

# **Exploring teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit**

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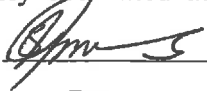
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## DECLARATION

I Sboniso Pius Mngoma, declare that Exploring teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit, is my own thesis and has not been previously submitted at any university. The sources that I used have all been referenced.

Signed:  Date: 16.08.2019

Supervisor: Dr B Mngomezulu

Signature: 

Date: 19/08/19.

## **ACKNOWLEDGEMENT**

I would like to acknowledge my fellow students for their courage, support and guidance towards the completion of my dissertation and the teachers and schools where I collected data. I would like to express my sincere gratitude to my supervisor, Dr Mngomezulu, who guided me through this difficult journey. I consider her my hero.

## **DEDICATION**

I dedicate my dissertation to the creator of heaven and earth for giving me power and strength through this journey. I also dedicate this dissertation to my granny, Zisizile Mngoma, who normally woke me up early the morning during my childhood. She passed away on 01 November 2010 (REST IN PEACE).

**By**

**Sboniso Mngoma**

## ABSTRACT

The study was conducted in Inanda. The participating schools were located in Inanda North which is a semi-rural area North of Durban, close to Umzinyathi and Ntuzuma. These residences have a low socio-economic status. Many learners came from disadvantaged families, with some having teenagers as parents. Most learners' households are solely dependent on the social grant. The children are usually left to be taken care of by the grandmothers and grandfathers. The learners' school attendance is affected by family commitments such as taking care of elderly relatives at home and by religion such as parents or guardians keep children at home during their conference or ceremonies of Shembe Baptist Nazareth.

The schools that this study focused on did not charge school fees, and had between 1300 to 1500 learners' enrolment. The learners had at least one meal a day at the school, courtesy of the feeding scheme in place. The schools were considered by teachers and Mafukuzela Gandhi inspectors as dedicated schools in terms of curriculum coverage, qualified educators, and excelling in extra mural activities such as cultural activities, music and athletics. The schools were also well equipped with resources such as books and computers. This study used a sample consisting of three grade 7 Natural Science teachers from three schools in Mafukuzela Gandhi circuit in KwaZulu-Natal. One participant from each school would represent entire group of Natural Science teachers. This study employed research instruments such as interviews and questionnaires as a method of collecting data. One participant from each school would represent entire group of Natural Science teachers.

The aim of the research is to get teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit. Schools that were selected had different backgrounds that allowed the researcher to compare and give a clear picture of teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit. The diversity was meant to provide different context that would potentially yield different narratives, and add to the understanding of the phenomenon to teachers and department of education. These schools differed in terms of enrolment, provision of Natural Science equipment, and background of the school. The teachers revealed that teaching Natural Science has made them to experience that the content is packed and terminology is hard for learners to master in one-year. Therefore, educators also find it hard to complete the syllabus on time due to internal contextual factors

Like paperwork, extra mural activities and loaded learners in classrooms. Another point is that came through from the research was that some teachers are less confident to teach certain content and practical's due to lack of resources, lack of specialization of subject teacher and lack of knowledge for practical's in grade 7. To sum up, since the inception of education policies being landed to other foreign countries it has created a number of experiences for teachers to adapt in the curriculum implemented and adopted by department of basic education. It must be notable that Outcome Based Education (OBE) phase was implemented as a goal to achieve learning outcomes of learning areas; the previous curriculum was implemented to fix issues arising in the education system like curriculum2005. Thus has resulted not adequate time for teachers to conceptualize these framework of teaching. Nevertheless, education system has encountered radical changes; however, teachers are experiencing several amendments in these curriculums, skills development remained in the previous curriculum programmes. The same skills that were addressed in post 1994 curriculum are still captured in CAPS. For example, lack of science laboratories or resources are still escalating, inexperience Science teachers. Therefore, that why Natural Science teachers are experiencing difficulties in teaching Natural Science in grade seven.

**Key Words:** Contextual Factors, Natural Science Content, Natural Science Teachers Attitude and Practical Work.

## **CONTENTS**

Declaration.....	2
Acknowledgement.....	3
Dedication.....	4
ABSTRACT.....	5-6
LIST OF ABBREVIATIONS .....	14
<b>CHAPTER ONE:</b>	
1.1 Introduction.....	15
1.2 Background of study .....	15
1.2.1 Post 1994 education System .....	15-19
1.3 Problem statement .....	19-20
1.4 Rationale for the study.....	21
1.5 Significant of the study.....	22-23
1.6 Aims / Objectives of the study.....	23
1.6.1 The aim.....	23
1.6.1.1 Objectives of the study .....	23
1.6.1.2 The research questions.....	23
1.7 Purpose of the study.....	23
1.8 Definition of key concepts .....	24-25
1.9 Delimitation of the study .....	25
1.10 Overview of the study .....	26
1.11 Methodology .....	26- 27
1.11.1 Selection of participants.....	27
1.12 Chapter Outline .....	27-28
1.13 Conclusion .....	28

**CHAPTER TWO:**

2.1 Introduction.....	29
2.2 The nature of Natural Science as a subject. ....	29-31
2.2.1 Definition and discussion about teachers’ experiences .....	31
2.3 Pedagogical situations of teaching Natural Science in South Africa .....	31-32
2.3.1 Pedagogical orientations concepts and the teaching of science.....	32
2.3.2 Activities and Assessment.....	33
2.3.3 Activities.....	33
2.3.4 Assessment.....	34
2.3.5 Formative Assessment.....	34-35
2.3.6 Summative Assessment.....	35
2.3.7 Assessment Feedback.....	35-36
2.3.8 Insufficient Resources.....	36-37
2.3.8 Preparation and Support.....	37
2.4 Natural Science teachers’ understanding of content knowledge and practical content.....	37-39
2.5 Natural science in South African environment .....	39
2.6 The teacher reflection of teaching Natural Science in Australia .....	39-40
2.6.1 Cooperative learning .....	40-41
2.7 Teachers’ attitude towards teaching Natural Science and contextual factors in teaching Natural Science. ....	41-44
2.8 Skills and knowledge of practical work in teaching Natural Science. ....	44
2.9 Workshop development though practical, content and teacher’s knowledge .....	44-45
2.10 Natural Science teachers’ experience in teaching Science in South Africa and barriers.....	45-46
2.11 Barriers of Natural Science teachers. ....	46

2.12 Science practical work and content knowledge at township schools in South Africa. .....	46-47
2.13 Subject matter in teaching Natural Science .....	48
2.14 Insufficiency of teachers' pre arrangement of the learning area of Natural Science. ....	48
2.15 Under preparedness of learners for the next level. ....	48
2.16 Insufficient pedagogical support. ....	48-49
2.17 Time Constraints.....	49-50
2.18 Lesson Design for practical activities. ....	50-51
2.19 Practical task assessment in South Africa .....	51
2.20 Challenges of scientific task in South Africa. ....	51-52
2.21 Scientific task assessment in other countries .....	52-53
2.22 Theoretical Framework.....	53
2.22.1 Theory of implementation Zone of Feasible Innovation (ZFI). ....	53-54
2.22.2 Nature of a teacher theory.....	55-56
2.22.3 Self Determination Theory.....	56
2.22.4 Conclusion .....	56-57
 <b>CHAPTER THREE:</b>	
3.1 Introduction. ....	58
3.2 Research Paradigms.....	58
3.2.1 The Positivist.....	55
3.2.2 Critical Theory.....	58
3.2.3 Critical Pedagogy.....	59
3.2.4 Critical Applied Linguistic (CAL).....	60
3.2.5 Postmodernism.....	59-60
3.2.6 Post Structuralism.....	60

3.2.7 Marxist and Neo Marxist.....	60
3.2.8 Pragmatism and Feminism.....	60
3.2.9 Interpretivist Paradigm.....	60-61
3.3 Research Design .....	61
3.3.1 Research Methodology.....	61-62
3.3.2 Case Study.....	62
3.3.3 Strength and weaknesses of using a Case Study.....	62
3.4 Research Approach .....	62
3.4.1 Qualitative Approach .....	63
3.4.2 Qualitative Data Analysis and Types of Qualitative Data.....	63-64
3.4.3 Approaches to qualitative data analysis .....	64
3.4.4 Advantages and Disadvantages of content analysis. ....	64
3.5 Sampling and Method of Data Collection .....	64
3.5.1 Schools Sampling. ....	64-65
3.5.2 Teachers Sampling.....	65
3.5.3 Methods of data collection.....	65
3.5.4 Key steps of analysing data.....	65-66
3.6 Document Analysis.....	66
3.6.1 Semi structured Interview .....	67
3.6.2 Advantages and Disadvantages of Semi Structured Interviews .....	67
3.6.3 Semi structured questionnaire .....	67-68
3.6.4 Advantages and Disadvantages of Questionnaire .....	68
3.6.5 Data Generation Plan table: 01.....	68-69
3.7 Data analysis procedure .....	69-70

3.8 Issue of trustworthiness .....	70
3.8.1 Credibility .....	70-71
3.8.2 Dependability .....	71
3.8.3 Confirmability .....	71
3.8.4 Transferability.....	71-72
3.8.5 Triangulations.....	72
3.9 Ethical Issues.....	72
3.9.1 Permission to conduct research.....	73
3.9.2 Informed Consent.....	73
3.9.3 Confidentiality.....	73
3.10 Limitations of the study.....	73
3.11 Conclusion. ....	74
CHAPTER FOUR-DATA PRESENTATION AND DISCUSSION .....	75
4.1 Introduction .....	75
4.1.1 Demographic characterisation of participants and schools .....	75
4.1.2 Table: 2 Participation across the three selected school.....	76
4.1.3 Table: 3 Demographic characterisation of educators (participants).....	76-77
4.2 Data Presentation and Discussion. ....	77
4.2.1 Research question: 01 .....	77
4.2.2 Table: 4 Natural Science teachers' experiences in teaching NS in grade seven.....	77-79
4.3 Theme: 01 Necessary competence for teaching Natural Science. ....	79
4.3.1 Subtheme: 01 Understanding content knowledge. ....	79
4.3.2 Subtheme: 02 Teachers' understanding of learners. ....	80-81
4.4 Theme: 02 Challenges experienced by teachers when teaching Natural Science.....	81

