This agrees with Berkvens et al. (2009) they state that the environment is where school-based learning activities take place. Aldridge, Fraser, and Ntuli (2009) reveal that learners choose the learning environment that suits them over the one that is available. Further, Naidoo (2011) reveals that scaffolding approaches and methods can be used in any classroom environment. Mathematics classroom environment full of concrete objects gives the learners the chance to solve the problem, make a connection, promote thinking skills, express and connect concepts correctly (Wilhelm, Sherrod, & Walters, 2008). The above studies emphasise is the creation of mathematics class conducive for the learners to learn fractions. This implies that fractions should be practical (learners must be able to write fraction parts on the board working with their peers) the pictures and fractional charts would help them in developing their deductive reasoning (Wohlhuter, 1998). Teachers working in a conducive place tend to be productive (Wilhelm et al., 2008). Therefore, practicality in teaching fractions has been marked as the most competent strategy of educating in the 21st century (Lombardi, 2007). Thus, fractions can be taught outside the classroom environment, a laboratory can be used in teaching fractions.

3.13.2 Computer laboratory

Sipos and Kosztolányi (2009) state that learners become motivated when working in the computer laboratory. This implies that curriculum designers should consider schools that are under-resourced when designing the curriculum. Further, Okigbo and Osuafor (2008) reveal that the use of mathematical laboratory enhanced achievement in Mathematics and that no difference exists between the achievement of male and female taught in mathematics laboratory. The above studies identify computer laboratory as the most conducive place to teach fractions. This suggests that the experience of teaching geometry using releVant soft-ware in the laboratory enhanced learners' understanding of fraction concepts (Edwards & Jones, 2006; Okigbo & Osuafor, 2008). The use of visual devices in the classroom draws learners' attention and excitement, and promote understanding (Aflahah, 2018). As a result, curriculum developers should consider providing digital electronic devices in schools to make teaching mathematics contents sustainable. However,

Roberts and Vänskä, (2011) reveal that the use of one mobile-kit makes it difficult to work in that learning environment especially in rural schools, where there is a lack of technological resources. This is an indication that most rural schools are faced with the problem of providing the movable technological resources into the classroom, and maintenance of the available resources (Milrad et al., 2013). Based on CAPS, there is nothing said about the releVant learning environment for teaching fractions, although they want learners to be critical thinkers and be able to compete nationally and internationally. The above studies indicated that the mobile-kit can be used in a classroom environment although the learning environment is not sustainable for teaching fractions (Roberts & Vänskä, 2011). This implies that the use of technology in teaching fractions can sustain our curriculum for the changing world.

3.14 Assessment

Assessment is the tool used by the teacher to test learner's progress on what they have learned. Kennedy et al. (2009), describe assessment as formative and summative. Formative is used for learning and summative summarise learners learning usually at the end of the learning. Yiannis (1997) defines "assessment" as information that has been gathered from making judgments on learners, in order to make decisions that can improve teaching and learning. The definition does not, however, give direction as to who gathers this information although this task normally falls to the teachers. Huba and Freed (2000) argue that "assessment" is the process of collecting and discussing information from numerous and diverse sources in order to develop a profound understanding of what learners distinguish, comprehend and can do with their knowledge as a result of their scholastic practises. According to the DBE (2011) "assessment" is a continuous, planned process of identifying, gathering and interpreting information regarding the performance of learners, using various methods. Teachers' experiences will assist teachers to understand assessment in their teaching practices.

3.14.1 Assessment for learning

Assessment for learning is described as a formative assessment that includes the activities chosen by the teacher to assess learners' progress and assist teachers together with the learners to change their teaching and learning activities (Kennedy et al., 2009). However, Smeets (2005) states that

most teachers choose to use traditional assessment and those methods of assessment are used by teachers to cater to learners' different abilities. Changing the nature of assessment would help the teachers to be specific on why they assess the learners, who are they assessing (e.g. group work, peers or individual) and when to assess the learners (Brown, 2004). Further, Sriprakash (2010) argues that teachers who use learner-centred assessment make the learners take charge of the classroom. This an indication that assessment for learning is used to judge learners' performance as based on their standardized tests. Therefore, assessment should clearly state what needs to be learned by the learners and be in line with the curriculum by using different forms of assessment (Brown, 2004).

3.14.2 Assessment of learning

"Summative assessment" is the assessment of learning as it is focused mainly on the products of learning (DBE, 2011; Bennett, 2011). Khoza (2013) concurs in asserting that "summative assessment" is a summary of the formative assessment of students' attainment of the learning outcomes for grading purposes. According to the case study carried out by Cele (2009), "summative assessment" takes place at the end of a lesson, course, semester or year. It concentrates on marking and recording scores, and also promotes the grading of learners because it is coupled with scores. This suggests that teachers are using summative assessment to grade their learners' infractions.

Assessment of learning should be in line with the curriculum goals and daily activities of educators and learners by marking programs on future outcomes (Marx et al., 2004). From the views of the above studies, assessment of learning is based on what is learned in that specific time and should not be used to make a judgment on learners' performance. According to CAPS, assessment of learning is in line with the general aims of inclusive education to address the injustice of learning. Further, Berkvens et al. (2014) state that the assessment of teaching and learning and its outcomes are needed when measuring the quality of the curriculum. This is an indication that any forms of assessment done in schools depends on the implemented curriculum to gain the intended outcomes of the curriculum. Kauffman, Moore, Johnson, Kardos, Liu, and Peske (2002) proclaim that teachers are not given support on what to teach and how to teach. Some teachers are experiencing difficulties and leave the teaching profession because of failing to deliver the curriculum to the

learners; the learners learn less of what they are expected to learn in the classroom because the teachers lack support for the curriculum to be delivered (Kauffman et al., 2002). Therefore, meeting the needs of learners, teachers should assess learning to learners to check how far they have achieved the content taught in mathematics.

3.15 Conclusion

This study may help the teachers to develop their content knowledge which may help learners to benefit more as teachers revealing their daily encounters of teaching fractions in Mathematics. Therefore, this study will use ten curricular spider web concepts for the aim of understanding teachers' experiences of teaching fractions using differentiated curriculum approaches. Most of the curricular-spider web components may not be releVant in some of the semi-rural schools, but using curriculum differentiation as a practical approach that is aligned with CAPS, will be of great benefit to learners. Thus, the following chapter deals with the research design and data generation methods used to gather Mathematics teachers' experiences.

CHAPTER FOUR

RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

The previous chapter presented the framework that underpins the current study. The ten curricular spider web concepts were used in order to understand teachers' educational experiences of teaching fractions using differentiated curriculum approaches in the classroom. Therefore, it is noted that learners are different because they have different backgrounds and different needs, thus, in this case, they need to be taught differently in order to meet their individual needs. This chapter discusses the research paradigm that will influence this research inquiry, research style, and methodology. The chapter further explains sampling procedures, and data generation methods, explaining that reflection activity, semi-structured interviews, classroom observations and document analysis. It also describes the data analysis, trustworthiness (credibility, transferability, dependability, and conformability), ethical issues and limitations of the study, and provides a conclusion.

4.2 The critical research questions

The main objectives of this study are to explore the Grade 3 teachers' experiences of teaching fractions using differentiated curriculum approaches. The researcher further intends to understand how teachers engaged in the implementation of curriculum differentiation as an approach for diverse learners, and why they experience the differentiated approaches in teaching fractions the way they do. In pursuing these aims, the study wanted to answer the following questions:

- What are Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions?
- How do Grade 3 teachers experience differentiated approaches in teaching fractions?
- Why do Grade 3 teachers experience the differentiated approaches in teaching fractions the way they do?

4.3 Research paradigm

The research paradigm is a shared world view that represents the beliefs and values in discipline and that guides how problems are solved (Szyjka, 2012). However, every researcher has his/her own view of what constitutes truth and knowledge, furthermore, a researcher's approach depends upon how the researcher thinks about the problem, and how it can be studied, so that the findings are credible to others involved, in a particular way of discipline. Paradigms guide our thought-patterns, beliefs, and philosophical assumptions about society and ourselves. Thus, (Szyjka, 2012) claims that ways of assumptions can be described as, firstly, (ontology) – that is, what do we believe about the nature of reality, secondly, (epistemology) – how we know the truth or reality, and ethical issues and value system (axiology). Moreover, paradigms can be viewed as the best or typical solutions to problems, and that they may represent shared beliefs of a given research field (Alase & Studies, 2017). The four prominent paradigms used to guide research are described within a framework of its epistemology, ontology, axiology, and methodology. The descriptions mentioned above suggest that the paradigm(s) upon which research design is based are clearly understood as well in the research itself (Mackenzie & Knipe, 2006).

This study is positioned within an interpretive paradigm. However, the paradigm is the way of seeing the world and doing research. Despite that Taber (2013) describes paradigm as approaches to educational inquiry and field of study. In this case, the interpretive paradigm is the idea that researching human, subjective experience might eventually need some special approaches, has merely not always been commonly accepted (Taber, 2013). Therefore, this study employed an interpretive paradigm because of what the research required, the experiences of teachers and interpret the meaning of social action. Seemingly, the use of the interpretive paradigm is helpful in developing an in-depth understanding of how people make sense of contexts in which they live and work. The teaching of fractions using different approaches and methods in Grade 3 will reveal teachers' experiences as well as learner's engagement in the implementation of a differentiated curriculum. Hence, Cohen, Manion, and Morrison (2013) assert that the interpretive paradigm strives to understand and interpret the world in terms of its actors. This suggests that the interpretive paradigm is concerned with describing and explaining the teachers' experiences of teaching fractions in Grade 3 using differentiated curriculum approaches. Consequently, that is why the questions of this study ask what, how and why in order to describe and explain the

experiences of teachers teaching using differentiated approaches for fractions in Grade 3. This study focuses on understanding teachers' experiences of teaching fractions in a diverse classroom using different approaches in order to meet all learners' needs. The main aim of the interpretivist paradigm is to understand human experiences (Cohen et al., 2011). Then, the main focus of this study is not to solve the teachers' experiences of teaching fractions to Grade 3 learners but rather to understand these experiences. The experiences of Grade 3 teachers will, therefore, be explored to see how they teach fractions using an approach that accommodates all learners regardless of their differences. Furthermore, the Grade 3 teachers and the schools at which they teach will provide the context. As the study aims to understand a particular social reality – teachers' experiences of teaching fractions using curriculum differentiation for different learners in the classroom, in this case, the interpretivists do not aim to predict what people will do, but rather to describe how people make sense of their worlds (Bertram & Christiansen, 2014).

4.4 The Research design

Creswell (2013) defines research design as plans and procedures for the research that spans the decision from broad assumptions to detailed methods of data generation and analysis. This research focused on teachers' experiences of teaching fractions in Grade 3 using curriculum differentiation as an approach. However, Merriam and Tisdell (2015) articulate that a research design is an overall plan of collecting conceptual research problems to the pertinent (and achievable) empirical research. Thus, in other words, the research design defines what data is required, what methods are going to be used to generate and analyse this data, and finally, how all this going to answer research questions. On the other hand, Bertram and Christiansen (2014) point out that a research design is a strategy of how the researcher will generate and analyse the data that is anticipated to answer the research questions. Furthermore, Singh and Walwyn (2017) argue that the choice of research design is based on the researcher's assumptions, research skills, and research practices, and influences the way in which he or she generates data. In this case, according to these explanations, a research design focuses on the end product, expresses a research problem as a point of departure, and focuses on the logic of the research. Thus, choosing an appropriate design when doing research is crucial before researchers apply the releVant methodology and data-generation methods, and utilise academic writing to accomplish their goals.