4.4.1 Subtheme: 01 Curriculum coverage .....	81-82
4.4.2 Subtheme: 02 Time constraints .....	82-83
4.4.3 Subtheme: 03 Lack of resources.....	83
4.4.4 Subtheme: 03 Language barriers.....	84
4.5 Theme: 03 Opportunities to improve knowledge of teaching Natural Sciences. ....	85
4.5.1 Subtheme: 01 Usefulness of workshop.....	85
4.5.2 Subtheme: 02 Time frame of development. ....	86
4.6 Data Presentation and Discussion .....	86
4.6.1 Research question 2.....	86
4.6.2 Table: 5 the reasons why grade seven teachers have particular experiences of teaching NS .....	86-89
4.7 Theme: 01 Skills/ knowledge of teaching Natural science. ....	89
4.7.1 Subtheme: 01 Understanding of practical content. ....	89-90
4.7.2 Subtheme: 02 Teacher specialisation. ....	90-91
4.7.2 Subtheme: 03 the amount of grade 7 Natural Science content.....	91
4.8 Theme: 02 Teachers' attitude towards teaching Natural Science .....	92
4.8.1 Subtheme: 02 Negative Attitudes .....	92-93
4.9 Theme: 03 Contextual factors.....	93
4.9.1 Subtheme: 01 internal factor.....	93-94
4.9.2 Subtheme: 02 External factor .....	94
4.9.3 Subtheme: 03 Workshop assistance .....	94-95
4.10 Theme: 04 Professionalism. ....	95
4.10.1 Subtheme: 01 Teaching Approach.....	95-96
4.10.2 Subtheme: 02 Lack of knowledge .....	96-97
5 Conclusion .....	97

## **CHAPTER: 05**

5.1 Introduction .....	98
5.1.1 RESEARCH QUESTION 01 .....	98
5.1.1.1 Demands of teaching Natural Sciences. ....	98-99
5.1.1.2 Challenges experienced when teaching Natural Science. ....	99
5.1.1.3 Opportunities to improve knowledge of teaching Natural Sciences. ....	100
5.2 RESEARCH QUESTION 02 .....	100
5.2.1 Skills and knowledge required in teaching Natural science. ....	100-101
5.2.2 Teachers' attitude towards teaching Natural Science. ....	101
5.2.3 Contextual factors. ....	101
5.2.4 Professionalism. ....	101-102
6. Conclusion. ....	102
7. Recommendations.....	102-103
8. Implications of the study. ....	103
9. Conclusion. ....	103
10. Bibliographies .....	104-118
APPENDIX B .....	119-124
APPENDIX C.....	125-126
APPENDIX D .....	127-133
APPENDIX E.....	134-136

## **LIST OF ABBREVIATION**

C 2005: Curriculum 2005

CAPS: Curriculum and Assessment Policy Statements

NCS: National Curriculum Statement

DoE: Department of Education

NDBET: National Department of Basic Education and Training

RNCS: Revised National Curriculum Statement

NS: Natural Science

PCK: Pedagogical Content Knowledge

SMK: Subject Matter Knowledge

USA: United States of America

SMT: School Management Team

US: United States

HKEAA: Hong Kong Examination and Assessment Authority

TSA: Teachers Assessment Scheme

CE: Certificate of Education

SPA: Science Practical Assessment

ZFI: Zone of Feasible Innovation

ZPD: Zone of Proximal Development

SDT: Self Determination Theory

## **CHAPTER ONE: BACKGROUND OF THE STUDY**

## **1.1 Introduction**

The process of schooling and understanding of Natural Science caters for advancing of numerous skills that can be utilised in daily basis, by a group of people or in their place of work. Learners are able to obtain abilities in a situation that underpin their knowledge and place responsibility such as to enlarge knowledge in practical situation and enhance confidence and creativity in real environment Doe (2002).

Natural Science or science in 21st century relies on skills development in schools DoE (2002). Science teachers attempt to assist learners to get and apply skills knowledge. Natural Science schooling and understanding which encourages information and concepts development on the expenses of abilities advances which does not create fairness for the pupils. DoE (2002), states that according to the National Department of Basic Education and Training (NDBET), a knowledge context that is encouraging to educating abilities is a requirement for the attainment thereof. Therefore, the exploration of Natural Science teachers' experiences in teaching Natural science in grade 7 and policies of Natural Science regarding practical task will help decision makers to promote value of teaching natural science learning as anticipated (Mthokwa, 2014).

The contextual for the study is deliberated in Unit 1.2. Unit 1.3 outlines the statement problem, which necessitates the study. The rationale is presented in Unit 1.4. The importance of the study in Unit 1.5. Aims and Objectives are tabled in Unit 1.6, followed by an overview of the study and summary in Unit 1.7.

## **1.2 Background of study**

This unit briefly outlines the background to the study that informs the study. It also considers the Natural Science curriculum content, skills and assessment of 1994 and after 1994 in South Africa.

### **1.2.1 Post 1994 education System**

Subsequently during the inception of 1994, the South African state brought up different educational fluctuations aimed at improving 'societal, justice dedicated by apartheid group' (Bantwini & King-Mckenzie, 2011, p. 5). The national department of education in South Africa introduce Curriculum 2005 (Vermeulen, 2003). This curriculum was meant to be implemented from grade R-12 by year 2005. According to Vermeulen (2003) and DoE (2002), this was intended to promote learners' capability to apply given abilities as a demonstration of active process teaching and learning.

Government fully communicated the intention of science schooling in 21 century and brought up a new curriculum for Natural Science. South Africa intended to lay a science foundation that produced exploratory literate people who would be able to compete countrywide and globally (DoE, 2002; Kotze, 2008). The skills acquired would contribute to economic development of the country due to the strong relationship between science skills and economic growth level (DoE, 2002). South Africa's states objective was to make sure that learners were coached to apply science importantly in a practical framework at early from primary school education (DoE, 2002, 2011; Vermeulen, 2003). The pupils had to be equipped not only to obtain information and principles, however also to understand what they acquire and apply it in life (DoE, 2011; Kotze, 2008).

The South African government intended to eradicate the pre 1994 science education error such as there were lack of resources, unqualified teachers and teachers were not exposing learners in real life situation. It remained important that after 1994 education system removed from acquisition of information skill and values to the expansion of practical work (Hattingh, Aldous, & Rogan, 2007). Scholars argue that before 1994 science education, the emphasis was on pupils understanding content rather than practical skill development (Du Toit, Du Toit, & Reddy, 2008).

The Natural Science subject was brought up to encourage the concepts of scientific literacy .The skills that were expected for grade 7 learners to master were explicit in the Natural Science curriculum. The skills that were envisaged were to make observation, measure and interpret information, handle equipment and record information (DoE, 2002). Three learning outcomes were expected to be practised. These were: doing science like investigation, making connection like applying knowledge in a new context, understanding the uses of science in society and environment; scientific (DoE, 2002). The Department of Education sought to improve curriculum implementation. The first task was to staff develop Natural Science teachers about the new curriculum. To develop school science literacy, South Africa built science centres in the country (Mawanga-Zake, 2009).

Surprisingly, the new curriculum did not produce the intended product (DoE, 2002). The evidence showed that the result for grade 12 learners nationally was constantly low (DoE, 2010b, 2010c). Constantly bad results obviously showed that the Natural Science curriculum experienced serious problems or encounters challenges that needed special attention. Decision and program creators tried to evaluate the curriculum to enhance Natural Science schooling

performance. Thus, Curriculum 2005 was reviewed in 2001 (DoE, 2002). The aim of this program was eradicating deprived pupil performance (Howie, Scherman, & Venter, 2008). The deprived performance ended in complaints regarding its complex terminology (Vermeulen, 2003). The focus of the revised curriculum was on practical skills and knowledge and it was called Revised Curriculum Statement (RNCS) (DoE, 2002).

Nevertheless, the schooling structure that was intended is far away from complete application (Maree & Fraser, 2008). To substantiate the fact that educational expectation is partially completely done, Howie et al. (2008) state that the schooling in South Africa noticed various changes since 1994 as each new minister altered the curriculum while the performance of learners continued. So the curriculum improvements done did not yield desired outcomes.

In 2009, the curriculum again changed under the supervision of the new minister of education. The national education brought up a comprehensive curriculum; the Curriculum and Assessment Policy Statements (CAPS) document in 2010. Nevertheless, this was applied in senior phase with effect from January 2012 (DoE, 2011). The CAPS changed Revised National Curriculum Statement (RNCS) that was normally known as National Curriculum Statement (NCS). Although there are several amendments in this new curriculum, skill development still remains. The same skill that was addressed in post 1994 curricula is still captured in CAPS. Influenced by background, this study is concerned with grade 7 Natural Science teacher's experiences regarding grade 7 NS curriculum.

It seems that a lot of work needs to be done in South Africa. Teachers teaching Natural Science are compromised by various issues that remain unresolved since 1994 teachers experience several amendments but skill development still remains unchanged in Curriculum 2005, RNCS or NCS and then CAPS. The skill that was addressed in post 1994 curriculum is still captured in CAPS. However, the policy stipulates that at the first six skills must have been assessed at a grade appropriate level (DoE, 2011).

Teachers are at a liberty to teach the learners this sophisticated skill at their will. The table below shows the three types of specific aims covered in CAPS (DoE, 2011).

Specific Aim 1	Knowing Natural Science	This involves knowing, understanding and making meaning of sciences in a way they enables learners to make many connections between the ideas and conception their minds. The following thinking (cognitive) skills comprise the range of skills that learners should develop: acquisition of knowledge; understanding, comprehending, making connections between ideas and concepts to make meaning of Natural Science; applying knowledge of Natural Science in a new and unfamiliar situation; analysing, evaluating and synthesising science knowledge, connects and ideas.
Specific Aim 2	Investigating phenomena in Natural Science.	Learners must able to plan and carry out the investigation as well as to solve problems that require some practical ability. The skills relating to doing practical work in Natural Science are: following instructions handling apparatus, making observations, recording information, measuring: interpreting and planning investigations.
Specific Aim 3	Appreciating and understanding the history, importance and applications of Natural Sciences in society.	The skills that are developed in the process of achieving specific aim 3 are cognitive rather than the practical skills Specific Aim 2. These are: understanding the history and relevance of some scientific discoveries; the value and application of Natural Science knowledge in industry with respect to career opportunities and in everyday life and developing language skills, that is, reading writing.

To sum up, Educational system experienced many changes in the curricula in an attempt to improve and address challenges which relate to inequality and lack of quality within the education system which is attributed to the apartheid dispensation. The transition of democracy was quickly accompanied by the introduction of a series of curriculum changes including Curriculum 2005, and most recently the Curriculum and Assessment Policy Statement brings about significant changes in methods of assessments, time that learners have to spend in the classroom from grade R-12 and new teaching approaches. Before the implementation of CAPS,

the Portfolio Committee on Basic Education visited areas such as the Eastern Cape, Limpopo and Mpumalanga to verify their readiness in terms of the implementation of CAPS. The portfolio committee came to the conclusion that overall implementation of Curriculum and Assessment Policy Statements has experienced major challenges (DoE, 2011). Some of these challenges were:

Unrecoverable shortage of subject specialists to support teachers in primary schools during the implementation of CAPS and shortage of Physical Science and Mathematics teachers (DoE, 2011).

The development of this study was influenced by the information provided in this background. The question that kept surfacing was why science performance consistently remained poor despite the efforts of the post-1994 education system to improve curriculum implementation.

### **1.3 Problem statement**

The teaching of Natural Science as a subject in grade 7 in the Mafukuzela Gandhi schools has great challenges regarding to practical skills, content and other matters.

This study explores the experiences of Natural Science teachers in grade 7. Learners experience challenges when required to use science skills, fail to apply science concepts in real life situations. Teachers are constrained by insufficient science resources, insufficient time to incorporate work, and internal and external contextual factors of the classroom environment.

Learners' skills are still far from being developed (Clough & Olson, 2008; Rogan, 2004). Natural Science and Technology is a combined learning area from grade 4-6 (Intermediate Phase). From grade 7 to grade 9 (Senior Phase), Natural science is not a combine learning area but it is a stand-alone or separate subject. I teach Natural Science in grade seven, I encounter a challenge when it comes to the content and practical at grade 7 level. The content is packed and terminology is hard for learners to master it in one-year. The educators find it hard to accomplish the syllabus on time because they have to fill in prior gaps such language barrier, unpacking of concepts in learners and familiarise the learners with the new packed content and its practical's. Some teachers are less confident to teach certain content and practical's because of lack of resources, especially for practical's in grade 7, while grade 4-6 teachers do not have a content and practical's difficulties compared to grade 7 teachers.

Brígido, Borrachero, Bermejo, and Mellado (2013) State that teachers end up omitting a certain chapter that they do not know or depend on text- book for instruction testing and memorization

of science content. In-service primary school teachers' self-confidence, capability and attitude to teaching science is a challenge (Smith, 2014). Educators with little confidence or deprived Natural Science content understanding utilise teaching approaches that evade engaging learners in Natural Science (Nowicki, Sullivan-Watts, Shim, Young, & Pockalny, 2012). Primary school teachers feel insecure when they are teaching science content and most of them feel anxious having to teach practical's, and feel as poorly qualified to teach Natural Science (Brígido et al., 2013). This may affect the result of pupils in Natural Science. Teachers conduct hands-on work assigned not in courageous manner. Fisher (2010), states that teachers have insufficient equipment to carry out all hands-on activities that fulfil utmost subject's matters in primary schools curriculum, and end up improvising equipment to do practical work.

Practical's experiments, in primary schools are still huge challenges for teachers to conduct and this affects the performance of learners.

Nowicki et al. (2012), state that teachers have to engage learners in a pure scientific exploration. In order to instil Natural Science effectively, educators must have full understanding of a subject, not only good science content knowledge, but also knowledge of how to interpret content in proper teaching approaches for particular topics and particular groups of learners (learners have different background , teacher has to fulfil all the needs of learners) (Ramnarain & Schuster, 2014). Furthermore, pedagogical content knowledge (PCK) defines information of teaching materials, how to disseminate the topic matter. For the inquiry learning curricular, PCK has to include grasping of scientific inquiry (Ramnarain & Schuster, 2014) and how to mirror it in science instruction.

Grade seven teachers do not specialise in teaching Natural Science. A teacher teaches all subjects and does not have enough insight and knowledge of a particular subject sometimes. Teachers are forced to teach Natural Science even when they have not specialised in NS. The teacher ends up dependant on textbooks due to the lack of knowledge and support.

#### **1.4 Rationale for the study**

My research is focused on teacher's experiences of teaching Natural Science in grade seven classes in Mafukuzela Gandhi circuit. The researcher will look at understandings of teaching Natural Science in grade seven classes as experienced by teachers in particular selected schools. According to Their and Daviss (2002), state that teachers should teach learners to be

aware of core knowledge, Natural Science concepts and strands to perform things such as explaining, naming and describing material world. In addition, according to Thaanyane (2010), states that teachers are the ones who are concerned with implementing the curriculum. The researcher saw the important need to explore teachers' experiences of teaching Natural Science in three selected schools under Mafukuzela Gandhi circuit. According to Baker, Clay, and Fox (1996), state that a teacher should use core knowledge and Natural Science concepts to talk about science content and developing learners in applying knowledge, interpreting information such as tables and graphs and grouping information that they encounter in their environment such as workplace and community.

Another objective is to understand why grade seven teachers who are teaching Natural sciences are unable to reflect skills that were envisaged in the curriculum. These include: making observation, measuring and interpreting information, handling equipment, and recording information with their learners (DoE, 2002). Another matter to conduct the study is to comprehend why some learners demonstrate deprived performance in Natural Science as a subject. The department of education showed that many schools particularly in grade 12 attain poor results in Natural Science (DoE, 2010c). Grade seven is an exit grade to senior phase that is accountable for building Natural Science groundwork and many grade learners show inability to apply envisaged skill such as understanding of practical work and Natural Science concepts realistically as a policy needed them to do (Mthokwa, 2014). So, in my study, I hope to get real insight into what informs the experience of teachers in teaching Natural science in grade seven.

### **1.5 Significance of the study**

Instilling Science abilities is one technique of ensuring the upcoming commercial growth of the country (Bantwini, 2010). The existent study would play an important part in exploring teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit.

It seeks to comprehend the nature of practical's and Natural Science content experienced by teachers in grade 7. According to Collette and Chiappetta (1994), state that the centre knowledge and concepts of Natural Science will expand knowledge in learners of how material world function. Therefore, the teaching and learning about material world will expose learners that science is dynamic. In addition, Baker at al. (1996). Teachers should infuse in learners the knowledge of Natural Science as a product of practices that apply everywhere. The learners can utilise knowledge and concepts of Natural Science to take into account scientific debates or decision such as the learners can utilise Natural Science concepts and knowledge to desire environment as well as their lives.

Findings of the study and recommendations can be utilised by the school principal, head of department, science teachers and curriculum advisors to address challenges or barriers regard to effective delivery of valuable science education. The findings may promote teachers who experience challenges and difficulties in teaching Natural sciences in grade 7 to overcome problems and obtain confidence as Natural Science teachers (Baker, 1994).

The stakeholders such as policy makers, administrators, community members, local business and teachers may utilise recommendations and findings as a stepping-stone to review the current programme (Mthokwa, 2014). These may speed up teachers who experience some difficulties when teaching Natural Science and to regain confidence in their roles as capacitors of Natural Science. Recommendation and findings may assist as evidence for ability structuring workspaces or other interventions. Furthermore, educational policy indecision makers can utilise the conclusions and approvals of this study when scheduling Natural Science curriculum forms.

According to Mthokwa (2014) there is a shortage of research done in Natural Science teaching in grade seven, primary schools meanwhile few readings emphasis on process abilities in primary schools education. In South Africa studies mostly pay attention to Secondary schools regarding science teaching and learning. Fewer studies focus on primary schools, particularly in grade 7 as an exit grade in primary school. The researchers who are interested to further more their studies may use this study to get more insight in planning for NS curriculum innovation (Mthokwa, 2014). 1.6 Aims / Objectives of the study 1.6.1 the aim exploring teachers' experiences of teaching Natural Science in grade seven classes in Mafukuzela Gandhi circuit.

## **1.6 Objectives/ Aims of the study**

### **1.6.1 The aim**

Exploring teachers' experiences of teaching Natural Science in grade seven classes in Mafukuzela Gandhi circuit.

#### **1.6.1.1 Objective of the study**

- To explore the Natural Science teachers' experiences of teaching natural science in grade seven.
- To understand what informs Natural Sciences teachers in teaching Natural science in grade seven.

#### **1.6.1.2 The research questions**

- What are the teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit?
- How nature of science impacts Natural Science teachers' classroom and practice?

## **1.7 Purpose of the study**

The research reflection could improve instruction and knowledge of Natural Science in grade seven by producing desirable cognitive and productive outcomes. It is reflecting the teachers' experiences of teaching Natural Science on the Nature of Science instruction and learning towards experienced Natural Science teachers. The study would be helpful to teachers to understand and improve the quality of their practice in classroom and also the ways for exploring the structure and promoting change of Natural Science instruction and learning. It could enhance the usefulness of professional development for teachers and learners to enhance their knowledge, understanding, and their classroom practice. According to Jonane (2005), state that working together could improve teaching and learning of Natural Science by generating useful cognitive goal and productive outcomes. This would be helpful in science teachers, learners, administrators and policy makers to know more about what it is to be a teacher of Natural Science.

## **1.8 Definition of key concepts**

a) Qualitative Research is works with meanings and not with plain numbers. Qualitative research can be administered using several of sources like structured, semi structured, observation and questionnaires (Dey, 1993). In addition, qualitative data is wealthy and is

because the researchers normally obtain data through the process of gaining and understanding opinion from participant thorough face to face and unstructured ways (Punch, 2009). That would be realistic about teachers who are teaching Natural Science. I needed to get the in-depth understanding of experiences from teacher.

b) Case study: Empirical inquiry that describes a present issue in a real world context under a situation that is not clear (Yin, 2003). Examine a single entity in three schools to get in depth information from teachers, using interviews, documents and records are some sources of data for a case study, therefore records and documents would help to make themes and transcript (Yin, 2014).

c) Sampling: Portion of a population (Etikan, Musa, & Alkassim, 2016). Three schools were purposively sampled. Each school was situated in township, semi-rural and urban area and sampled schools were under diverse economic status and environment. Participants have selected purposefully, to get people who can readily provide the information because of the qualities they possess.

d) Research method: The world view of a researcher which builds the basic of how research should be conducted (Saunders, Mark, Lewis, Philip, & Thornhill, 2012). In order for me to find what really these teachers experience, semi structured interview and one semi structured questionnaire in each participant should be conducted in different days. Each interview took 20 minutes to 40 minutes with each participant. Conrad and Schober (2008), state that structured interview is a structured ways of asking questions are viewed to lead to responses that can be estimated across participants. Interviewer is supposed to analyse questions exactly as asked to every respondent (Leavy, 2014). I used digital recorder as an important instrument to get information in the form of reply to semi structured interview questions. Therefore, semi structured interviews were organised at a suitable period and day for participants and myself.

e) Literature review: Academic development that underpins the particular topic in order to be skilled scholar and serious operator of investigation information (Hart, 2018). Discussion of literature related to Natural Science teachers' experiences, which resulted from a review of mostly related research, which further help me to identify Natural Science curriculum issues and contradictions in research corpus.

f) Interview: One to one discussion between participant and a researcher (Lewis & Nichols, 2013). According to Opdenakker (2006), state the advantage of face to face interview is that,

it can be recorded but with the permission of interviewees. Using tape recorder has an advantage. It is more accurate than writing down notes and semi-structured interview is a flexible way communication between interviewee and interviewee. Tap recording is time consuming during transcription because one hour of tape recording consumes five to six hours of transcribing.

g) Semi-Structured Questionnaire: Unstructured and flexible order of question that allows a participant to narrate everything (Sreejesh, Mohapatra, & Anusree, 2014). Rowley (2014), states that semi structure or closed questions are fast and easy for respondents and the answers to closed questions are much easy to code and interpret. Open questions are useful or helpful for gathering in depth understandings, and permit participant to utilise own abilities or language and present their individual feelings.

### **1.9 Delimitations of the study**

Although the research seeks to provide valuable information, it leaves out the scientific way of verification because findings cannot be generalised to other context and people (Cohen, Manion & Morrison, 2011).