Research design is viewed from two perspectives, quantitative research design or qualitative research design, which both have extended components. They can both be applied distinctively or together. As for this study, a qualitative research design within a case study was employed for such that, it is more exploratory in nature as it tries to explore not predict the outcome, in fact, it seeks to answer the questions 'what, why and how'. Furthermore, it is designed to explore the meaning and understanding of complex social environments, such as the nature of people's experiences. This design is flexible, minimises bias and maximises the reliability of data collected. Furthermore, by adopting this design, my aim was to explore and understand Grade 3 teachers' experiences of using differentiated approaches in teaching Fractions.

4.5 Research methodology

Cohen et al. (2013) articulate that Qualitative methodology is an investigation methodology that is useful for exploring and understanding a central phenomenon. The phenomenon is an idea that the researcher would like to explore, discover, explain, identify or describe (Cohen et al., 2013). Thus, that is why a qualitative method was employed to explore teachers' experiences of teaching fractions to Grade 3 learners using differentiated curriculum approaches. On the other hand, McMillan and Schumacher (2010) claim that the qualitative research methodology is based on a naturalistic phenomenological philosophy that views reality as a multi-layered, interactive and social experience. In addition, they further affirm that qualitative research involves the study of social phenomena from the participants' perspective and includes the participants' feelings, beliefs, ideas, thoughts, and actions. Therefore, a qualitative approach enables the researcher to understand the events, situations, experiences, and actions of the participants involved in the study (Thorne, 2016). In this case, it is suggested that a qualitative approach allows the researcher to understand the particular context and processes within which a participant acts. Therefore, the experiences of teachers teaching fractions to Grade 3 learners using the differentiated curriculum approaches form the focal point of this study.

In addition to the above, Henning, Van Rensburg, and Smit (2004) proclaim that, in qualitative research, the characteristics, qualities or properties of a particular phenomenon are examined in order to achieve an enhanced understanding and facilitate a better explanation of the phenomenon. In order to accomplish this, Silverman (2016) states that qualitative research is based on the view that individuals interact with their social world to construct a reality. In this view, the researcher becomes the primary instrument for data generation and analysis by physically approaching the participants. Moreover, it is of demand to a qualitative researcher to seek answers to questions based on the phenomenon.

Creswell (2017) affirms that qualitative researchers typically gather multiple forms of data, such as interviews, observations, documents and audiovisual information rather than rely on a single data source. The research process for qualitative researchers is emergent. This means that the initial plan for research cannot be tightly prescribed, and some of the processes may change or shift once the researcher enters the field and starts to collect data. Creswell (2017) states that a qualitative observation is when a researcher takes field notes on the behaviour and activities of individuals at the site, hence semi-structured interviews are conducted face to face with participants involving open-ended questions that are few in number. Therefore, this study, the data were collected through these above-mentioned instruments. In this case, the methodology applied assisted in answering the research questions and provide more detailed information on teachers' experiences of using differentiated approaches in teaching fractions to Grade 3 learners.

4.6 The Population and Sampling

The population targeted for this study were mathematics teachers in the Ngwelezane Circuit, Empangeni, South Africa. The data was collected from Grade 3 Mathematics teachers. The reason for selecting Grade 3 teachers was that Grade 3 is the exit class and teachers lay the foundation of Grade 4 as the Intermediate Phase. The participants were selected from 3 semi-rural primary schools.

Maree (2010) defines sampling as the selection of participants or a subset of a population to participate in the study. According to Waruingi (2013) and Padgett (2016), a sampling method is

determined by the context of the researcher in conjunction with the research questions of the study. Maree (2010) assumes that the choice of sampling method explicitly depends on the research approach, data production method, and sample size. Hence, Daniel (2011) and Bryman and Bell (2015) deliberate that education research sampling has distinguishable divisions namely: probability sampling (systematic, simple random, stratified and multi-stage);non-probability sampling (convenience, quota and purposive). In addition, this study employed non-probability sampling (purposive and convenience), because the selection of participants was purposeful for the aims of gaining an insight of Grade 3 teachers' experiences as they continually implementing the curriculum using differentiated approaches while teaching Mathematics.

4.6.1 Purposive sampling

Purposive sampling is defined by Palinkas et al. (2016) and Ritchie, Lewis, Nicholis, and Ormston (2014) as the selection of participants with required information that can provide releVant understanding in the research. However, Gentles, Charles, Ploeg, and McKibbon (2015) state that "purposive sampling" describes a situation in which participants are selected or chosen because of defining characteristics that make them a releVant source of information. Therefore, I have chosen Grade 3 teachers who teach mathematics because of their experiences and it was also of my concern that randomization was not important to this study.

McMillan and Schumacher (2010) assert that the sample of the study is not necessarily a characteristic of the population only. In this case, teachers might directly responsible for teaching mathematics but also have different qualifications and years of teaching at this level, this providing a possibility of gathering rich data.

Thus, in this case, the sample of this study was formed as indicated in Table 4.6.2

Teachers	Teaching experience in Grade 3	Qualifications	Gender
School 3-A teacher	20	JPTD, FDE , Honours Degree	Female
School 1-B teacher	7	B.Ed., FDE	Female
School 2-C teacher	10	JPTD, B.Ed.	Female

The "experience" indicated in Table 4.6.2 is the number of years that the participants have taught Mathematics in the Foundation Phase. A school a teacher is most experienced, with 20 years of teaching experience and also experiencing the changes being made to the mathematics curriculum, including teaching fractions as defined by CAPS. Her Honours degree is specialising with mathematics. In this case, this experience is important to this study because it will provide rich data. Then a school-B teacher has seven years of experience but is less qualified than Mathematics school teacher-A. This will allow for different perspectives as their experiences are explored in this study. Moreover, a school C-teacher has got more experience than a school -B teacher and is specialising with all foundation phase subjects including mathematics. Therefore, comparing these teaching experiences will assist in finalising the data for different teacher's perspectives and their experiences of teaching fractions using the different approaches, to different learners in the classroom.

4.6.3 Convenience sampling

According to Cohen et al. (2013) convenience sampling or opportunity, sampling involves choosing the nearest individuals to serve as participants. Hence McMillan and Schumacher (2010) contend that convenience sampling involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or have experience with a phenomenon of interest. Furthermore, Pacho and Science (2015) emphasise that sampling is convenient because it is dependent only on the accessibility and availability of participants. In this case, I have selected teachers with different years of experiences who teach Grade 3 mathematics but have all worked

in Ngwelezane Circuit. The teachers that I have chosen are in Primary schools where fractions are taught and for their accessibility in the subject. The three schools that were sampled, were renamed using alphabets A-C and the participants were renamed using numbers 2 – 4. Participant 1 came from school B, participant 2 came from school C, and then participant 3 came from school A. Therefore, the participant's names were combined as 1B, 2C, and 3A.

4.7 Data generation methods

Given the qualitative nature of this study, I used three different methods for data generation, namely one-on-one (semi-structured interviews), classroom observations, and analysis of documents. This approach to qualitative data collection applied here arose 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 Creswell (2017). Based on the researchers' plan, 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.

I decided to start with the reflective activity as a data generation activity. A reflective activity was used because participants had to reflect on their experiences of teaching fractions using the differentiated curriculum approaches for learner diversity. This kind of reflection was part of one-on-one (semi-structured interviews). The semi-structured interviews allow flexibility and afford interviewees the freedom to relax enough to provide rich information as the researcher enquiries for more responses (Cohen et al., 2013). Then the classroom observation was also done, followed by an analysis of documents used for teaching and learning that are aligned with CAPS.

4.7.1 Reflective activity

Shabeeb and Akkary (2014) define "reflection activity" as an activity that looks back at the educational goals, purposes, subject matter, curriculum, school organisation and structure to ensure that they are logical. Before their interviews, all of the participants were asked to reflect on their experiences of teaching using curriculum differentiation as an approach infractions to Grade 3 learners. McMillan and Schumacher (2010) affirm that a reflective activity is a written activity that asks participants to complete a small series of questions about the issue being studied. Thus, this activity allowed these teachers to reflect on their experiences of teaching fractions to Grade 3 learners using different approaches. On the other hand, Flores, Day, and education (2006) proclaim that reflection is a revisiting of past experiences to inform the meaning of present or future experiences. Evidently, Boud, Keogh, and Walker (2013) supported that reflection is an important human activity in which people recapture experiences and assess them. Therefore, according to these definitions, reflection is the process of learning from experiences so that the findings can be realistic in new contexts.

However, in this study, the reflective activity was conducted in order for teachers to look back their journey of teaching Grade 3 fractions, and furthermore, were given enough time to reflect on their perception of teaching diverse learners. This information from reflective activity gave me a go-ahead for the next stage which is the semi-structured interviews since the participants had a clear picture of what the study is all about.

4.7.2 One-on-one (semi-structured interviews)

According to Pathak and Intratat (2016), semi-structured interviews tend to provide valid data, thus creating opportunities for reflection, probing and clarifying the ambiguity. However, Cohen et al. (2013) argue that semi-structured interviews allow flexibility, giving the person being interviewed the freedom to relax and give more information as the researcher probes for more responses. The researcher allows participants to respond in the language in which they are most comfortable with. Hence, Longhurst (2003), articulates that a semi-structured interview permits a researcher to respond to a situation as it unfolds. Therefore, according to the above explanations, a researcher must allow and accept all kinds responds from the participants, as the participants unfold what is in their minds relating to their experiences.

Semi-structured interviews are useful for producing rich descriptive data that help to understand how participants construct knowledge and their reality Hammer and Wildavsky (2018). They further state that the semi-structured interview is commonly used in research projects to validate data emerging from other sources. In this study, semi-structured interviews were a follow-up to the reflection activity, and I explored the participants following the outcomes of the reflection activity. The data received from the reflective activity were connected to the data received from the semi-structured interviews. This data collection technique allowed me to obtain information from individual teachers away from the influence of other teachers, as each was interviewed alone (Pathak & Intratat, 2016). This suggests that the participants should have been open, comfortable and able to express their experiences freely. Thus, I generated data through semi-structured interviews with participants in a quiet place and using a recording device and handwritten notes were taken during the interviews. I recorded the 30-minute-long interviews to transcribe them at a later date. The interviews were conducted during breaks and after school hours so that the academic programme of the school was not disturbed. The use of the recording device is helpful during transcriptions and for the data analysis process.

While interviews are time-consuming, they were suitable for this study because I only chose three teachers which is manageable. During the interview, I explained to the participants the purpose of the interview and tried to put the participants at ease (Cohen et al., 2013). I explained that the interview would be recorded in order to prevent the loss of data during the process. In addition, Cohen et al. (2013) allude that as one of the shortcomings. That is the reason for recording to refrain from losing the data. The use of semi-structured interviews in this study was adVantageous in a way that, the process encouraged the participants to speak freely about their experiences of teaching fractions to Grade 3 using the differentiated curriculum approaches to diverse learners. During the process of conducting the interviews with the teachers, I tried to prevent bias. Thus, interviewing the teachers was interesting for both the researcher and the participant's experiences. In this case, the researcher was able to generate the required data. All the participants answered the same questions but these questions were open-ended to allow for probing. The adVantage of these interviews is that they were open-ended, therefore allowing me to follow up leads and thus generate more data. During exploratory, I received more details from the participants on their experiences of teaching fractions to Grade 3 learners using curriculum differentiation as an

approach. For more in-depth data, the generation of a classroom observation was organised after a week after the semi-structured interview was conducted.

4.7.3 Classroom observation

Observation as a data-collecting strategy in qualitative research, according to Flick (2018), tries to bring about an 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 4.2 above, the researcher saw it fitting to collect data by observing teacher-learner interaction during the teaching of fractions using different strategies in the classroom. To facilitate data-capturing during this lesson, the researcher had designed an observational protocol. Therefore, the protocol included the following items:

- Flexible grouping
- Lesson presentation
- Grouping strategies
- Attention to learner diversity
- Questioning strategies
- Teaching-learning content
- Learner participation
- Continuous assessment
- Teaching and learning support materials (resources)

This observational protocol was used together with a recording device, as the researcher observing the teacher-learner interaction. Furthermore, I initially took notes on how teachers responded to learner diversity and grouping strategies. Thus, during the teaching and learning process, challenges that teachers experienced were also observed. The whole process took 40 minutes.