Schools and Natural Science teachers are from different environments and their commitment and attitudes towards Science are not the same. Teachers have provided valuable information about classroom environment that has inspired the teachers and positively affect their practices. According to Mack (2010), Interpretivist is based on an ontological assumption that is subjective rather than subjective.

The results are more easily affected by personal biases. Teachers may deceive themselves by thinking that the investigation is worth unrestricted. This is because at the end of research process, researchers interpret findings and make recommendations (Riyan, 2015). Interpretivist focuses on understanding of current situation and neglecting to address the issue of empowering individual and societies (Mack, 2010).

### **1.10 Overview of the study**

The research was designed to exploring teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit. Chapters are as follows:

**Chapter 1:** Is an address of preliminary chapter of research. It gives the background of Natural Science of the study. This chapter gives rationale, objectives, significance, and goal of the research and delimitation of the research.

**Chapter 2:** It gives the literature review along with theoretical framework. This chapter provides a summary of the debate with respect to teachers' experiences of teaching Natural Science in grade seven classes in Mafukuzela Gandhi circuit. This chapter will look at teachers' experiences of teaching Natural Science at international and national context.

**Chapter 3:** This chapter gives an explanation of methodology and research design that are used in this research project and interpretive research paradigm using qualitative approach. It also clarifying a case study approach including instruments that have been used. Sample has discussed and issues of proper considerations and limitation of research. **Chapter 4:** Its presents the information gathered investigation and discusses all results accordance with research questions and themes are presented. Descriptions of data gathered from participants are provided. Lastly, the researcher extracts on the data collected using instrument as provide in chapter three. **Chapter 5:** Its summarises the research findings that is being undertaken, and recommendations of the study

### **1.11 Methodology**

In my study, I conducted a qualitative approach to get different perspective from participants and realities about teachers who are teaching Natural Science. I needed to get the in-depth understanding of experiences from teachers; the qualitative approach was relevant to my study. Creswell (2009), states that qualitative research explores and interprets the situation of entities or sets regarding a societal or human difficult.

In addition, the reason why qualitative data is wealthy and is because the researchers normally obtain data through the process of gaining and understanding opinion from participant thorough face to face and unstructured ways (Punch, 2009). I used a case study to examine a single entity in three schools to get in depth information from teachers. McMillan and schumacher (2010), state that a case study caters for multiple sources of data.

In this study, I used purposive sampling which is non-probability. According to Etikan (2016), the benefit of purposive sampling is to get people who are ready to provide the information because of their knowledge or experience. Furthermore, the importance of participant willingness helps to communicate experiences, opinions in a reflective manner. Purposive

sampling helped me to get Natural Science teachers experiences in teaching Natural Science in grade seven under Mafukuzela Gandhi circuit. In this study, I used the interview or questionnaire method of gathering data. According to Sreejesh et al. (2014), interview is an individual conversation between researcher and participant. I used interviews to get a deep understanding of Natural Science teachers' experiences, feelings and beliefs in teaching Natural Science in grade seven.

### **1.11.1 Selection of participants**

This study sample consists of three grade 7 Natural Science teachers from three schools in Mafukuzela Gandhi circuit in KwaZulu Natal. Profile of the schools being selected has different background that allows for views from teachers teaching in diverse context. The three schools are chosen for their diversity. The different contexts provided different narratives which enriched understanding of the phenomenon. The schools differed in terms of enrolment, Natural science resource provision and background of the school. The sample consisted of educators from three schools who taught Natural Science in grade seven (Senior Phase) and had experience of teaching. The participants included qualified educators only. According to Cresswell and Plano Clark (2011), purposeful sampling involves recognising and selecting individuals or groups that are especially knowledgeable or well informed or experienced about the situation of interest. Participants participated in Semi Structured interviews and semi structured questionnaires, one teacher per school will be allowed to participate in a research to represent entire group.

## **1.12 Chapter Outline**

This chapter has pointed out the background of the educational change in South Africa before 1994 schooling scheme and after 1994 schooling scheme. This educational transition demonstrated the aim to renew our education system especially in Natural Science. The current situation in education seems as if nothing has changed since after 1994. Teachers are still struggling to produce real life scientific work due to various contextual factors. The problem statement has pointed out the reason for conducting a study with teachers who are teaching Natural Science in grade seven. Furthermore, the rationale and purpose of the study, as well as the aim and objectives were discussed.

## **1.13 Conclusion**

My study has outlined the background of science education in South Africa post 1994. In problem statement, I provided the intention of my study in grade 7 classes under Mafukuzela Gandhi primary schools. In addition, objectives, research questions and rationale for my study were discussed. The following chapters address the specific focus areas namely; literature review (chapter 2), methodology of research in (chapter 3), results in (chapter 4) and chapter 5 is all about conversation of results. Recommendations and ends are constructed on literature and document analysis (Mthokwa, 2014).

## **CHAPTER TWO**

### **REVIEW OF LITERATURE AND THEORETICAL FRAMEWORK**

#### **2.1 Introduction**

Here in this chapter, I bring a conversation of the body of works on Natural Science practical's, content and the subject itself (Natural Science). This enables the identification of gaps and contradictions in the literature, on the subject.

Firstly, I discuss the nature of, and ideas of various researchers on Natural Science pre-and post- 1994. I discuss the experiences of teachers in terms of challenges, demands of teaching Natural Science, opportunities for assistance from workshop, and teacher specialisation. Secondly, I discuss the views of teachers regarding their experiences in teaching Natural Science in grade 7, the contextual factors that are faced by Natural Science teachers; internal and external, the background of teachers and learners, professionalism and workshop development. Thirdly, I discuss the nature of Natural science as a subject. I also explore the experiences of different researchers connected with practical work, workshop development and Natural Science content as subject. A discussion of lesson design for schooling and learning of Natural Science is also undertaken. I also specify how the education system of different countries understands practical activities, their opportunities for workshop development. I also presented scientific tasks assessment in other countries, challenges of scientific tasks in South Africa and Lesson Design for practical activities. The theoretical framework that support my study is presented and also an overview of the chapter.

## **2.2 The nature of Natural Science as a subject**

The education system in South Africa introduced Natural Science as a learning area post 1994. So, after Curriculum 2005 has left, Natural Science reserved as education policy in South Africa, department of education introduce Curriculum Assessment Policy Statement as an essential document in middle phase and senior phase (DoE, 2011). In fact, Natural Science subject was essential even before C2005 and NCS (DoE, 2002). Even today, it is quiet essential under CAPS (DoE, 2011). This Natural Science subject was called General Science in South Africa until 1999 (Mthokwa, 2014).

According to Millar (2004), Natural Science is knowledge from the natural world where people live in United states (US) defines it is a “method of expressive the ordinary biosphere built on verified descriptions reinforced gathered practical verification” (DoE, 2011, p. 11). In South Africa, Natural Science is regarded as a “logical method of observing for descriptions and linking up the ideas” (DoE, 2011, p. 11). Apparently, South Africa has imported ideas of further nations regarding the curriculum. Natural Science is formed when people, particularly scientists as well as researchers, try to understand the origin of the world over noticing,

organizing and analysis concepts (DoE, 2002) .The analysis action that scientist use when trying to comprehend the natural world goes beyond seeing it as a mere precise of knowledge, as described by National Research Council in US (NRC, 2000).

Once organizing NS schooling and knowledge, it is important to plainly shape the aim of each lesson (Abrahams & Saglam, 2010), take cognisance of development skills in learners, observe and carefully record information. Millar (2004), views the aim as that of assisting learners so that they take initiative to notice real phenomenon and analyse phenomenon in detail themselves so that the phenomenon will be recalled in the upcoming.

According to Doe (2011) the process of schooling and learning Natural Science helps two aims. Firstly, it “makes learners to understand phenomenon of the sphere in technical and shaping pupils to progress with a Natural Science in FET phase and further ” (DoE, 2011, p. 12). Secondly, it helps as a tool to build groundwork through science education and growth of abilities (Kotze, 2008). Bantwini (2010) and Maree, Aldous, Hattingh, Swanepoel and Van Der Linde (2006) partied idea of establishing a Natural Science groundwork. They posit that establishing science groundwork will create well-educated populations able to use knowledge and skills and relate their knowledge nationally and internationally and contribute to South Africa’s in economic development.

Taylor, Jones, Broadwell, and Oppewal (2008), note that science schooling systems through the nation focus on creating well-educated peoples. Rybakova (2008), states that Natural Science and schooling are vital to economic civilisation in the world .It is difficult for a country with little development in science to succeed once there is no science approval (Gvozdeva & Vysotskii, 2006).

In South Africa, the goal of Natural Science is designed into four understanding aspects (DoE, 2011). According to NS policy documents, each knowledge aspects is established continuously through the three years, which the pupil is anticipated to fulfil inside the Senior phase (grade 7 to 9)(DoE, 2011).

**The understanding aspects remain as follows:**

- Life and Living
- Matter and Materials
- Energy and change

- Earth and Beyond.

### **2.2.1 Definition and discussion about teachers' experiences**

According to Kini and Podolsky (2006) Teachers experiences are clearly connected with learner's success improvement during teachers calling while Lankford (2014) state that teachers usefulness raises a superior level when teachers teach in a caring and friendly working situation.

According to Kini and Podolsky (2006) there is difference in educator success at every single step of the schooling calling, so not all inexperienced educator is fewer active and not all skilled educator is extra active. However, policymakers usually expertise strategy for the standard, and then, it is vital to identify that, on ordinary.

However, according to Lankford (2014) State that maximum teachers, knowledge raise success. The profits of schooling knowledge would be greatest appreciated when educators are cautiously nominated and prearranged at the fact of entrance into the education labour force, as well as strongly supervised and thoroughly assessed earlier to getting tenancy. This will ensure that those who enter the professional tier of teaching have met a competency standard from which they can continue to expand their expertise throughout their careers.

### **2.3 Pedagogical situations of teaching Natural Science South Africa**

Ramnarain and Schuster (2014), use the term 'orientations' to express a general model and behaviour of thought pertaining to science teaching and learning. They mention four orientations that express various approaches to science teaching: Activity driven, conceptual change, didactic, and discovery orientation. Hewson (1987) refers to pedagogical orientation as a set of ideas and translations of experience pertaining the teacher and teaching, the nature of science content, and learners and teaching, which the teacher normal uses in making the decision about teaching, both in design and execution.

Ramnarain and Schuster (2014), also argue that orientations express educators' understanding and opinions about the aims and goals for coaching science at a particular grade level. They posit eight teaching Natural Science orientations namely: guide inquiry, project based, discovery, activity driven, conceptual change, didactic, project based and academic rigour inquiry. In all these definitions what is common is that pedagogical orientation supports the classroom practice of teachers and hence, is key to the learning of learners.