4.7.3 Analysis of documents

In my attempt to understand how teachers planned their Mathematics lessons including fractions concepts, teacher's lesson plans were studied especially the documents that aligned with CAPS. The lesson plan for Mathematics was used and it is was analysed in the Jikimfundo lesson plan

document. Teachers were using CAPS Planner and Tracker as teacher toolkit. I managed to access these documents with the permission of the teacher as a participant. 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 fractions in relation to curriculum differentiation. Notes were taken on the structure of lesson plan, content and allowed me to compare with lesson presentation that was done by the teacher during a classroom observation. I also asked for the mathematics DBE workbooks for learners to see how group work has done. This process was done within 30 minutes because I did not analyse the whole class learner's workbooks.

Table 4.2 Data generation plan

Question	**Objective 1**	**Objective 2**	**Objective 3**
Why is the data being generated?	To explore Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions	To explore how Grade 3 teachers experience differentiated approaches in teaching fractions	To understand why Grade 3 teachers experience the differentiated approaches in teaching fractions the way they do
How were the data generated?	Reflective activity, one-on-one semi-structured interviews, classroom observations and analysis of documents	Reflective activity, one-on-one semi-structured interviews, classroom observations and analysis of documents	Reflective activity, one-on-one semi-structured interviews, classroom observations and analysis of documents
Who (or what) were the sources of data?	Three Grade 3 Mathematics teachers	Three Grade 3 Mathematics teachers	Three Grade 3 Mathematics teachers

Where was the data generated?	One-on-one interviews were conducted in different places where the participant was comfortable with. Classroom observation was conducted in the classroom. Documents analysis were studied in the classroom	One-on-one interviews were conducted in different places where the participant was comfortable with. Classroom observation was conducted in the classroom. Documents analysis were studied in the classroom	One-on-one interviews were conducted in different places where the participant was comfortable with. Classroom observation was conducted in the classroom. Documents analysis were studied in the classroom
How often were the data generated?	Reflective activity and one-on-one semi-structured interviews for each participant took 30 minutes. Classroom observation was done in 40 minutes Analysis of documents was studied in 30 minutes.	Reflective activity and one-on-one semi-structured interviews for each participant took 30 minutes. Classroom observation was done in 40 minutes Analysis of documents was studied in 30 minutes.	Reflective activity and one-on-one semi-structured interviews for each participant took 30 minutes. Classroom observation was done in 40 minutes Analysis of documents was studied in 30 minutes.
Justification of this plan for data generation:	The reflective activity allowed the participants to reflect on their experiences	The reflective activity allowed the participants to reflect on their experiences	The reflective activity allowed the participants to reflect on their experiences by writing down their responses but some

	by writing down their responses but some participants responded verbally to this activity. Semi-structured interviews helped the researcher to obtain an in-depth analysis of teachers' experiences of teaching fractions in Grade 3 using differentiated approaches. The teacher's interview schedule was designed by the researcher using the inductive and deductive questions. As a researcher, I have managed to get first-hand information.	by writing down their responses but some participants responded verbally to this activity. Semi-structured interviews helped the researcher to obtain an in-depth analysis of teachers' experiences of teaching fractions in Grade 3 using differentiated approaches. The teacher's interview schedule was designed by the researcher that has an inductive and deductive question. As a researcher, I have managed to get first-hand information.	participants responded verbally to this activity. Semi-structured interviews helped the researcher to obtain an in-depth analysis of teachers' experiences of teaching fractions in Grade 3 using differentiated approaches. The teacher's interview schedule was designed by the researcher that has an inductive and deductive question. As a researcher, I have managed to get first-hand information.

The plan, however, helped the researcher to generate in-depth data using the three data generation instruments mentioned above. Moreover, the data generation process trustworthiness of the study was considered.

4.8 Trustworthiness

According to Cohen et al. (2013), trustworthiness, credibility, dependability, conformability and transferability as the tools used in qualitative research design. These tools were considered in this study since this is qualitative research that deals with meaning and peoples' experiences as individuals. As a result, trustworthiness was considered during data generation, data analysis, and data interpretation phase. To improve trustworthiness in the study, triangulation was used during the data generation phase, and the participants validated the data after analysis to confirm what they have said. As a result, during data generation, I gave the participants an activity to reflect on their past experiences of teaching and recordings were done during the interview session to ensure that I accurately noted the exact words used by the participants.

Furthermore, McMillan and Schumacher (2010) state that the trustworthiness of qualitative research refers to "the degree of congruence between the explanations of the phenomena and the realities of the world". Creswell (2013) asserts that a research study is trustworthy to the extent that there has been some rigour in carrying it out. Furthermore, Merriam and Tisdell (2015) state that trustworthiness refers to the manner in which the researcher can convince the readers that the findings in the study are of high quality and can thus be trusted. Therefore, the aim of trustworthiness in qualitative research is to support the argument that the question's findings are worth paying attention to Cohen et al. (2013).

4.8.1 Credibility (truth value)

The credibility of the study deals with believable, confirmable and reliability of the data generated (Creswell, 2013). To maintain the credibility of the study, I chose participants in different schools, with a different number of years in the teaching to get different experiences of their teaching in Grade 3. Thus, the credibility of the study was improved by using reflective activity, semi-structured interviews, classroom observations and document analysis, using voice recording with

the participants together with the notes taken during the whole process. The use of triangulation in the study was to ensure the authenticity of the data generated (Cohen et al., 2013). Finally, the participants were given feedback about their responses during the data generation process in order to confirm what they had said.

4.8.2 Transferability (applicability)

Transferability is when the research findings can be transferred to another context by the reader (Graneheim & Lundman, 2004). Likewise, Cohen et al. (2013) state that transferability as the level when the research findings can be generalized to the population at large. I have explained clearly the focus of the study, data collected, analysis and the findings of the study for the reader to conclude if the data can be transferred. Therefore, I enhanced the transferability of the study thoroughly and gave detailed research findings of teachers' experiences in teaching Grade 3 fractions using the differentiated curriculum approaches in semi-rural schools (Cohen et al., 2013).

4.8.3 Dependability (consistency)

Dependability is the consistency of the study (Guest, MacQueen, & Namey, 2012). To accommodate consistency in the study, I generated data in an appropriate setting and at times as suggested in the data generation plan. A curricular spider web framed all the questions. Hence, data analysis was given enough time for transcription to minimise biasness and subjectivity of the data interpretation by the researcher. Therefore, the participants were given the opportunity to read the findings before submission to see that the data was not interpreted wrong and the direct quote from the recordings was used to give participants the true meaning of data generated (Cohen et al., 2013).

4.8.4 Conformability (neutrality)

Conformability means that the data exactly represent the information that the participants provided, and the interpretations of those data are not invented by the researcher (Guest et al., 2012). To ensure conformability I did not allow personal issues to interfere with the study. The participants' experiences were recorded literal, without any tampering by myself. All the participants in this study had the same set of questions for the different data generating methods. This implies that the questions for the reflection activity, the semi-structured interviews and observation plan were the same.

4.9 Data analysis

According to Cohen et al. (2013) data analysis that makes meaning of the data in particular of the participants' definition of the condition, noting designs, ideas, classifications and regularities are of concern. Data analysis tries to illustrate the conclusion from the data generated. However, McMillan and Schumacher (2010) allude that qualitative data analysis is a well-ordered process of giving definitions of a particular phenomenon studied. The study interpreted and analysed the primary data on teachers' experiences of teaching Grade 3 fractions using the differentiated curriculum approaches. McMillan and Schumacher's (2010) primary data is valuable as it derived from original sources. Hence, the secondary data defines as the interpretation of primary data and is not as accurate because data is interpreted by people who did not originally experience the phenomenon. This study used qualitative data analysis in examining the data according to the participants' meaning of the situation, themes, and categories (Cohen et al., 2013). The data was analysed by reading the notes and listening to the recordings to find the common and different experiences of teaching using the curriculum differentiation as an approach (McMillan & Schumacher, 2010). Qualitative data analysis comes from transcribed interview data and is influenced by a smaller number of participants (Cohen et al., 2013). Consequently, from the verbal responses told by the participants, I analysed the data generated by using guided and thematic data analysis. Therefore, as the conceptual framework for the study, guided data analysis was used following spider web concepts. Guided data analysis describes the behaviour and the context in which the behaviour occurred using open coding (Cohen et al., 2013). However, thematic analysis was used by writing, coding, theorising, and reading data of the stories by participants about their journey in teaching Grade 3 fractions using different approaches for different learners. Moreover,

the data generated was reduced, displayed and concluded as based on what the participants had stated about teacher' experiences in teaching Grade 3. I also read the data generated from reflective activity, and listened to the recorded data from semi-structured and compare the analysis of documents used by teachers. Whilst reading and listening to the recorded data thus, the data were analysed for similarities and differences between the three Mathematics teachers' experiences of teaching fractions in Grade 3 using differentiated approaches in the classroom. Finally, conclusions are drawn in regard to the curricular spider web. However, data analysis through transcription is time-consuming, and transcribers are expensive (Cohen et al., 2013). As a result, I decided to transcribe the data myself to avoid losing meaning within the data and distorting the participants meaning of their experiences. I was able to select the releVant data I needed from the data generated. Additionally, Cohen et al. (2013) point out one of the limitations of data analysis is it can be influenced by the number of participants from whom the data were generated and the way the analysis is written. To avoid the above drawbacks, I selected three participants that are manageable, and it was easy to transcribe the recording of the three participants. Despite that analysing data, ethical issues were taken into consideration, confidentiality was maintained by using the number for the participant and letter for their schools.

4.10 Ethical issues

Ethical issues refer to moral principles or rules of behaviour that researchers have to take into consideration before conducting research, particularly with the research involving humans (Cohen et al., 2013). Essentially, researchers follow certain ethical principles when conducting a study (Bertram & Christiansen, 2014). According to the University of Kwa-Zulu Natal Ethical Research office, ethical principles should include the right to privacy, confidentiality and anonymity, the right to withdraw or terminate participation, the right to access information, and so forth. Therefore, it is important to protect the rights of participants from any harm that might be caused by the research.

I applied for ethical clearance through the University of KwaZulu-Natal (UKZN). Permission to conduct this study was received from the KZN DoE and also the principal of the school where the participants were interviewed and observed. Cohen et al. (2013) identified four guidelines to

ensure that researchers are ethically considerate toward the participants in their research: informed consent (subjects must voluntarily agree to participate after being informed about the nature and results of the research): avoidance of deception (deliberate misrepresentation must be avoided); respect for privacy and confidentiality (the participants' identities and the research location must be protected); and accuracy (the data must be free from omissions and contriVance). However, Bertram and Christiansen (2014) assert that anonymity and confidentiality are the cornerstones of academic research. Cohen et al. (2013) articulate state that confidentiality refers to the agreement between the researcher and the participant as to what may be done with the data. They refer to anonymity as the absence of identifiers in the study. In this study, confidentiality and anonymity were determined with each participant through a voluntary consent form that was provided at the beginning of each interview. This consent form specified that personal information concerning the research participants would be kept confidential, and their anonymity was guaranteed (Bertram & Christiansen, 2014).

4.11 Limitations to this research

Greener (2018) asserts that limitations are potential weaknesses of a study and they incorporate all the factors that are impossible to avoid and which thereby affect the internal validity of the research. Nuijten et al. (2016) declare that limitations are matters that arise in a study and which are out of the researcher's control. Moreover, Creswell (2013) defines limitations as shortcomings that the researcher identifies in a study. The limitations of this study were time and context. Interviews were conducted during breaks and after school hours at their spare time. Therefore, conducting interviews during breaks interfered with the teachers' time for her lunch. The interviews that were conducted after school interfered with their time for their personal stuff. In this case, some teachers indicated that they had family commitments and meetings after school. In terms of context, there had previously been robberies and hijackings at the school and some teachers were afraid to stay after school hours. Therefore, to address these issues arrangements for a neutral venue and time for conducting the interviews were negotiated with the participants. The fact that I am a teacher at this same school was also a limitation as the participants thought that I was evaluating their teaching practices. As a result, one of the participants postponed taking part in the interviews. In order to address this, I explained to them that the study was for the fulfillment of my degree requirements and not for the DoE.

4.12 Conclusion

This chapter has discussed the research design and the methodology of this study. It also discussed the suitability of the paradigm and style used in the study. It further discussed sampling, data-generation methods, data analysis, trustworthiness (credibility, transferability, dependability and conformability), ethical issues and the limitations of the study. The next chapter will focus on analysing the data that were generated using the above-mentioned methods.

CHAPTER FIVE

DATA PRESENTATION AND DISCUSSION

5.1 Introduction

The previous chapter focused on the detailed description of the research paradigm, research design and methodological issues for data generation relating to teachers' experiences of teaching using differentiated curriculum approach in teaching Grade 3 fractions. The data generation instruments were described, namely semi-structured interviews, classroom observations and document analysis. The process of data generation was done in three semi-rural primary schools with three Grade 3 teachers in each school, who are basically teaching mathematics. In this chapter, I present, analyse and discuss the findings of the results from the data generated through one-on-one (semi-structured interviews), classroom observations and documents analysis as tools. The findings are trying to answer my key research questions that are as follows:

- What are Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions?
- How do Grade 3 teachers experience differentiated approaches in teaching fractions?
- Why do Grade 3 teachers experience the differentiated approaches in teaching fractions the way they do?

Experience, as defined by Kinkead-Clark (2015), is the information of an occasion obtained through participation in itself. Hence, Khoza (2015) affirms that experiences are categorised into three levels which are as follows; self-experience, informal experience, and formal experience. He further articulates that self-experience in an experience that puts the individual teacher at the core of teaching contexts. However, Vogd and Harth (2019) declare that self-experiences are those experiences that consist of a state of individual perception to shape someone's own state of reality. Informal experience is defined by Khoza (2015) as the experiences that are interpreted and created socially through other people's ideas. Moreover, a formal experience defined as an experience that considers discipline or profession at the core of teaching and learning context (Chan & Yung, 2018). Therefore, this study is more concerned about teachers' experiences that are categorised into three levels, as it is looking to answer the above questions.

Furthermore, to ensure the trustworthiness of data generated and consider confidentiality in this research findings; thus, I preferred to use pseudonyms for all participants and their respective schools (Cohen et al., 2013). Therefore, in this case, the alphabets and numbers are used to represent the participants and their schools' names. The findings are presented under themes from the curricular spider-web concepts. I also used the literature review presented in chapter 2 to critique the findings.

5.2 Presentation of findings

The research findings and discussion of teachers' experiences of using the differentiated curriculum as an approach in teaching fractions in Grade 3 are presented thematically to reveal the data generated through the transcripts of semi-structured interviews, classroom observations and document analysis. In this case, I have used guided analysis to interpret data by using a concept that was adopted from the curricular spider-web, and as the conceptual framework of the study. The lens of the study is framed by concepts drawn from the spider-web. Therefore, these concepts were used as the clarifying way to see the connection between teachers' experiences through the different aspects of the curriculum. As a result, guided analysis is flexible in terms of allowing researchers to do amendments in principles of theories to accommodate important issues that seem to transpire from the data (Cohen et al., 2013). Finally, data analysis for this study, in particular, is influenced by the experiences of teachers who participated in the study and formed the themes that are in relation to the concepts.

5.2.1 Theme 1: Content

What are you teaching in fractions?

The data generated through the semi-structured interviews, classroom observations and document analysis indicated that teachers' experiences of teaching fractions using differentiated curriculum approaches are based on CAPS as a guide to content. In this case, teachers' experiences are prejudiced by performance or vertical curriculum where the intellectual field has more privilege than other fields Khoza (2016). Whereas, (Chan & Yung, 2018) insist that this kind of experience which is categorised as formal is an experience that places discipline or profession at the core of

teaching and learning context. Therefore, the findings below show what teachers teach fractions using different curriculum approaches in the classroom.

Participant 1B: I ask learners to count in 2's 4's and 10's. I ask learners prior knowledge of fractions and show them the fraction wall chart on the chalkboard. I repeatedly ask questions in both languages in order to ensure that they understand the fraction concept. Therefore, I teach learners to calculate, describe and order proper fractions. For the fact that they are instructed to count, I prepare them for mathematics lessons.

Participant 2C: I ask learners to rhyme a song about big and small numbers, doubled and half of the numbers. I teach learners only proper fractions because CAPS allows me to do so at this stage. I teach them how to calculate and solve problems with fractions on their own. I also repeat the fraction concept in their home language which is isiZulu "amaqhezu".

Participant 3A: I teach learners to count in turns, calculate in groups, to separate proper and improper fractions according to their knowledge. Counting in turns makes them prepare for the new lesson in mathematics. I also bring a loaf of bread and oranges for each group to cut into halves, thirds and quarters. This can help the different learners to be able to calculate with fractions, comparing, ordering and giving their names e.g. "one third" of the whole.

Findings indicate that teachers confidently mentioned their experiences on content taught infractions as to solve problems with fractions, describing, comparing and ordering fractions, and doing calculations with fractions. This suggests that teachers were familiar with the content of fractions entailed in the curriculum (Chamane, 2016) However, Hoadley and Jansen (2013) also agree that teachers must know all the topics of the subject they are teaching so that they will yield good results when teaching fractions. Supporting that statement, teaching, and learning of fractions should integrate with all subjects taught in order to meet individual needs. Findings also revealed the beliefs that influenced these teachers' experiences of teaching fractions using different approaches through the curriculum. Moreover, it is also confirmed that they believed that their background, experiences and content knowledge were essential in presenting content in the fraction classroom (Ball, Thames, & Phelps, 2008). In this case, this was based on the fact that teachers enter the profession with personal values and belief systems (Adler, 2015). On the other hand, such factors inform teachers' experiences of their classroom practices, such as teachers' schooling experiences of how they were taught fractions interfered with their practices of teaching

fractions in Grade 3 using different curriculum strategies. As a result, they found that they were confused by the methods/approaches that were used for teaching and learning fractions that were prescribed by the curriculum. Actually, their teachers were unable to consider their learners' differences in the classroom.

In short, teachers' previous knowledge, beliefs, ideas and previous experiences in teacher education influence how they teach (Khoza, 2016). This is further supported by U Hoadley and Jansen (2013), who state that teachers' challenges of teaching fractions rooted in their experiences. A gap in practices offered an indication that teachers did not fully understand the use of content in such a way that they do not sure about the curriculum differentiation when teaching fractions (Tomlinson & Imbeau, 2010). Yet, it appreciated to use the language that learners understand easily and it allows them to master the content taught irrespective of their differences (Nkonde et al., 2018). Furthermore, it is evident that the use of the mother tongue can help learners to develop not only mathematics concepts but also literacy and content taught (Heugh, 2015). Therefore, using the mother tongue in implementing the curriculum differentiation when teaching fractions in Grade 3 learners is vital.

Finally, the prescriptive nature of the curriculum discarded teachers' autonomy on the content to teach. This is further supported by Christian and Nhlanhla (2018), who argue that CAPS is a content-driven curriculum with detailed explanations that are laid down for teachers to follow when teaching. Such approaches to curriculum design repudiate the teachers' opportunities to take the autonomous decision on how to teach fractions in a diverse classroom. This was found to hinder teachers with years of experience of teaching Mathematics, who had an understanding of how to assist the learners when they were experiencing problems in teaching fractions using different approaches. Therefore, they were deprived of the innovative ways of teaching fractions differently.

5.2.2 Theme 2: Teaching activities

How do you teach fractions?

Formal activities versus informal activities

The data generated through semi-structured interviews, classroom observations and document analysis revealed that teachers used different activities when teaching fractions. The use of different activities allows learners to participate fully as they are being accommodated in a classroom environment. Teachers used worksheets for shading a diagram to form a given fraction, using a number line to represent fractions, A4 papers, a loaf of bread, DBE workbooks, crayons for shading and colouring, fraction wallcharts and oranges. Furthermore, they were teaching the same content for week 7 in their departmental trackers (Jikimfundo document) and understood the importance of activities but implemented them differently. The documents were analysed and revealed that teachers' experiences of teaching fractions using different curriculum approaches are based on the Teacher lesson plan, CAPS Planner and Tracker as well as DBE learner workbooks.

It was interesting to find that teachers planned to learn activities using common sense and what they felt was needed as an activity. In this case, it was not clear whether the activities that they used for teaching were effective in enhancing the teaching of fractions. This is further substantiated by Thijs and Van den Akker (2009), who argue that during teaching it is important to consider the best activities for attaining the subject's aims. This indicates that aligning the activities with the aims will help the teachers to select releVant activities that will improve the teaching of fractions in the diverse classroom. It is also impressive to see teachers grouped learners according to their abilities and instructed to sit appropriately to their allocated groups. However, I was not sure either the learner were feeling comfortable to work with those group members.

Therefore, the findings below revealed the experiences of teachers being engaged with learners in the diverse classroom by using different teaching activities for teaching fractions in Grade 3.

Participant 1B: I usually use the telling method, give instructions to learners on what is expected to them to do. For my introduction, I ask questions that are releVant to the lesson. I also use a loaf of bread and indicate that it is representing a whole, thereafter we cut it together to make two equal halves. I also give learners worksheets with different 2D-shapes to shade and give fraction names. I move around and help those who are not sure of what to do. I also use DBE workbooks as per lesson plan and tracker instruction. Learners complete their activities on their DBE workbooks.

Participant 2C: I use the instruction method. I bring along an orange as a teaching activity that will withdraw learners' attention. I allow learners to draw for themselves different shapes and cut them into fractions. I work separately with those that are struggling to follow instructions and unable to work without teachers' help. I also teach learners how to represent a fraction in a number line. Learners used to enjoy working on a number line because they show off their different creativity and using their colourful rulers.

Participant 3A: I prefer the learner-centered approach as it helps the learner to choose what they will draw in order to represent fraction numbers on their understanding. I let them write their answers on the chalkboard so that other learners gain from others. Nevertheless, my focus as a teacher is based on the objectives that I want to achieve in the lesson. Teaching fractions in Grade 3 is enjoyable to me and as well as to learners, because they move up and down trying to get attractive colours from other groups.

Therefore, the above responses indicate how different teachers experience different approaches to teaching fractions by using different teaching activities.

Those activities can be group work, teacher-led, learner-centered, and whole class activity where learners work as an individual (Dilekli, Tezci, & Creativity, 2016). The findings suggest that the use of different learning activities is valuable in accommodating different learners' abilities. This suggests that teaching should be part of active learning (Nisbet & Shucksmith, 2017). The use of different activities helped teachers to recognise learners' strengths and weaknesses in learning fraction concepts (Shange, 2015). When the activity is designed, they focus on objectives that need to be achieved under the supervision of a teacher. The lesson that is driven by objectives is more of a teacher-centered approach because learners have to follow instructions given, and they cannot learn on their own (Khoza, 2016). In this case, when giving instructions and examples, indicate that the lesson is designed to promote objectives. **Participant 3A response:**

> **"***I prefer a learner-centred approach as it helps the learner to choose what they will draw in order to represent fraction numbers on their own understanding. I let them write their answers on the chalkboard so that other learners gain from others. Nevertheless, my focus as a teacher is based on the objectives that I want to achieve in the lesson".***

This teacher is concerned about achieving the objectives while allowing learners to draw shapes that represent fraction numbers for themselves, that will be on their understanding and let the learners to be engaged in solving problems on their own in real life. Therefore, the findings indicate that teachers' perception is on the technical level of educational experiences, where they are worried about the teaching methods to use, and the achievements of the objectives in the classroom (Yost et al., 2000). Hence, Delamont (2016) suggests that mathematics teachers should use teaching methods that will accommodate different learners' abilities, and thus, technical experiences are determined through classroom practical experiences.