### **2.3.1 Pedagogical, Orientations concepts and the Teaching of Science**

To instil science efficiently, educators necessity to ensure not lone worthy content knowledge but also understanding of how to interpret lesson accurate schooling methods for precise themes and certain sets of pupils. Such capability is what Shulman (1987) called pedagogical content knowledge (PCK). PCK embraces understanding of active instructional performance related to precise subject matter areas. For the first-hand inquiry-based syllabi, PCK must hence embrace understanding of systematic inquiry (Lowery & Schultz, 2000) and how to reveal it and exemplary it in science teaching.

Pedagogical has been hypothesized as an element of Pedagogical Content Knowledge (Magnusson, Krajcik, & Borke, 1999) while Grossman (1990) mentions pedagogical as “ideas resolving for teaching science content” (p. 5). According to Anderson and Smith (1987) utilised the concept ‘orientations’ to define teachers’ “overall designs of thought and performance connected to science schooling and knowledge” (p. 99). Anderson and Smith (1987) recognised four orientations that define diverse methods to science schooling: (1) activity driven, (2) didactic, (3) discovery and (4) conceptual change. Hewson (1987) refer to pedagogical as ‘notions of science schooling’, or Set of thoughts, considerations, and clarifications of experience regarding the teacher and schooling, the environment of content of science and the learners and scholarship which the teacher utilise in creating conclusions about schooling, both in preparation and implementation. (p. 194).

Bybee (1993) emphasises the essential part of the teacher in syllabus application, keeping that if teachers’ performance does not signify the syllabus improvements, the whole procedure of syllabus change fades and ultimately fails. The burden of classroom results cascades greatest seriously on the single science teacher. Teachers apprehend learners’ interest in science by giving chances for learners to: explore natural issues over experimental and theoretical investigations (Metz, 2008).

### **2.3.2 Activities and Assessment**

#### **2.3.1 Activities**

According to Kotze (2008), science practical, projects and investigation tasks are completed to develop abilities growth in learners. Likewise, Hume and Coll (2008), reflect the aim being to deliver pupils with the chance to obtain the technical and theoretical understanding essential to perform an investigation in a mode that imitates the real work completed by scientific societies. Furthermore, (Frost (2010)), shows that in UK, hands-on tasks are assumed in three techniques of ordering, namely. Demonstrative hands-on design, projects and investigation clarify actual systematic phenomenon; drills to progress hands-on skills and performance, and finally, inquiry hands-on work and problem solving in command to acquire how to examine and to resolve complications. In South Africa, the hands-on skill which pupils in the middle and senior levels are anticipated to progress and leading over learning Natural Science are obtainable as follows (DoE, 2011)

- Track instructions,
- Control tools or apparatus,
- Make interpretations,
- Record evidence or information
- Measure
- Understand, and plan inquiries or experiments

This list of hands-on skills, project and investigation are visibly defined in CAPS policy document below specific Aim 2: exploration issues in Natural Science, which firmly narrates to undertaking science or hands-on tasks and investigation (DoE, 2011). Though there are several skills scheduled, the policy needs the grade seven pupils to have understood and be evaluated in at slightest the above first six skills yearly (DoE, 2011). The seventh skill, which is strategies inquiries or experiments, is not enforced for the grade seven learners (DoE, 2011).

### **2.3.2 Assessment**

Assessment is an automobile or instrument for the understanding of learning progress (Dreyer, 2007). In this study, hands-on duty assessment is measured as a procedure of gathering

evidence about the progress of systematic abilities in learners (DoE, 2007a). Thus, assessment is strictly connected to the systematic abilities imparted and learned (Van Aswegen & Dreyer, 2007). Thus, assessment must convert an on-going action that makes vital part of Natural Science schooling and learning (DoE, 2007a). Being on-going merely means that hands-on duty assessment is not limited (Dreyer, 2007).

The highest aim of hands-on, project and investigation assessment is guarantee that learners are fit equipped to reveal systematic skills (Clough & Olson, 2008). To reveal systematic skills appropriately, main and primary, strains development of the schooling of science hands-on skill which educators are anticipated to impart and evaluate through the educational year (Van Aswegen & Dreyer, 2007). Upgrading of Natural Science hands-on skills schooling pays greatly to making learners to contribute in the community in which science and technology prioritize an important role (Clough & Olson, 2008). Vitality, assessment assists a teacher to understand the strong point and weak point of the schooling methodologies that they utilise (Cheung & Yip, 2004). Furthermore, assessment helps as a substance for the enhancement of the science syllabus presented in schools (Cheung & yip, 2004). Therefore, it is very essential for Natural Science teachers to advance legal and trustworthy hands-on duty assessment tools capable of revealing evidence about the level of abilities progress (Michael, 2007).

### **2.3.3 Formative Assessment**

Formative assessment of hands-on errands is an action over which a teacher collects evidence about the progress of learners' systematic abilities on an ordered basis (DoE, 2007b). Meaningfully, formative assessment has the budding to expose the achievement of the methodologies utilised and how learners obtain understanding and abilities through the schooling and learning progression (Dreyer, 2007). According to Furtak (2007) support that formative assessment is able of straight improving learning because it arises through hands-on actions. In backing of this, Towndrow (2008) , states that formative assessment caters day-to-day errands whereby pupils conduct tests in backing of formal instruction. Nevertheless, in my considerate , assessment develops formative when the evidence composed through the route is in turn used to adjust the schooling and learning of systematic abilities to encounter the requirements of the learners.

Additionally, formative assessment is separated into two divisions i.e., informal formative and formal formative assessment (DoE, 2007b). Informal formative assessment offers evidence regarding how the pupils comprehend and improve abilities on a day to day basis (DoE, 2007b).

Ordinarily, informal formative assessment arises when the teacher generates a chance for learners to reply problems orally or to reveal capabilities reliably and in a mode that creates evidence accessible instantly (Furtak, 2007). Essentially, formal formative assessment is written down as evidence (DoE, 2007b). Records deliver educators with trustworthy evidence to practise, mainly when defining the capabilities or skills and movement of each pupil per school period (DoE, 2007b). Once more, records assist educators to recognise learning difficulties. Finally, when educators select on the progress or advancement of pupils at the culmination of the year, teachers take performance registers as a fact of reference (DoE, 2007b).

#### **2.3.4 Summative Assessment.**

Commonly, summative assessment is utilised for liability drives (Eubanks, 2009). According to the assessment programme for Natural Science, educators are actual to reason to varied stakeholders, for instance a school supervision team, parents, the Department of Education and to the pupils concerning performance (DoE, 2007a). However, though hands-on errands assessment is concerned, the educators reason to the school supervision group and to the pupils. Mostly, summative assessment is directed to regulate the growth of pupils (DoE, 2007a). Nevertheless, in republics like Hong kong and United Kingdom, school constructed assessment of hands-on work is utilised to complement and balance written inspections (Van Aswegen & Dreyer, 2007). Thus, it is authoritative to manner summative assessment. Normally this kind of duty takes place once an extended period of interval, for instance, through the intermediate of the last school term, or at the culmination of a curriculum nearly annually (DoE, 2007b).

#### **2.3.5 Assessment feedback**

Assessment feedback is evidence established from controlled assessment (Clough & Olson, 2008). Through the year, formative assessment is utilised to produce evidence about pupil enactment and consequences are connected to the blood relation and publics in authority (DoE, 2010a). Assessment outcomes disclose together the educator and pupils' portion of the effort achieved well by pupils and that which still wants additional consideration (Mwanzia & Miano, 2004).

Furthermore, Mwanzia and Miano (2004), clarify that feedback improves actual learning and schooling. The suggestion is that an educator utilises the outcomes and orders the following tuition by method of constructing on what the pupils have grasped while concurrently trying to

near the present understanding and ability gaps (Van Aswegen & Dreyer, 2007). Once more, an educator has the accountability of cooperating feedback to the pupils who are anticipated to utilise the consequences as a reflector to mirror on their enactment (Van Aswegen & Dreyer, 2007). Therefore, feedback on consequences allows pupils to comprehend any cracks that happen amongst the understanding and abilities they have presently learnt and what has remained set for pupils to accomplish. Additionally, pupils should utilise reaction to monitor them when discovering activities suitable to accomplish set aims.

Moreover, the old-fashioned feedback, which is categorised by grades, marks and scores only, is observed as unproductive because other educators, plus other backers or investors in education, unable to work out precisely what abilities pupils still essential to expand by mere arbitrating of the marks or scores (Clymer & William, 2007). Even the pupils themselves might not estimate the abilities which are missing and exactly how to mend the condition by arbitrating statistical figures and closed observations. Openly clarification of what the consequences involve, rather than recording only, is vital.

### **2.3.6 Insufficient Resources.**

In insufficient workplace like classroom, laboratories, libraries and schoolyard can disturb the application of teaching and learning in Natural Science (A. R. Taylor, Jones, Broadwell, & Oppewal, 2008). Availability of research laboratory in schools is vital; libraries help in contributing an extensive series of reading material. The accessibility of resources, capitals and conducive setting for teaching and learning also takes an important part in confirming real operation of the curriculum. Therefore, the deficiency of resources is also one of the issues which disturb the process of teaching and learning in Natural Science. Mdutshane (2006) disputes that the distribution of measurable resources is one of the part that disturb programme change, as it will create a large change for learners in vastly capitalised schools and learners in undercapitalised schools. According to Mohammad (2008), schoolrooms and learners' functioning are the facts at which we can size how real a syllabus is. However, there are numerous resources restrictions in the organization which disturb the real curriculum.

### **2.3.7 Preparation and Support**

According to Wilson (2009), in instructive changes, the notions of the schoolroom teacher, who is the greatest serious influence in the operation of the change, has been disregarded. It is essential that teachers are inspired to uphold active operation of change. However, there is a necessity to comprise teachers in policy creation procedure which is designed at introducing

syllabus reform. The teachers' opinions must be engaged into consideration. The other inadequacy is that education and learning resources are often insufficient for usage by the teacher. Wilson (2009), additionally, state that it is extremely essential to deliver backing to teachers, school management team and parents in order attain real curriculum enactment. According to Mimosa (2014), emphasized that teachers want adequate knowledge and scholastic content of the learning area and teachers also want to contact the syllabus lesson construction in command to assist them as programme implementers create worthy choices concerning their versions and obliging the innovative curriculum.

#### **2.4 Natural Science teachers understanding of content knowledge and practical content.**

Current NS content creates some problems for teachers because teachers still are facing with the problems of unpacking science concepts to learners due to the background of science knowledge that they have. Teachers are failing to develop learners in content understanding (Avraamidou, 2013). According to Capps, Crawford, and Constatas (2012), state that educator's shortage in science contextual. Many are badly prepared to monitor learners in mounting both Natural Science content and practice skills, and they end up passing their misconceptions on to their learners.