Nevertheless, teachers' experiences indicate that they design the lesson in the interest of the learners. Hence, Riccomini et al. (2015) state that instructional methods in mathematics classrooms provide learners with an inadequate opportunity to learn fraction concepts. In this case, thus, Mathematics teachers reveal that they use different learning activities to help learners to learn, and although instructions were used, the learners were allowed to work on their own. Likewise, the findings from the semi-structured interview and classroom observation reveal that the teacher's design activities for the learners. Participant 2 C reveals it**:**

> *"I use the instruction method. I bring along an orange as a teaching activity that will withdraw learners' attention".*

Therefore, it is of good results when learners are instructed to bring oranges for themselves so that they will use that knowledge even from their homes.

The findings from the teachers' experiences revealed that teachers employed different activities, including concrete objects, when teaching fractions in their classrooms. They believed that learners understand more quickly when they link real objects to numbers. This is generally based on the belief that it is helpful for learners to be allowed to move from the concrete to the abstract. Therefore, it indicates that the use of real objects encourages more abstract thinking when teaching fractions in a diverse classroom.

5.2.3 Theme 3: Teacher role

How do you facilitate learning in fractions?

These teachers understood their roles as facilitators, instructors, managers, assessors as well as content-centered. Teachers were facilitators (learner-centered philosophy) when they directed learners' knowledge in order to make their meaning during the teaching and learning process. This indicates that when teachers were permitting the learners to help each other during group work, they were facilitators too. Therefore, this implies that learners were active participants in learning and co-constructors of knowledge, although they were given less time. On the other hand, when teachers gave learners the concept of fractions, they were instructors. Therefore, teachers performed as instructors when they exercised control and guided learners on various activities. In this case, this symbolises that the teachers had more control over the selection of activities, sequence, and pace of learning.

Similarly, this donates that teachers' roles as instructors do not consider learners' prior knowledge as necessary, although few questions were asked during the introduction of the lesson. Therefore, teachers did not allow enough space for personal development and growth of learners. Hoadley and Jansen (2013) argue that if teachers use aims and objectives to drive their lessons, it shows that teachers are using the teacher-centered approach. Teachers must know the approach they are using when teaching fractions to locate their roles. However, when teachers assumed the roles of being facilitators, they consider learners' prior knowledge. Teachers' teaching strategies were shaped by the teachers' understanding of the learners' prior knowledge, not by the abilities of learners. They align their teaching approaches with learners' prior knowledge, and the false impression was discovered. The following data finding was generated through a semi-structured interview and during classroom observation sessions from **Participant 1B:**

> *"I ask learners questions as my introduction and instruct them to do what is expected for them to do. I also ensure that they always engaged in the lesson by asking whether there are still with me or not".*

I have discovered that the Participant wanted to impress me while asking learners questions throughout the lesson, and the learners got bored.

Concluding the findings from the semi-structured interviews and classroom observation, the teachers' responses revealed that all of them understood their roles as facilitators (learner-centered), instructors (teacher-centered), class managers and assessors when teaching fractions in a diverse classroom. Their accounts also revealed that they had challenges in performing their roles when they teach fractions. The following responses asserted confirmed what teachers said:

Participant 2 C: "I ask questions that are written on the Teacher Lesson plan (Jikimfundo is supporting document), but some questions are not formulated to cater for learners with learning barriers. That is why it is not easy for me to deal with learners of special needs at the same time dealing with those who are capable of. I ask whether they still remember the denominator and the numerator, I instruct the groups to underline all the denominators, and facilitate the activity as per the lesson plan".

Participant 3A: "I firstly consult the Teacher Lesson plan, the Tracker, as well as the DBE workbook for learners. These three support each other because the DBE workbooks determine the activities for the day. I usually show them where to start and where to end. When learners busy with their DBE workbooks, I facilitate the activity and manage their handwriting. Some learners are paging the workbooks for a long time, meaning they are unable to use number pages sequentially. I draw shapes that representing those fractions, by doing that, learners can interpret what is needed to do in their workbooks".

Therefore, the teachers' roles in any educational context are significant because learners need guidance and support during the learning process. Data analysed from the findings also revealed that teachers' experiences were influenced by their roles when they teach fractions in a diverse classroom. De Witt and Lessing (2013) states that a teacher is a facilitator (learner-centered) who creates a classroom environment in which learners can appreciate the learning opportunities and make sense of the knowledge, skills, and values being learnt infractions. If teachers are using learning outcomes to drive their lessons, it means that teachers are using the learner-centred approach (Khoza, 2013). Learner-centred education suggests that human beings learn by actively constructing and assimilating knowledge rather than through the passive addition of discrete facts to an existing store of knowledge (Ochola, Persson, Schumacher, & Lingo, 2015). This denotes the role of the teacher is to be an instructor and facilitator in a competence curriculum when teaching fractions (Hoadley & Jansen, 2013).

5.2.4 Why do teachers have particular experiences of teaching fractions using differentiated approaches in Grade 3?

The data also revealed why teachers have particular experiences of teaching fractions in Grade 3. Rationale, Resources, grouping, time, location and assessment were highlighted as being the most influential on teachers' experiences. Following is a discussion on how these concepts shape teachers' experiences of teaching fractions.

5.2.5 Theme 5: Rationale

Why are you teaching fractions the way you do?

Rationale serves as the link between all other curriculum concepts such as goals, content, learning activities, teacher role, materials and resources, location, time, and assessment. In this case, the rationale is described as "the reply to the question of why a subject is taught at school or why learners are learning this subject"(Van den Akker, 2004). Basically, this concept will be used to understand teachers' experiences of using the differentiated curriculum approaches in teaching fractions as a mathematics concept in Grade 3. Therefore, the reasons (rationale) for teaching fractions using differentiated curriculum strategies are presented in three categories which are: personal (pedagogical); societal (beneficial) and content (professional).

The findings below confirm the experiences emerged during the interviews sessions:

Participant 1B: I have been teaching fractions since I was employed to teach in the FP especially to Grade 3 learners, and I enjoy it. I ensure that all learners are benefiting and able to solve daily life problems. Yet, I am not familiar with curriculum differentiation as an approach. I usually teach learners as a class because there is no enough space and time to deal with them individually.

Participant 2C: I teach fractions using different strategies because I consider their different needs and abilities towards learning. I have a passion and it is enjoyable to me as well as to the learners. Learners enjoy using bread and fruits during the lesson of fractions. Although, it is not easy to deal with those who seem to be very slow.

Participant 3A: As a qualified teacher, I teach fractions because it is within the curriculum that acquires learners with different skills. I want my learners to know that fractions are part of the whole, and fractions are all over even in the other primary level subjects. Lastly, they form the part of mathematics vocabulary. I do understand that some learners need special attention but, I did not attend any workshop for curriculum differentiation since I was employed.

These findings revealed that participants' experiences are mostly based on personal and societal reasons, thus, it is noticeable that there are not teaching fractions because they have trained to teach fractions in a diverse classroom, but it is within the curriculum. Teachers teach fractions because they have a passion for teaching them. In this case, this showed the personal rationale as the most influential rationale that drives teachers to teach their subject successfully (Hill et al., 2005). Olsen (2015) argues that personal rationale is what makes a successful teacher and guides them to do what needs to be done differently to prepare learners for the 21st century. However, Hill et al. (2005) assert that when teachers are guided by personal rationale, they demonstrate a conceptual understanding of their subjects particularly in this case in mathematics concepts.

This is an indication of self-experience (Hoadley & Jansen, 2013). Some of the teachers teach fractions because of the interest they have, and skills that qualify them to teach (Adler, 2015). Therefore, with the love of fractional concepts, learners can improve a better understanding of the subject taught at an earlier stage. Teachers' interest in teaching fractions also tends to create positive attitudes towards the learners' interest in learning fractions and to other basic mathematical concepts for Grade 3 learners (Adler, 2015). Thus, love of the subject and skills are needed to teach fractions using different approaches in order to produce good results, because learners' performance is influenced by their teachers' attitude and interest towards the teaching of fractions. In addition, (Hill et al., 2005) insist that teachers who show a positive attitude towards Mathematics may gain learners' interest in learning Mathematics especially fractions, which seem to be more challenging to both teachers and learners. This is an indication that promoting positive attitudes towards teaching and learning of fractions calls for approaches and practices that promote positive attitudes for better results as well as for the performance curriculum taught in schools (DoE, 2011).

The participants' experiences of teaching fractions using different strategies based on societal reasons are also indicated by means of revealing that, they are teaching fractions in trying to give back to the community, since fractions used in everyday life, and learners can embark on various jobs through learning of them and develop cognitive skills (Gardner, 2000). However, they are not aware of curriculum differentiation per-ser**. Participants 1B and 2C** reveal that they are highly concerned about the learners' needs, while **Participant 2C** says:

"I teach fractions using different strategies because I consider their different needs and abilities towards learning". Yet, she is not able to deal with those who are performing very slow, and this reveals that these learners almost left behind. In this case, teachers' experiences of teaching fractions, to different learners is a norm, and using the approaches that will accommodate all is also vital. Therefore, **Participant 2C** has revealed her societal reasons for teaching fractions, because these learners are coming from different communities with different societal issues and having different needs in order to succeed in the future. Furthermore, this is resulted to consider an attained curriculum, because learners will use this knowledge in other educational contexts irrespective of their environment and background (U Hoadley & Jansen, 2013). On the other hand **Participant 1B** responded and revealing her informal experience that put society at the core of the teaching context, as follows:

"I ensure that all learners are benefiting and able to solve daily life problems".

As a researcher, this finding reveals that this kind of a teacher ensures that teaching and learning of fractions to a lower grade level is essential, because every human being including learners face the different challenges in life, and need to be solved in one way or another. Therefore, to conclude the findings for **Participant 1B and 2C**, teachers who guide and support learners towards achieving their goals and a result of constructivism, the knowledge they gain will be constructed and used in every situation in life.

However, **Participant 3A** reveals that she teaches fractions because **"it is within the curriculum"** This suggests that teachers' experiences are influenced by the vertical curriculum (formal). They are teaching fractions using different curriculum approaches to please the curriculum developers and to follow orders of the department of education (Intended curriculum). Thus, this is an

indication that some Mathematics teachers teach fractions without identifying their individual strengths and weaknesses, they teach what is given to them within the curriculum. Therefore, findings indicate that fractions are part of Mathematics that needs to be taught in schools in order to develop learners' reasoning skills. Hence, Gutstein (2018) indicates that teaching fractions is a struggle for teachers and learners but, it promotes learners' reasoning skills. This is an indication that fractions are needed in most of the careers. Fractions were included in the curriculum because it is needed by society as a whole. Therefore, learners who learn fractions in different ways develop their reasoning skills in schools and they may have better job opportunities in the future.
The following response reflects on the teachers' content rationale:

> **"***As a qualified teacher, I teach fractions because it is within the curriculum that acquires learners with different skills. I want my learners to know that fractions are part of the whole, and fractions are all over even in the other primary level subjects. Lastly, they form the part of mathematics vocabulary".*

The findings showed that the teachers' experiences of professional knowledge equipped learners with the necessary knowledge of fractions. This means that when learners are engaged with fractions they will be able to apply the knowledge they have grasped to use fractions without any problem. In this case, if learners have Mathematics knowledge then they have the potential to excel and that manner, they will eventually, get well-paid jobs. Furthermore, teachers' responses also revealed that the teaching of fractions depended upon knowledgeable teachers who understood the subject matter (Shaughnessy et al., 2016). Therefore, this suggests that, if teachers who are teaching Mathematics are not knowledgeable infractions they will not be able to teach fractions effectively and successfully. Supporting this data generated in this study, it is also indicated that these teachers teach fractions to instill mathematical problem-solving skills in learners. Evidently, these teachers take their teaching as a professional obligation and are driven by their knowledge to attain curricular aims, particularly the teaching of fractions. They also understood that every learner should have knowledge of mathematics in order to solve problems in their real-life situations. Seemingly, these teachers' professional knowledge promotes this engagement. Finally, looking at these findings, I articulate that teachers were able to reflect on the rationale for their experiences of teaching fractions even though they were not aware that they were guided by

rationales in their teaching (Chamane, 2016). However, Khoza (2016) asserts that the understanding of rationale promotes a good connection between theory and practice. As a result, having rationales encourages teachers to question the curriculum ideology as they plan their teaching and consequently, construct a personal, societal and content rationale for teaching. Therefore, according to this rationale, it is noticeable that teachers are having less knowledge of differentiated curriculum approaches, because only one participant who have mentioned the different strategies for teaching and learning.

5.2.6 Theme 6: Resources

Resources for teaching fractions

The data findings revealed that resources influenced teachers' experiences and impacted on their teaching. Resources such as fruits, a loaf of bread, textbooks, charts, chalkboards and DBE workbooks were found to be the common resources used for teaching fractions. Pepin et al. (2017) articulate that curriculum demands more resources such as textbooks, stationery, wall charts and worksheets. In this case, this denotes that teachers were able to use different resources when teaching fractions. In order for a resource to be effective, there has to be a connection between the teacher and the learner while using the resource as a medium of explanation (Pansell & Bjorklund Boistrup, 2018). This suggests that resources encourage thinking and communication about fractions. Teachers took into consideration that the use of resources that were available enabled their pupils' learning of fractions were successful. As such, they believed that the use of resources helps learners to develop different skills, analyse strategies for adding and subtracting fractions. In addition, Van den Akker (2004) state that resources are mainly thought of at the micro (school) level of curriculum development where the teachers select which materials to use when they teach.

Despite that, teachers' responses indicated that they used resources that were known and familiar to learners from their home backgrounds. However, Khan (2017) asserts that the primary resource for mathematics, including the teaching of fractions, is the textbooks. McElroy, Moore, Hilterbrand, and Hindes (2017), supported the significance of textbooks and states that books determine the knowledge that the curriculum aims to convey and further state that learners should have access to textbooks. In addition, Pepin et al. (2017) also claim that textbooks are the most

common form of curriculum material (resource) used throughout the world. Macgilchrist (2017) also agrees that textbooks significantly assist the teacher not only with daily lesson planning but also for curriculum coverage purposes. In this case, findings revealed that these teachers' experiences of teaching fractions determined by DBE workbooks as resources for mathematics. Ursula Hoadley and Galant (2016) articulate that DBE workbooks for mathematics were granted for the purpose of helping learners to improve conceptual understanding and problem-solving skills.

Therefore, as DBE introduced workbooks as supplementary study material for learners but the findings revealed that teachers did not use them the way they were supposed to. Some learners' work were not marked, insufficient of workbooks due to the fact that they have worn out. In case, teachers revealing that learners are not doing their homework and they used to absent themselves. Teachers are guided by these workbooks on a daily basis which is become a problem when learners did not finish their activities on time, therefore, teachers have to move on. Learners used to lose their books because these books supposed to be kept and used for two terms which are a long time for young ones.

5.2.7 Theme 7: Grouping

With whom are they learning?

Grouping learners according to their abilities is essential for effective teaching and for teachers' experiences of teaching using different approaches for fractions.

Firstly, the resources were insufficient for teaching fractions in groups, therefore teachers were experiencing challenges due to the lack of enough resources for each learner. The availability of resources will give a direction of the content to be taught and the teaching strategies to be used. For this matter, teachers believed that grouping learners would help learners to have equal access to resources as well as to learning. They also believed that reserved learners get an opportunity to express themselves in groups. Nevertheless, there were challenges in managing big groups as a result of learners who dominated the activities. Teachers' experiences also revealed that their workloads and class sizes were another barrier to the teaching of fractions, hence there are learners who have barriers to learning. In this case, they further indicated other problems such as insufficient floor space; as a result, they were unable to pay attention to each group and each

learner. The teachers in this study also highlighted that workload affected learners' performance infractions as they were teaching all FP subjects.

5.2.8 Theme 8: Time and learning environment

When and where are they learning?

Participant 1B: I teach fractions in the classroom, sometimes I take learners outside the classroom. It happens that learners are unable to come to school due to severe injuries, I ask their parents to help them from home. Teaching mathematics content areas takes 90 minutes per day. The specific times for fraction concept for Grade 3 in terms 2, 3, 4 are weeks 7 and 8.

Participant 2C: I teach fractions inside the classroom, I avoid teaching outside because learners will lose focus. The time allocated for Mathematics is 7 hours per week, it is enough for Grade 3 learners. But the fraction concept has time is not enough for the term. When it is raining outside, I sometimes use the P.E periods to cover the fractions concepts.

Participant 3A: As are we in a rural area, I use the ordinary classroom that is not suitable for conducive learning, we sometimes go to the school hall in order to get enough space for doing cut and paste activities. The teaching time for Mathematics is in the morning, but teaching time for fractions is not enough for learners to acquire problem-solving skills. The structure of the lesson plan is divided into Mental maths which is, 15 minutes, Homework corrections-15 minutes, Lesson content-30 minutes, Classwork activity-25 minutes, and Homework activity-5minutes then on Fridays there are no formal lessons in the lesson plans. Therefore I use this time to cover the work that is left behind.

The findings revealed that teachers were teaching fractions inside the classroom and outside. This is supported by Van den Akker (2004), who said that teaching may take place anywhere inside the school building. During the interviews, these teachers confirmed that most of the parents were not interested in helping their learners with homework, as a result, they did not receive support from their parents. The teachers also mentioned that some parents fail to assist their learners with

homework because they are illiterate. Therefore, teachers are left with no choice but to continue to give homework as it appears to their planning and learning fractions at home are vital. Homework is a combined effort involving learner, teacher and parent, in which all parties have a vital role to play regardless of their educational background (Harris, 2018). The findings on teachers' experiences also revealed that their learners were not receiving support from parents because of the school's rural context. Under those circumstances, teachers preserve the responsibility for retaining the knowledge of the different learning situations, contexts and environments of education, as well as prevailing policies, and the political and organisational contexts (DBE, 2011). Thus, if teachers lack an understanding of the context, the chance that they will be successful in the teaching of fractions using different approaches and strategies is limited. The findings also indicated that the time allocated for mathematics was not sufficient for the teaching of fractions. The teachers indicated that they use the periods for P.E in the morning to cover the fractional content. This indicates that teachers are concerned about learners who are not capable of finishing their work due to different reasons.

Most of the participants' experiences indicate that they are teaching fractions in the classroom using the formal time allocated in the weekly time table which is not enough to cover the content (Berkvens, 2009). Teachers feel that time allocated to teach fractions is not enough because the time allocation for content development is 30 minutes for the day. The document provides 90 minutes for different activities including content for the day. Therefore, the participants feel it is not sufficient since they are teaching learners with different needs.

Additionally, teachers feel that floor space is problematic too due to overcrowded classes.

5.2.9 Theme: 9 Assessment

How do you continuously assess learners in fractions?

The findings from the teachers' experiences indicated that teachers were guided by the CAPS document when assessing fractions. They said that they use both informal (formative) and formal (summative) assessments (Khoza, 2015). Formative and summative assessments are important when ensuring the attainment of learning outcomes infractions. During the semi-structured interviews, the teachers stated that they continuously assess learners as per the lesson plan for the day. This kind of assessment is informal and it is not for recording purposes. The findings on

classroom observations revealed that teachers are using the structured assessment tool which basically allows the learners to answer orally. The formative assessment was more suitable for every learner in the classroom, and it was an indication of a clear understanding. This is substantiated by Nicol and Macfarlane-Dick (2006) who proclaim that formative assessment is a powerful tool that enables learners to recognise the areas in which they have difficulty. They further, articulate that formative assessment also helps learners to take control of their own learning and become self-regulated learners. Andersson, Palm, and Practice (2018) also agree that formative assessments should be part and parcel of the teaching and learning process, thus, it may represent "the next best hope" for promoting greater achievement gains for learners. In this case, Formative assessment is called "assessment for learning" and for this reason, it is used during, or at the end of, each lesson (DBE, 2011). This suggests that formative assessment is intended to support the improvement of learners when teaching fractions, especially in a diverse classroom. Dolin, Black, Harlen, and Tiberghien (2018) articulate that formative and summative assessments must be part of teaching and learning. This implies that formative assessment informs the learning process on a daily and weekly basis, as opposed to at the end of a unit of work hence summative is used for reporting to learners, parents, as well to the department.

5.2.10 Conclusion

This chapter discussed the findings and analysed data generated through the semi-structured interviews, classroom observations and document analysis with three school teachers who are teaching fractions to Grade 3 learners. The findings were then analysed and discussed through the lens of curricular spider-web concepts as well as the literature review chosen for this study. The following chapter postulates a summary of the entire study and an interpretation of the conclusions derived, and lastly, it ends with the recommendations drawn from the findings associated with the key research questions.

CHAPTER SIX
SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

In this chapter, I present the summary of the findings, conclusions, and recommendations that emerged from transcribed data and discussion as based on the semi-structured interviews, classroom observations and document analysis presented in the previous chapter. Grounded in the findings that emerged from data discussion in chapter five some suggestions and recommendations of this study have been considered in relation to the critical questions formulated in Chapter One.

6.2 Conclusions on this research

The study focused on exploring teacher' experiences of using differentiated curriculum approaches in teaching fractions in Grade 3. This is a multi-case of three semi-rural schools in the Ngwelezane Circuit. The study further tried to understand how and why do Grade 3 teachers have those specific experiences. The conclusions resulting from the findings discussed the concepts of the curricular spider-web as the themes that organised these teachers' experiences of teaching fractions using differentiated curriculum approaches to Grade 3 learners in semi-rural primary schools.

6.3.1 Content knowledge of teaching Fractions

The study revealed that teachers understand the content that is based on CAPS. Teachers' experiences of teaching content are categorised as formal because it places profession at the core of teaching and learning context. Findings further indicated that when learners are able to solve fractional problems, they will master the content and get good results.

Therefore, teachers' professional knowledge should be at a high level and supported by the department continuously. Lastly, the findings revealed that although teachers using different strategies for teaching fractions in Grade 3, they are not sure of curriculum differentiation for a diverse classroom.

6.3.2 Teaching activities

The findings indicated that the teacher-centered and learner-centered approach were used yet, learning activities were teacher-centered. Learners were fully involved and enjoyed fractional concept activities. Teaching activities used by teachers were reliable for teaching and learning purposes, and they were based on CAPS lesson plan and DBE learner workbooks. The findings suggest that the use of different teaching activities are valuable in accommodating different learners' abilities and needs. Lastly, the findings from teachers' experiences revealed that teachers employed different activities including concrete objects when teaching fractions. Therefore, they believed that learners understand more quickly when they link real objects to numbers.

6.3.3. Teacher's role

The findings indicated that teachers understood their roles as facilitators, instructors, managers and assessors. A teacher is a facilitator who creates a classroom environment that is conducive to learners being able to make sense of the knowledge, able to develop learners' different skills and values being taught infractions. Learner-centred education suggests that human beings learn by actively constructing and assimilating knowledge rather than passively adding discrete facts to current knowledge. Teachers as instructors focus on the content that they teach and on what they "do best" in teaching. Therefore, being an instructor she or he believes that learning is the direct result of having been taught. Teachers are able to manage their classrooms and perform their duties abundantly. Consequently, teachers decide which role to assume when teaching fractions in using differentiated curriculum approaches.