However, according to Sadler, Sonnert, Coyle, Cook-Smith, and Miller (2013), state that a teacher with relevant (SMK) subject matter content of a certain concepts can teach more effective than a teacher who lacking subject matter content. Teachers are still struggling yet they have degrees from university. Simultaneously, literature on disregard of science schooling has also been booming (Bantwini, 2010) . For many times the attention has remained on the high school with purposes to confirm better passed degree that will finally roll for science degrees at university education level. Debatably, the organization strived to heal the dripping roof whilst ignoring the failing establishment. This inattention enhances to a surplus of current problems that opposes learners and teachers. Scholars display that in common, South African science teachers are stressed due to insufficient science subject matter knowledge and educational skills and absence of self-confidence (Bantwini 2010). These fights are to a point accredited to the environment of teacher preparation that several teachers obtained education through the apartheid era. Muwanga-Zake (2003), views teacher problems, plus their shortages in practical or everyday skills and theoretical understanding, as being delivered on from teacher to learner. The learner far ahead develops a teacher, thereby disseminating the rotation from one group to the next. He opposes that deprived teacher teaching could also reason for teachers' word for word reliance upon textbook notes and chalkboard teach and their incompetence to

utilise science tools. This is because Smith (2014) states, Natural science teachers in primary school have low confidence, lack competence and hold negative attitudes towards teaching science. So, a teacher may end up avoiding engaging learners in science and avoiding teaching science altogether or not teaching a certain chapters or topics. Teachers also depend on textbook to instruct, evaluate and memorize information due to their lack of confidence. Added backing to primary school science schooling encounters is that the learning area is ordinarily imparted by teachers who did not specialise in it (Bantwini, 2010). These are teachers who were briefly requested to teach as their schools anticipated actions of expert teachers by the Department of Education (Bantwini, 2013). Subsequently, the tutoring department delivers in-service teacher development workshops planned to improve subject matter content knowledge and academic skills. The quantity of workshops development per annum differs reliant on a district aims and capability to provide on their program (Bantwini & Diko, 2011) . However, scholars have revealed that many school districts stressing to backing all the primary school science teachers due to vast quantities that they have to attend. According to Bantwini and King-Mckenzie (2011), some science district officers have confessed to being incapable to deliver sufficient backing to their teachers for several explanations plus absence of human power, monetary, period and other resources. Obviously, these problems need near teamwork among together teachers and district administrators to prosper in their instructions. Additionally, this has allegations for teacher expert development passed by the school districts. In addition Brígido et al. (2013) state that Natural Science teachers in primary schools show a low level of knowledge of science which is an obstacle to its effective. The low level of scientific knowledge (practical work) poses difficulties in carrying through educational changes.

The teachers fail to straight test for thoughtful of exact science concepts, truths and abilities. Sadler et al. (2013), notes that a teacher with little content knowledge spends time telling learners science truths and insufficient time controlling them in constructing information and also holding science ideas closer to those of their learners than scientific knowledge. According to Nowicki et al. (2012), a teacher with additional science contextual ask a lot of questions connecting to cause / effect , in contrast to the teacher with less subject matter knowledge. A teacher teaching areas for which their information is great, ask extra challenging questions and gives learners more chances to speak (Nowicki et al., 2012)

## **2.5 Natural science in South Africa environment**

Throughout the world, studies reveal that despite the focus on inquiry learning approach in Natural Science curricular and teacher preparation, implementation has different across countries. Classroom environments are complex and imbalanced in terms of school resources, curriculum, restrictions placed on individual teacher, pedagogical knowledge, background of learners and teachers, class capacity etc. All these are restrictions in the degree to which pedagogical change manifests (Ramnarain & Schuster, 2014). If the teachers cannot stand for curriculum innovations, the whole curriculum process change falters. The burden of classroom decisions and how they associate to curriculum reform falls on the science teacher . It is already well known that teachers teaching in suburb and township schools perform in unequal contexts (Ramnarain & Schuster, 2014).

## **2.6 The teacher reflection of teaching Natural Science in Australia**

Teachers catch children's interest in science by giving them opportunities to: investigate natural issues through experimental and conceptual explorations, asking provoking questions, and engaging in groups to discuss and communicate scientific ideas. To develop these aims in children normally requires that teachers participate in professional learning experiences to strengthen their own knowledge of practical content, enable them to learn the content and practical's appropriate for teaching science, and develop their capability to translate and respond to observations and evaluation results (Gillies & Nichols, 2015). However ,while proficient knowledge activities can end in basic changes in the teachers understanding, opinions, and practices, Lumpe, Czemiak, Haney, and Beltyukova (2012), note that these can be negatively affected by too short duration, scarce funding and resources, lack of application of instruction and ideas from the professional learning workshops to classroom practice (Gillies & Nichols, 2015). .

Gillies and Nichols (2015) state that there is an uncertainty that teaching inquiry in elementary Natural Science classes can create problems for teachers who often struggle to produce sufficient science inquiry experiences, given the restriction of time , crowded curriculum and learners lack of experience with practical learning. Gillies and Boyle (2010), state that knowing how to build small cooperating groups so learners understand that they are doing work together to share ideas, discuss differences, and build new understanding is an additional difficulty that teachers have to deal with when they implement practical learning.

### **2.6.1 Cooperative learning**

According to Gillies and Nichols (2015), cooperative learning is an extensively pedagogical practice that encourages learners engagement and learning, mainly because learners are need to work together to fulfil a common goal or task. When learners cooperate, they learn to listen on what other peers say, share ideas, clear all misconceptions and produce new ideas and understanding in Natural science classrooms. Ford and Forman (2014), argue that learners engage in a process of conversational discourse that enables them to work together in constructing and critiquing various ideas and points of view. Learners begin to communicate how to play roles as a scientific community. By allowing learners to interact with each other, learners also acquire to utilize language in many ways to clarify experiences and realities.

Gillies and Nichols (2015), say when learners are taught to communicate and reason together, and put these skills into practice in their own in Natural Science classes, this provides an opportunity for learners to investigate issues of interest and discuss potential research question collect and analyse the information and communicate and show scientific ideas and information.

According to Crawford (2007), elementary classrooms do not often reflect the aims or practices of practical knowledge construction. This may occur due to primary teachers' insufficient confidence in teaching Natural Science. Many teachers seemingly have difficulty in making classroom environment for inquiry learning, Inquiry learning is deemed as a critical essential to assist learners engage in science, yet teachers are still continuing to fight with what inquiry is supposed to look like and how it is supposed to be done. Gillies and Nichols (2015), identified three elements considered essential in teaching Natural Science in primary schools. First, teachers must evoke learners' imagination by producing new ideas that are already within learners' (zone of proximal development) and associate new knowledge to the environment and structure of present background knowledge. Secondly, the teachers must allow learners to work together to solve problems under a form of discussion, and finally, learners must be involved in continually asking any questions to test their ideas and eventually prove their hypotheses.

Furthermore, progress of inquiry relied on the teacher to pay more attention in engaging learners in the inquiry process. When a teacher stimulates learners' rational and problematic resolving in cooperative learning and make them to participate, the procedure of training and education in inquiry will be successful (Gillies & Nichols, 2015). Harris and Rooks (2010), state that inquiry learning needs teachers to plan platform activities so that learners understand

how to analyse tasks. This requires the procedural knowledge of how to come out, how to work with other learners and how to reflect on their learning.

## **2.7 Teachers' attitude towards teaching Natural Science and contextual factors in teaching Natural Science.**

A natural science teacher may not be enthusiastic to teach natural science as they should teach. Teachers may actually not like even to teach science, find it difficult and boring, sometimes a teacher lack even to remember science from university. Avraamidou (2013), observes that teachers lack trustworthiness to teach natural sciences. Female teachers feel as if science is not for them while males demonstrating lack of trustworthiness (Lowery & Schultz, 2000). Avraamidou (2013), states that teachers also have stereotypical image of females growing up not interested in science. The attitude of a teacher can have an effect on the learner in a classroom that is why I say Natural science teachers teach the science but not really expose the learners to science. Therefore, Pandor (2008) keeps that worthy science and technology teaching is essential for South Africa upcoming modernization and essential to increase as they strengthen commercial developments, enhancement in health organisations, teaching and structure. It emphasises that science and technology are the differentiators among republics that are capable to attack poverty successfully by developing and raising their economies. South African primary school science teaching has for a while been stressed to obtain the due care presently liked by the high-school level. Bantwini and Diko (2011) disclose that the middle-phase (4-7 grades) Natural science teachers conveyed certain concern about the inattention of middle phase level by the district officials, in such a way that grade 4-7 were not noticeable as a an exit phase in the education structure. This inattention has produced hindrance for numerous teachers who are stressed to device the new syllabus alterations in their schoolrooms. Avraamidou (2013), states that science teachers interpret experiences through their existing information and opinions about learning, coaching and subject matter.

A researcher states that most countries such as North America, Europeans countries people were not specialising with teaching, they were in other faculties like journalism, Tourism etc., that the reason why teachers are not confident in science content knowledge but even the teachers with teaching profession still are not confidence in science due to the background science knowledge they had before (Avraamidou, 2013). In primary school a teacher teaches every subject irrespective of his or her specialisation so this result to teachers' knowledge and attitudes because a teacher must play an important role in teaching a subject matter. In addition,

Avraamidou (2013) states that if teachers are not specialising with their subject, they end up with less knowledge, subject matter and even ability to conduct inquiry learning.

The content that is used in grade seven is too much for learners to master because learners are still struggling with vocabulary while the teachers are struggling to prepare meaningful science content. Nowicki et al. (2012), state that Natural Science teachers are still faced with the difficult demand to expose learners to authentic science processes, vocabulary and concepts while they are not confident in science content. Teachers transmit their misconceptions because there is no accuracy of content between teachers and inquiry learning in grade seven. The teacher ends up teaching science not doing science accurately. Nowicki et al. (2012), state that teachers are also challenged to expose learners to real scientific inquiry (science practical), science teachers end up not preparing learners in developing science content and process skills.

According to Minner, Leavy, and Century (2010) and Nowicki et al. (2012), inquiry learning (science practical) is a structure that assist learners to build vivid abilities in problem resolving and reasoning while at the same time obtaining more information of Natural Science content. If teachers are not well prepared in science content, and schools do not have relevant practical activities, how are they going to teach learners sufficiently in Natural Science.

According to Osborne (2010) and Nowicki et al. (2012), teaching inquiry learning (science practical) in grade seven involves learners in genuine scientific knowledge. Teachers must be prepared to generate practical questions during investigation, problem solving, result analyses, and drawing of conclusions. This is unrealistic because learners are still struggling with scientific vocabulary, and science concepts that are introduced to grade seven learners, while teachers are still struggling to create scientific exploration by evaluating scientific based evidence. They should provide learners with knowledge, make learners to think and synthesise all science skills for effective teaching (Nowicki et al., 2012; Osborne, 2010). So, teachers may see inquiry pedagogy as a challenge and may to embrace hands on practical science pedagogy. Nowicki et al. (2012), also state that teachers with fewer content information takes extra time in teaching their learners science truths and fewer time building knowledge thorough practical content pedagogy.