6.3.4 Rationale

The findings analysed from data generated reveal that teachers' experiences are influenced by the vertical curriculum (formal). They are teaching fractions using different curriculum approaches to please the curriculum developers and to follow orders of the department of education (Intended curriculum). Thus, this is an indication that some Mathematics teachers teach fractions without identifying their individual strengths and weaknesses, they teach what is given to them within the curriculum. The study revealed that some of the teachers teach fractions because of the interest they have, and skills that qualify them to teach (Adler, 2015). Therefore, with the love of fractional concepts, learners can improve a better understanding of the subject taught at an earlier stage.

Teachers' interest in teaching fractions also tends to create positive attitudes towards the learners' interest in learning fractions and to other basic mathematical concepts for Grade 3 learners.

6.3.5 Resources

According to the findings, teachers were using different resources effectively. They took into consideration that they must use resources that were available and affordable to enable learners' learning of fractions. This is corroborated by Thijs and Van den Akker (2009), who assert that resources are mainly taught at the micro (school) level, where the teachers select which materials to use when they teach. The most common form of curriculum materials (resources) used throughout the world are textbooks (Re. Textbooks greatly assist the teachers, not only with daily lesson planning but also with achieving curriculum coverage (Macgilchrist, 2017) (Taylor, 2008).

6.3.6 Grouping

The findings revealed that there were challenges in managing big groups as a result of learners who dominated the activities. Teachers' experiences also revealed that their workloads and class sizes were another barrier to the teaching of fractions, hence there are learners who have barriers to learning. In this case, they further indicated other problems such as insufficient floor space; as a result, they were unable to pay attention to each group and each learner.

6.3.7 Time and learning environment

The findings indicated that parents were not interested in the learning of their learners. Teachers' accounts revealed that learners were not receiving support from parents because of the school's rural context. However, DBE (2011) states that teachers should possess knowledge of different contexts. The findings also indicated that the time allocated for Mathematics was not sufficient for the teaching of fractions. The teachers indicated that they occasionally use P.E time to cover fractions concepts.

6.3.8 Different types of Assessment

The findings indicated that the teachers were guided by CAPS documents on how to assess fractions. Teachers stated that they use both informal (formative) and formal (summative) assessments (Nicol & Macfarlane-Dick, 2006).“Formative assessment” is part and parcel of the

teaching and learning process (Andersson et al., 2018). It is done informally and continuously to evaluate learners' knowledge and is not planned for grading purposes. "Summative assessment" is done formally and is planned for grading purposes. This concurs with Dolin et al. (2018) assertion that summative assessment focuses mainly on the product of learning.

6.4 Implications for further research

The study explored Grade 3 teachers' experiences of teaching fractions using differentiated curriculum approaches. Further studies can be conducted to get a deep understanding of teachers' experiences of implementing curriculum differentiation as an approach in their classrooms in order to meet learners' different needs. By doing so, South African schools will meet the international education standards. The literature indicated that there are few studies on teachers' experiences of teaching Grade 3 fractions using the curriculum differentiation as a philosophy that enables learners of all levels to attain their full potential. Follow-up research on teachers' experiences of teaching fractions using different approaches can, therefore, be carried out and cover all curriculum spider-web concepts. The use CAPS as a policy document is needed to correct teachers who continue using the same strategies for all learners during the teaching and learning process. Furthermore, studies on the use of mother-tongue instructions for the teaching of fractions through curriculum differentiation is also needed.

6.5 Recommendations for this research

6.5.1 Recommendation 1

The recommendation on content revealing that the prescriptive nature of the curriculum does enable a degree of interpretation on the part of the teachers, but their autonomy is non-existent. It is noted and recommended that teachers should be involved in all levels of curriculum implementation so that they will be well-versed with the content. Therefore, on that note, the DoE must clarify that the CAPS system is a performance-based, content-driven curriculum and that teachers must teach it according to the prescribed content.

6.5.2 Recommendation 2

These teachers used the activities that they were familiar with. The activities should challenge each learner according to his or her ability, and must not limit them in learning fractions at their level. Teachers were teaching using the approaches that they were taught during their schooling system. Therefore, it is recommended that teachers be creative and innovative. In this case, it is suggested that policymakers should also support teachers by showing them how to create other activities.

6.5.3 Recommendation 3

These teachers were applying most teacher-centered when teaching fractions. This suggests that teachers find it difficult to shift from a competence curriculum to CAPS, which is based on performance. CAPS is content-driven, and teachers play a leading role. The DoE should define the role of teachers in the CAPS system and provide strategies based on curriculum differentiation.

6.5.4 Recommendation 4

It is recommended that curriculum developers involve teachers in designing the intended curriculum so that teachers will implement the curriculum effectively. The DoE and school management team must support teachers with on-going professional development so that they are kept up-to-date on new teaching methods and other innovations through curriculum differentiation.

6.5.5 Recommendation 5

The findings were bringing their own real objects as resources for teaching, which were not enough for teaching each group. School managers need to support and take care by supplying resources so that the teaching of fractions can be effective. It is necessary that the DoE provides schools with electricity, Internet facilities so that teachers can download aids, and information technology resources as were are in the period of the 4th Industrial Revolution.

6.5.6 Recommendation 6

Due to the shortage of resources enforced these teachers to group their learners to give them access to the available resources. It is recommended that the DoE provides schools with more classrooms and laboratories for young learners so that the teachers are able to teach more effectively. In addition, the issue of damaged workbooks should be considered by providing a huge quantity of workbooks. The DoE should deal with overcrowded classes by employing more teachers and

building more primary schools so that learners will have access to quality learning. The school managers should assist teachers by adding more furniture and maintain the classrooms to enable more effective teaching.

6.5.7 Recommendation 7

Parents were not supporting the learners with their homework due to the school's rural context. Learners' backgrounds are very important for a learner to master the concepts of fractions. It is recommended that parents should support their learners as teachers should possess the knowledge of different contexts (DBE, 2011).

The time provided for the teaching of fractions was not sufficient and teachers occasionally use the time for other important subjects such as P.E. to cover fraction concepts. It is recommended that the policymakers assist teachers in utilising their instructional time to teach fractions efficiently and be taught throughout the year.

6.5.8 Recommendation 8

The DoE should ensure that teachers all have the same understanding of "assessment" in order to teach the same content at the same school. The in-service training is essential. Further, the assessment set in CAPS should accommodate all levels of learners in order to attain their full potentials.

6.6 Conclusion

The Mathematics teachers' experiences of teaching fractions using different curriculum approaches in Grade 3 within the Ngwelezane circuit have indicated that time and learning environment play a vital role in producing the intended results of the implemented curriculum. This suggests that spider web components will be affected because each component is attached to each other. A conducive learning environment will enable teachers to use professional content knowledge effectively. Moreover, teacher development in the implementation of curriculum differentiation through CAPS is needed in order to acquire the intended results of the curriculum. This chapter also included a summary of the research inquiry and the pertinent findings then I expressed achievable recommendations from each curriculum spider-web concept.

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APPENDICES

Appendix 1

University of KwaZulu-Natal

Edgewood Campus

Private Bag X03

3605

15 July 2019

The School Principal

Matshana Primary School

P.O. Box 1997

Empangeni

3880

Dear Sir/Madam

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN YOUR SCHOOL

I am a Master in Education student at the University of KwaZulu-Natal, Edgewood Campus, in the faculty of education. As part of the requirements for the degree of Master of Education, I am required to conduct research and to interview on exploring Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions. I am humbly requesting permission to conduct research in your school during September 2019.

The study aims to gain an insight into the teachers' experiences of using differentiated curriculum approaches in teaching fractions in Grade 3. It is hoped that the insight gained *will assist teachers in trying new ways of teaching. It will also help teachers in planning according to their classrooms' abilities.*

Data for this study will be collected by means of semi-structured interviews, lesson observations and the study of documents such as teacher portfolio. As part of this study, your teacher is required to take part in a voice recorded an interview that will last for 45 minutes at a time convenient to her/him. Certainly, the semi-structured interview process will not disrupt teaching and learning.

You are hereby assured that the information the teacher gives will be treated with the utmost confidentiality and that her/his identity, as well as that of your school, will be kept private.

Please note that your teacher is free to withdraw her/his consent and discontinue participation at any time without penalty.

Supervisor contact details	**UKZN Research Office**	**Researcher's/ Student's contact details**
Dr B. Ndlovu Tel: +27 31 260 3670 (office) E-mail: ndlovubl@ukzn.ac.za	Mariette Snyman HSSREC-Ethics Tel: +27 31 260 8350	Ms S.P Mngomezulu Tel: +27 72 6502526 E-mail: toysmng@gmail.com

Time table schedule

Visits	Activity	Dates	Type of activity
1st visit	Introduction	21/08/2019	To introduce myself and also give the research participants letters to sign
2nd visit	Semi-structured interviews	02/10/2019	
3rd visit	Classroom observation/s	09/10/2019	Either structured / unstructured
4th visit	Policy document / if your study has any/ if you stated that you will access policy documents from the school/ teachers' documents/ CAPS/ Files/ learners journals/ notebooks	11/10/2019	Document analysis process.
5th visit	Data confirmation	23/10/2019	To confirm the data generated and also make sure that what I have correlates with what they gave me.
6th visit	Thesis delivery/ Thank you	30/10/2019	To thank the research participants and their contribution to this research

Your positive response in this regard will be highly appreciated.

Yours Sincerely

Sibongile Patricia Mngomezulu

Appendix 2

Interview schedule for teachers
Opening

My name is Sibongile Patricia Mngomezulu, I am a Master's student at the University of KwaZulu-Natal, School of Education. Edgewood Campus. My discipline of study in Educational Psychology. The research topic is "Teachers' experiences of using differentiated curriculum approaches in teaching fractions in Grade 3. This is a multi-case of three rural schools in the Ngwelezane circuit. Thank you for allowing me time to generate data and understand whether teachers use differentiated curriculum for the different learners in their classrooms.

I will be focusing only on Grade 3 teachers that are teaching Mathematics.

Interview questions

1. What is your understanding of differentiated curriculum approaches in teaching?
2. How do you make sure that all learners in your Mathematics classroom understand what is expected of them?
3. Explain how you prepare learners for a Mathematics lesson?
4. Which strategies do you use when teaching fractions?
5. Why do you use the strategies mentioned above?
6. Are they effective in teaching and learning?
7. Do you use differentiated curriculum approaches when teaching fractions?
8. What challenges do you experience when teaching fractions using different approaches to learners?
9. If you were teaching another topic in Mathematics, will you be using the same strategy?
   If YES…. Why?
   If NO…..Why?
10. Do you allow learners to solve Maths problems from their own experience?

If YES… Why?

If NO…. Why?

11. How do you use the different strategies used for assessing fractions?
12. Do you continuously assess learners as CAPS requirement?
13. How do you do this?

Thank you for your time and patience, should I have any questions I will come back to you.

Appendix 3
Classroom observation schedule

- Flexible grouping
- Lesson presentation
- Grouping strategies
- Attention to learner diversity
- Questioning strategies
- Teaching-learning content
- Learner participation
- Continuous assessment
- Teaching and learning support materials (resources)

Appendix 4

University of KwaZulu-Natal
Edgewood Campus
Private Bag X03
ASHWOOD
3605
15 July 2019

Dear Sir/Madam

RE: REQUEST FOR YOUR PARTICIPATION IN MY RESEARCH

I am a Master in Education student at the University of KwaZulu-Natal, Edgewood Campus, in the faculty of education. As part of the requirements for the degree of Master of Education, I am required to conduct research and to interview on "*Teacher's experiences of using differentiated curriculum approaches in teaching fractions in Grade 3"*. I humbly request you to participate in this research.