Teachers end up to teaching to test but not exposing learners to practical situations. Daniel, Crawford, and Capps & Barbara (2013), argue that teachers have limited knowledge about inquiry and poor background about the nature of science. It is clear that teachers just teach

Natural Science as a subject not really to put learners in concrete understanding. Daniel et al. (2013), state that teachers only concentrate on basic abilities rather than practical situations. Daniel et al. (2013) also state that teachers have scarce experience with scientific inquiry learning and the series of actions which must be taken to generate scientific exploration. It tells me that a teacher should plan lessons that assist learners to create and develop full understanding of Natural Science but schools are not in a position to achieve that when it comes to science laboratory and curriculum.

Internal factors and external factors constrain Natural Science teachers to implement inquiry learning and which needs time and financial resources. Capps et al. (2012), state that teacher alone is not capable to provide learners with an accurate knowledge of Natural Science without getting assistance from science equipment, subject advisors and workshop development. Daniel et al. (2013), also argue that external and internal factors such as lack of time (external) and financial constraints (internal) hamper teachers from effecting best strategies. Some schools do not even have the class for science laboratory and science kits due to financial constraints. According to Daniel et al. (2013) workshops can assist teachers in magnifying their knowledge and ideas because even qualified teachers have to be work shopped irrespective of their qualification. Capps and Crawford, (in press) state that in USA schools, qualified teachers assumed that they were conducting and teaching inquiry learning, when they were not. The problem about workshops is that they provide teachers a short period of time to share and gain support and maybe occur once per year. According to Daniel et al. (2013) states that it is not true that all teachers gain knowledge at a short period during the workshop development, some teachers needs enough time to gain about inquiry and Natural Science content matter in a workshop not in a limited time.

### **2.8 Skills and knowledge of practical work in teaching Natural Science.**

According to Nowicki et al. (2012) practical science learners to grow solid abilities in problem resolving and serious thinking while also acquiring Science knowledge. A teacher with high Natural Science knowledge will do more practical activities with his or her learners but a teacher with less science knowledge will do less in practical work. Schools have a shortage of practical work resources to teach learners. In addition, Correia and freire (2016) say sufficient Natural Science subject matter understanding monitors the designing of operative scientific lesson, assist a teacher answer successfully to remarks and queries, and rises a educator's self-assurance and smoothness when foremost conversations. A teacher that engaging in scientific

inquiry promotes the growth of extra suitable understanding of science and practical investigation (Correia & freire, 2016).

However, teachers struggle with what practicals should be like and how they should be taught. According to Correia and freire (2016) primary school teachers perceived inquiry as a constraint, and they are faced with huge shortage of resources. They emphasise products of science, and textbooks dominate. There is shortage of time which leads them to assessment of simple activities that follow instructions from the teacher or a text. Teachers are still learning science and are not preparing learners sufficiently.

### **2.9 Workshop development through practical, content and teacher's knowledge**

According to Smith (2014) if educators enthusiastically involve in application of abilities and acquaintance through their individual learning, identify a solid correlation within the length of professional growth programmes and enhance value in educational practice, teachers may obtain more in science content and in practical work. Workshop opportunity gives teachers a chance to build their content information and to attempt out actions from workshops in their classrooms.

Teachers usually do not have much time to combine information and abilities attained from workshops into their classroom situation (Smith, 2014). Though teachers are graduates, they need more support from department and time to implement their subject's needs (Smith, 2014). Workshops stress on how to teach not what to teach. The workshops should bring positive change in teachers' self-assurance and capability in the schooling of Natural Science and in their attitudes to teach Natural Science (Smith, 2014). In South Africa, workshop development in science teachers is advocated as indispensable (Mthokwa, 2014), and the route to reduce old fashioned preparation of teaching Natural Science is to provide educators with enough understanding of present curriculum content and procedures (Mthokwa, 2014; Van der Valk & DE Jong, 2009). Mthokwa (2014) states that the role of practical activities should be searched to analyse and understand the demands on science teachers.

### **2.10 Natural Science teachers experience in teaching Science in South Africa and barriers.**

In South Africa, hands-on work in Natural Science is recognized and acknowledged as an essential part of schooling and learning of Natural Science concepts (Kibirige, Osodo, & Mgiba, 2014). A practical activity has a leading part in Natural Science teaching. Practical activity is deemed as an essential instrument for teachers to teach nearly experiments design

(Heeralal, 2014). Though scientists observe that hands-on or inquiry effort in Natural Science is vital, educators face problems in conducting practical work (Motlhabane, 2014). Furthermore, schools that are given equipment do not utilize much of it. Some costly equipment and apparatus are stacked and have not ever been utilized, decay in stockrooms and boxes in various schools (Motlhabane, 2014).

At place where the apparatus is accessible, educators say that the school structure does not permit efficient period to organize real-world work, teachers spend time doing paper work (administrative work), and end up working under pressure to ensure curriculum coverage, at the expenditure or cost of conducting realworld work. This weakens current training and learning Natural Science. Teachers are also responsible for marking scripts, collecting mark list and schedules of marks to the department. Normally teachers end up utilize training time to involve in these duties (Motlhabane, 2014).

In addition, Fisher (2010) and Motlhabane (2014) state that time as a hindrance in doing practical work is an unresolved issue, and suggest that those accountable for pulling up syllabus have stumbled in putting extra work than what should be fulfilled or educated by the educator in a space of the year .Furthermore, researchers also argue that conducting practical work is time consuming and teachers have to be convinced that conducting hands-on work enhances learning. According to Motlhabane (2014), the major problem for most primary schools in Africa, mainly in rural areas with no sufficient apparatus titled for Natural Science hands-on work, is that there is no formal equipment needed for teachers to carry out a entire area of hands-on work that covers greatest matters in primary school curriculum. Educators have to prepare or extemporize but due to teachers' inexperience or lack science concepts, teachers end up complaining about practical resources and avoiding practical work (Motlhabane, 2014). Educator inexperience as a hindrance to conducting hands-on work is as a consequences of an absence of confidence according to Fisher (2010); Motlhabane (2014) state that during teacher training most universities do not have a hands-on work element to the primary educator preparation program. Therefore, it means the prospective educator is not wide-open to any hands-on work during educator preparation and therefore, do not fix hands-on work when teachers begin teaching Natural Science in primary schools. The faculty has to involve hands-on work in preparation of primary school Natural Science teachers.

### **2.11 Barriers affecting Natural Science teachers.**

Teachers use less or insufficient period on hands-on work. Most of the educators favour to organize displays, which are very teacher-centred (Motlhabane, 2014). According to Fisher (2010); Motlhabane (2014), teachers have reasons for not conducting hands-on work in their classroom. Firstly, they do not have enough equipment, nor enough time and their classes are big. This is an indication that class capacity and time constraints are problems that make Natural Science teachers experience barrier in doing hands-on work.

Motlhabane (2014) argue that though educators in South Africa think that seminar capacity disturbs value, this is a misconception as international studies disprove this therefore, (SMT) school management team, parents, teachers, education sector and office bearers should get out this misconception and focus on providing quality education to learners. In addition, according to Fisher (2010) and Motlhabane (2014) also argue that it is not a seminar capacity itself that is a hindrance, but inadequate coaching knowledge, strictness and class discipline, organisation and arrangements of activities and noise levels that hinder the teacher from conducting hands-on work .

### **2.12 Science practical work and content knowledge at township schools in South Africa.**

Natural Science inquiry has been deemed a daily curriculum goal in science schools in South Africa and the entire world. Curriculum documents recommend that a teacher has to use strategies that cater for learners in scientific questions, investigations, collecting and analysing data (Crawford, 2014). Similarly, Motshekga (2011) states that CAPS' specific aim is to shape learners in their environment and to supply learners with skills that need investigating collecting and analysing data. But there is problem of disagreement regarding practical work and content knowledge. It leaves many teachers in quandary (Crawford,2014). Black learners are taught by under qualified teachers with less formal science education in town-ships and rural schools with poor resources for practical work. Indians and White learners attend the schools that are in privileged suburbs with better resources. So this is a backlog that disagrees with CAPS policy (Ramnarain, 2015)

In addition, Ramnarain and Schuster (2014) also state that CAPS makes learners aware about environment and supplies learners with investigations to give learners with a chance to develop thinking learning , conducting investigations etc. But in South Africa and in many countries , there is an imbalance in schools because teachers are faced with contextual factors like big class size, inaccessibility to resources, poor competence of teachers , lack of confidence and time constraints (Ramnarain & Schuster, 2014).

Capps et al. (2012), State that those teachers who had restricted experience with practical work tend to identify hands on learning. Although hands on learning is vital because it develops understanding of inquiry teaching (Crawford, 2014) .So learners need a teacher who has a good background in Natural Science and is at a resourced school. Ramnarain (2015) states that inquiry is like constructivist learning where learners build meaning for themselves and teachers plan constructivist activities where learners are actively involved in understanding rather than memorization.

NRC (2012), states that learners are not purely learning about inquiry. It needs both knowledge and skills to carry out planning and data analysis (NRC, 2012). Educators have to be well well-informed in terms of pedagogical subject matter understanding in particular topics (Ramnarain, 2015). Ramnarain (2015) states that teachers at townships schools in South Africa have positive experience of new topics in Natural Science but they show some problems in their content knowledge of new topics. Furthermore, Mthokwa (2014) says teachers in rural area are characterised by chalk and talk teaching method.

According to Kibirige et al. (2014) records for practical work should be kept as evidence. However, teachers are reluctant to keep record of learners regarding practical work. So they do not do that which they have to due to the shortage of laboratory space, insufficient equipment and lack of funds. They complain about their shortage of skills to use laboratory equipment, while others note inadequate time for practical work .A teacher should perform investigation, exercise cooperation and communication with learners and maintain accurate records of scientific analysis etc.(Kibirige et al., 2014).

### **2.13 Subject matter in teaching Natural Science**

According to Ramnarain and Schuster (2014), to instil Natural Science efficiently, educators must have good subject matter understanding and also strategy of how to interpret subject content appropriately in particular topics. That is why a teacher has to comply with CAPS policy documents. DoE (2011) states that CAPS outlines specific aim to shape learners in their environment and to supply learners with skills regarding investigations, collecting and analysing data. If a teacher does not have good background in science regarding content knowledge and science teaching knowledge, the teacher will fail to impart the knowledge. In addition, in a school where there is an absence of laboratory and tools apparatus due to economic constraint, a teacher ends up giving instruction that fits their situations. According

to Ramnarain and Fortus (2013), teachers who are limited in specialist content knowledge are unwilling to implement practical work teaching strategies with their learners. Instead, they end up depending heavily on textbook. Curriculum documents recommend that a teacher has to use strategies that engage learners in scientific questions, investigations, collecting and analysing data etc. (Crawford, 2014).