The study aims to gain an insight into how teachers experience the implementation of differentiated curriculum approaches in teaching Grade 3 fractions. It is hoped that the insight gained will assist teachers in trying new ways of teaching. It will also help teachers in planning according to their classrooms' abilities.

If you agree to participate in this study, I will come to your school at a time convenient to you. I will visit you three times in August /September this year, 2019. Two of the visits will be informal interview sessions, of about forty-five minutes to an hour each. Each interview will be voice-

recorded and will be conducted when you are free or after school. The third visit will be classroom observation.

Please note that you are free to withdraw your consent and discontinue participation at any time without penalty.

Supervisor contact details	UKZN Research Office	Researcher's / Student's contact details
Dr B Ndlovu Tel: +27 31 260 3670 (office) E-mail: ndlovubl@ukzn.ac.za	Mariette Snyman HSSREC- Ethics Tel: +27 31 260 8350	Mrs S.P Mngomezulu Cell: +27 726502526 E-mail: toysmng@gmail.com

As an indication of your positive response to the request, please fill in the informed consent declaration attached to this letter.

I will greatly appreciate your help, and I am looking forward to meeting you.

Yours Sincerely.

Sibongile P. Mngomezulu

Informed consent declaration

I,……the …….. I wholeheartedly give consent to my participation in this research study, I give consent to that. The interview may be audio recorded and that I may be observed in class. I also understand that I am at liberty to withdraw my participation at any point without penalty.

Preferred method of contact (please circle):

Home/ cell / office phone/ e-mail

Contact info:

_____

(Contact number)

_____

(e-mail)

_____ _____

Signature DATE

Audio recording

YES NO

Classroom observations

YES NO

Appendix 5

kzn education
Department:
Education
KWAZULU-NATAL

Application for Permission to Conduct Research in KwaZulu Natal Department of Education Institutions

1. Applicants Details

Title: Teachers' experiences of using differentiated curriculum approaches in teaching fractions in Grade 3
Surname: Mngomezulu
Name(s) Of Applicant(s): Sibongile Patricia
Email: toysmng@gmail.com
Fax: N/A -
Cell: 0726502526

2. Have you applied for permission to conduct this research or any other research within the KZNDoE institutions?

Yes	✓ No

If "yes", please state reference Number: _____

3. Is the proposed research part of a tertiary qualification?

✓ Yes	No

If "yes"
Name of tertiary institution: University of KwaZulu -Natal

Faculty and or School: Education

Qualification: Master in Educational Psychology

Name of Supervisor: Dr. Blanche Ndlovu

Supervisors Signature:

If "no", state purpose of research:

4.Briefly state the Research Background:

The curriculum has been identified in many education systems as one of the major barriers to facilitating the development of more inclusive system. Curriculum that is constituting major barriers include content, assessment, teaching strategies, learning support materials, instructional time, methods and processes, medium of instruction, classroom organization and management. Thus, for the curriculum to be accessible for all learners, it needs to be differentiated by using different approaches and different instructions. Curriculum differentiation refers to change that relate specifically to instruction or curriculum content. 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 classroom.

This implies that the curriculum should provide opportunities for adaptation to the individual differences and needs of all learners. It is evidently that teachers are faced with learners of different ability levels and high rate of learner poor performance. Thus, it is the Foundation Phase where support for learners in teaching using curriculum differentiated approaches, particularly in Grade 3 in Mathematics is mostly needed. This grade is about to exit the Phase and Mathematics is the most important subject. Therefore, the research study seeks to explore Grade 3 teachers' experiences of using differentiated curriculum approaches in teaching fractions.

5. **What is the main research question(s):**

- What are Grade 3 teacher' experiences of using differentiated curriculum approaches in teaching fractions?
- How do Grade 3 teachers experience differentiated approaches in teaching fractions?
- Why do Grade 3 teachers experience the differentiated approaches in teaching fractions the way they do?

6. **Methodology including sampling procedures and the people to be included in the sample**:

The approach to this research study is the Qualitative research approach under an Interpretivist paradigm, because it is more exploratory in nature and not predict the outcomes. It will understand some aspect of social life, and its methods which generate words, rather than numbers, as data for analysis. The research methods for this study will be in-depth semi-structured interviews which optimal for collecting data on individuals' personal histories, perspectives, and experiences, particularly when sensitive topics are being explored. The use of case study through classroom observations that aiming to observe teacher-learner interaction during the Mathematics lesson presentation will be noted down and recorded. Finally, as a researcher, I will also use document analysis such as teachers' portfolios or files with Mathematics lesson plans.

Sampling method for this research to be used is purposeful, which is selecting participants to fit the purpose, purposive sampling serves the purpose of providing the researcher with participants who will likely possess necessary information for the study. This sampling method will be used with a purpose in mind of gaining an insight of Grade 3 teachers' experiences as they continually implementing the curriculum using differentiated approaches in the teaching of Fractions. This sampling will consist of 1 Mathematics teacher in 3 rural schools that will be easier to reach in the Ngwelezane Circuit, at King Cetshwayo District. I will select teachers who will voluntary available to participate in the study and having experience on teaching of the subject in Grade 3. Data that will be generated through semi-structured interviews which consist of open-ended questions and allow room for discussion, classroom observations, and documents analysis, therefore, data interpretations would be in journal transcriptions and audio recordings and finally data analysis will be thematic. In this study transcriptions will be done by myself because it is time consuming to hire someone to transcribe the data. Finally, the study will be using themes for analyzing documents.

7. **What contribution will the proposed study make to the education, health, safety, welfare of the learners and to the education system as a whole?**

I believe that this study may be useful to the curriculum developers, curriculum designers, curriculum implementers (teachers), learners with different needs including those that are highly gifted, and DoE in developing their new knowledge and understanding of the curriculum. This may close the gap among rural schools by improving educational practices.

None

15. Research Timelines:

- **Proposal defence: 25 June 2019**
- **Revised proposal : 12 July 2019**
- **Application to conduct research from DoE KZN: 18 July 2019**
- **Ethical Clearance application from UKZN: July 2019**
- **Semi-structured interviews: 2-6 September 2019**
- **Classroom observation: 9-13 September 2019**
- **Data analysis: October 2019**
- **First draft: November 2019**
- **Submission: December 2019**

16. Declaration

Signature of Applicant Bw **Date** 18/07/2019

17. Agreement to provide and to grant the KwaZulu Natal Department of Education the right to publish a summary of the report.

Signature of Applicant(s) Bw **Date** 18/07/2019

Return a completed form to:
Connie Kehologile – Tel: 033 392 1004
Office of the HOD; KwaZulu Natal Department of Education

Hand Delivered:
Office 318; 247 Burger Street; Anton Lembede House; Pietermaritzburg; 3201
Or
Ordinary Mail
Private Bag X9137; Pietermaritzburg; 3200
Or
Email
kehologile.connie@kzndoe.gov.za / Nomangisi.Ngubane@kzndoe.gov.za
Or
Fax
033 392 1203

Appendix 6

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma | Tel: 033 392 1063 | Ref.:2/4/8/1875

Ms SP Mngomezulu
University of KwaZulu-Natal
Durban
4031

Dear Ms Mngomezulu

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"TEACHERS' EXPERIENCES OF USING DIFFERENTIATED CURRICULUM APPROACHES IN TEACHING FRACTIONS IN GRADE 3"**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

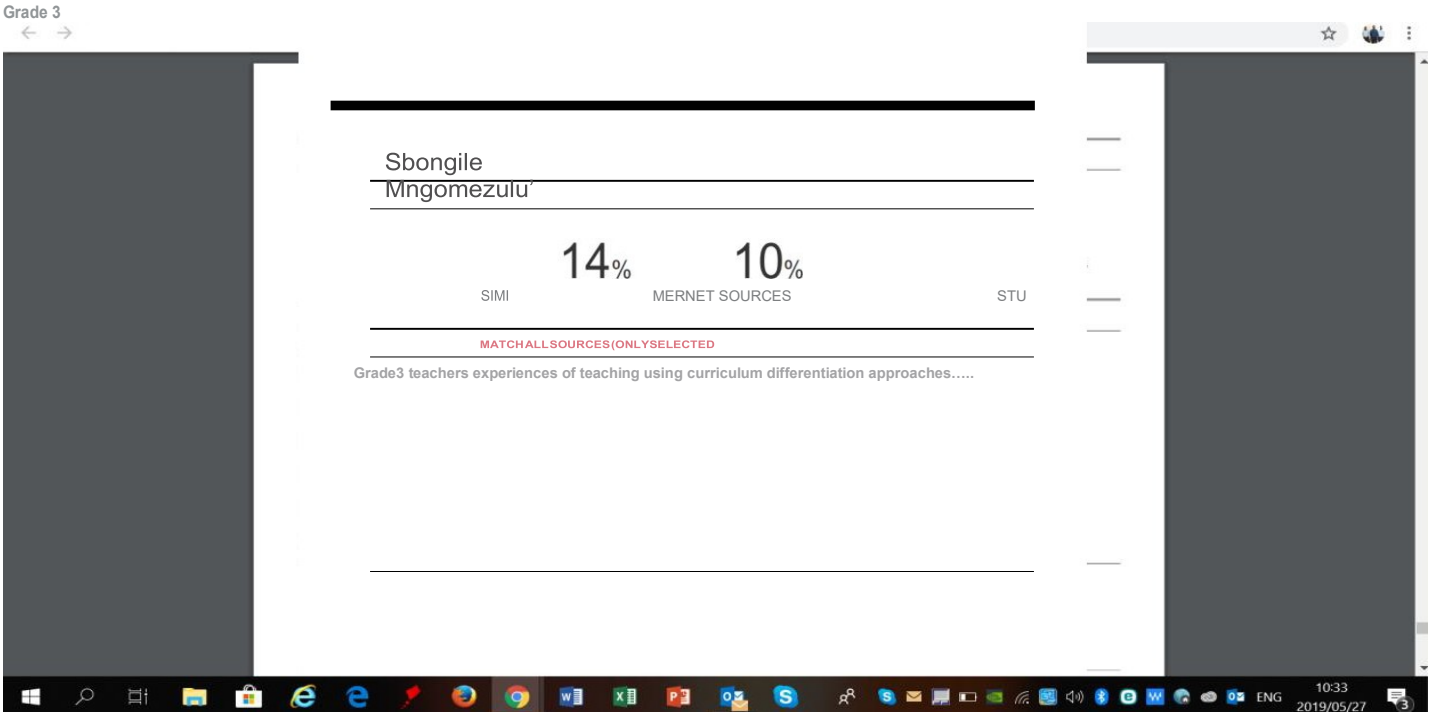
1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 24 July 2019 to 10 January 2022.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

King Cetshwayo District

Dr. EV Nzama
Head of Department: Education
Date: 25 July 2019

Appendix 7

Turn-it-in Report



Appendix 8

Ethical clearance

UNIVERSITY OF KWAZULU-NATAL

16 October 2019

Mrs Sibongile Patricia Mngomezulu
(218086759) School Of Education
Edgewood

Dear Mrs Mngomezulu,

Protocol reference number: HSSREC/00000463/2019
Project title: Teachers' experiences of using differentiated curriculum approaches in teaching fractions in grade 3

Full Approval - Expedited Application

This letter serves to notify you that your application received on 16 August 2019 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted FULL APPROVAL

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This app roval is valid for one year from 16 October 2019.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when the study is finished.

Yours sincerely,

fV **Dr Rosemary Sibanda (Chair)**

/dd

Humanities & Social Sciences
Research Ethics Committee Dr
Rosemary Sibanda (Chair)
UKZN Research Ethics Office Westville Campus, Govan **Mbeki** Building
Postal Address: Private Bag X54001, Durban 4000
Website: http://research.ukzn.ac.za/Research-Ethics/

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