#### **2.14 Insufficiency of teachers' pre arrangement of the learning area of Natural Science.**

Many teachers in South Africa are in charge for teaching all learning areas in grade seven (9 learning areas per subject) besides any specialisation. Because of being overburdened with many subjects, teachers tend to stick to their preferred subject or topic, to the possible harm others (Kokonyane, 2015). Furthermore, it is helpful to find out whether the Natural Science provided enough time required for prosperous learning in primary school (Kokonyane, 2015).

#### **2.15 Unprepared of learners for the next level.**

Preparedness of learners and the way the Natural Science is taught from grade to grade may create negative or positive control to learners work or performance at the of examinations (Stols, 2013). According to Kokonyane (2015), an everyday complaint by grade seven teachers is that fellow worker who teach lower class from 1-6 are unable to finish the curriculum coverage, which impacts negatively on the performance of learners in grade seven.

#### **2.16 Insufficient pedagogical support.**

Shortage of pedagogical support defines a shortage of skills and restricted understanding of the learning area (Natural science) and chances for learners to engage in classroom activities. It also describes the restricted position of teaching method and passage vision in science, in a way questions asked. Classroom activities done do not provide science to the real situation or build the skills that are required (Kokonyane, 2015).

In US, Doe (2009) addresses the vital role of using resources in doing practical work in teaching and learning. On other side Mthokwa (2014), disagrees that involvement of practical work relies on availability of resources like laboratory equipment. The value of resources is not taken as an essential matter. Hattingh et al. (2007) and Mthokwa (2014) argue that without a supportive intervention, lack of access to resources will produce minimal outcomes. This means though resources are available, if teacher does not have a science background and capability of using resources, the learners will be affected.

Furthermore, a study was conducted in Mpumalanga based on how teachers link practical work in grade seven classes. Most of the schools which participated had resources but the apparatus was not used. Surprisingly the interviewed teachers were complaining about lack of resources. Teachers did not have good background in using the equipment to teach learners although the resources were available. The reason is that sometimes teachers were forced to teach Natural Science even when they had not specialised in university or teacher training. In Eastern Cape, teachers did not bother themselves doing science activities because they were unclear about learning outcomes and ended up saving time on short cutting lessons (Mthokwa, 2014).

So, in South Africa some schools have tried to implement practical activities but were faced with challenges because activities that were done were easy and elementary gave little intellectual challenge in problem solving. South Africa has deemed as a country not only faced by this challenge. According to Mthokwa (2014) state that even Netherlands teachers sometimes use cookbook to teach science practical activities. Learners follow the instruction not to understand and solve problems. Although practical's takes place in some countries, they are deemed fallible ( not accurate) as teachers failing to produce real science coaching (Mthokwa, 2014) yet in another nation state like England , applied activities are deemed to play an important role in science like. Practical's demonstrate high level of performance in science and are guided by positive attitude of teachers regarding science (Mthokwa, 2014).

### **2.17 Time Constraint**

According to Barber, Chapman, Ellis-Sackey, Grainger, and Jones (2011) and Mthokwa (2014), time is a challenge in implementing science activities. A short period of time that is allocated may hamper some activities from happening or activities may take place faster due to time coverage while learners do not get enough time to get practice. For example, due to time constraint, teachers end up not visiting all groups of learners during practical work. Furthermore, pupils resulted being limited from obtaining essential abilities. According to Rybakova (2008), science activities with enough time are better than those which do not have enough time. In Russia learners are given enough to science work activities reaching more than sixteen hours each week in not the same terms (Rybakova, 2008).

### **2.18 Lesson Design for practical activities.**

An applied activity class plan is a structured allowable text which includes all exact abilities that a learner is anticipated to put into practice in a practical context (Mthokwa, 2014). Barber et al. (2011) and Mthokwa (2014) state that lessons plan clarify the target learning output

regarding of practical task. Explanation of the outputs help practical tasks to get intensive attention regarding planning instead of being measured as ‘soft target’ (Barber et al., 2011, p. 27). It remains important for educators to apply their opinions on what educators anticipate the pupils to accomplish (Mthokwa, 2014; Rodrigues, Tavares, Ortega, & De Mattos, 2010). Modern pupils are different from the old pupils born earlier information technology (Can Sahin, 2009; Mthokwa, 2014). Today, learners are digital natives and they spend time using cell phones, videogames and all tools for all digital tools. These tasks provide an advantage to learners in knowing how to utilise scientific skills before they are taught in schools, So, when designing a lesson, it a teacher should take cognisance of the education situation and separable learners into consideration (Can Sahin, 2009; Mthokwa, 2014).

The important factor is a teacher should have a pure understanding about what expected to accomplish (Mthokwa, 2014). In addition, Hume and Coll (2008), the information about how scientific thinking works and what creates the real practical knowledge, and abilities that help an educator to recognize the objective and create a decision about the relevant approaches and procedures needed for completion of the specific purposes (Millar, 2004; Mthokwa, 2014). The Natural Science learning subject matter strains enough set up, or else it could not be easy to produce or accomplish the intended learning outcomes (Liu & Wang, 2010; Mthokwa, 2014).

Taylor et al. (2008) states a worthy attention is a suggestion for the greatest appliance that can be adhered by teachers in order to design for exact skills that teachers need to achieve in teaching learners Mthokwa (2014) argues that teachers plan lesson design that generate ample chances for pupils to be successful.

### **2.19 Practical task assessment in South Africa**

According to Mthokwa (2014) and Mere and Fraser (2008), assessment were done the same way after initiation of Outcome Based Education (OBE) in South Africa. It noticeable that no difference among assessment of logical information and logical growth in pupils. Even pre-1994 education system in South Africa, science practicals were assessed in traditional method of pencil and paper, test and examination. Furthermore, the focus was scientific knowledge mastery instead of ability to produce skills. According to Hattingh et al. (2007), state that teachers anticipated pupils to reveal proof of understanding mastery in a mode of remembering and bringing back scientific ideas during informal, formal assessments and final examination examinations.

The aim of curriculum 2005 was to shift what used to be through what learners could produce regarding scientific skills (Mthokwa, 2014). The emphasis was to shift content mastery to practical abilities in real life contexts. Seemingly, the real life situation is unchanged, even after much effort in amendment from NCS to CAPS (Mthokwa, 2014). The NS policy document stipulates clearly that the teacher is expected to assess and evaluate practical knowledge on daily basis (DoE, 2007b) which means a teacher should stick to the policy document in teaching and learning. NS teachers in South Africa conduct examinations tests which tell us that traditional assessment is still taking pace despite radical curriculum changes (Mthokwa, 2014). Natural Science teachers are using various techniques and various assessments in Natural Science. As (DoE, 2007b) stipulates, teachers should use various relevant techniques to develop skills in learners.

## **2.20 Challenges of scientific tasks in South Africa.**

According to Mthokwa (2014) and Towndrow (2008), in south Africa, the natural science assessment national policy outlines the issues of assessment of knowledge in general not in detail. It clearly says that there is no policy that stipulates clearly how NS teachers should conduct practical tasks and how to assess them. In other countries, there is a guide line policy which is responsible for scientific skill enhancement, hands on activities and vital skills regarding laboratory investigations. Examples are the SPA in (Singapore) and TAS in Hong Kong (Mthokwa, 2014 & Towndrow, 2008). However, in these countries it does not mean that tests and examinations are not vital in practical assessment. Examinations and tests are still important. in the same way assessments and examinations have an essential part after 1994 Natural Science curriculum, that is; C2005, RNCS and CAPS.

This traditional method of tests and examinations assesses the skill that is not used in the actual world. The major test is that the transcribed examinations and applied tasks demonstrate an inability to fulfil all important scientific skills (Mthokwa, 2014). Furthermore, Cheung and Yip (2004) and Mthokwa (2014) argue that the transcribed tasks like applied and examinations are not capable of assessing whether a learner is mastering or using scientific tools in the right manner. For example, a learner cannot observe experiment accurately like to see colour changes or titration etc. Even in Hong Kong, Ireland and Singapore, there is the same problem of teachers who have limited practical activities (Cheung & Yip, 2004; Mthokwa, 2014). In some areas of South Africa, problems are still taking place irrespective though the step setter

plainly address applied task. The syllabus coverage is negatively marked since only a minor designated practical task receives consideration.

The correct way of assessing and evaluating pupils in practical is scoring rubric or checklist (DoE, 2007b). A rubric is mentioned as a recording instrument for qualitative scoring of experiment task (DoE, 2007b). According to Mthokwa (2014) and Dreyer (2007), a rubric acts as a road sign, and enables learners to know the direction of what they already know and it helps learners to evaluate themselves and gain self-confidence. But the question is whether teachers utilize rubrics to develop pupils regularly. A rubric is designed by an educator in collaboration with the learners (Dreyer, 2007). The focus here is the discussion between teachers and learners prior to their administration.

### **2.21 Scientifically task assessment in other country**

In republic of Ireland, the scientist practical task was assessed by written papers through learning certificate examination (Matthews & McKenna, 2005; Mthokwa, 2014). There were several encounters, disappointment to produce the desired outcomes, and many learners were dropping and losing interest in physics and chemistry, and many teachers were repeating practical examinations. Republic of Ireland introduced a study that was based on practical based on chemistry and physics group of teachers. The chemistry group did chemistry activities and physics group developed skill related competences.

The practical assessment was grouped in three categories, namely; practical notebook, understanding of practical procedure, and common applied skills (Matthews & McKenna, 2005; Mthokwa, 2014). To prevent educators from concentrating minimum skills, which were normally reiterated in the examination, to encourage justice and top valuable abilities to pupils, the Republic of Ireland brought up a structure that caters for visiting or outer inspectors. The responsibility of outer inspectors and mediators was to discuss and compare scores of pupils and also the marks of individuals recorded separately (Matthews & McKenna, 2005; Mthokwa, 2014).

The Hong Kong education system is merely the same as the one utilized in Republic of Ireland. The Hong Cong system utilizes the teacher Assessment Scheme (TAS) to assess and evaluate practical skills on daily basis (Cheung & Yip, 2004; Mthokwa, 2014). Same applies in Republic of Ireland where by chemistry educators are accountable for assessing and evaluating growth of abilities on daily basis (Cheung & Yip, 2004; Mthokwa, 2014). This commission recommended that (TSA) needed to be enlarged to cover non-practical assessment.

Singapore utilises the science practical assessment (SPA) which is envisaged as institute based (Mthokwa, 2014; Towndrow, 2008). This approach was made to encourage considerate and more clarity of Natural Science ideas, promote pupils to vigorously contribute in the logical abilities teaching and schooling procedure and also creating probable abilities regards to Science workroom (Mthokwa, 2014; Towndrow, 2008). Pupils are evaluated continuously through applied activities performance. Singapore brought up the SPA scheme after getting that the technique of determining scientific skill of progress in pupils through ‘centralised and outside set , one time practical assessment’, which usually encouraged repetition and memorisation of work and procedure, not producing the anticipated successful outcome (Mthokwa, 2014; Towndrow, 2008, p. 904).

## **2.22 Theoretical Framework**

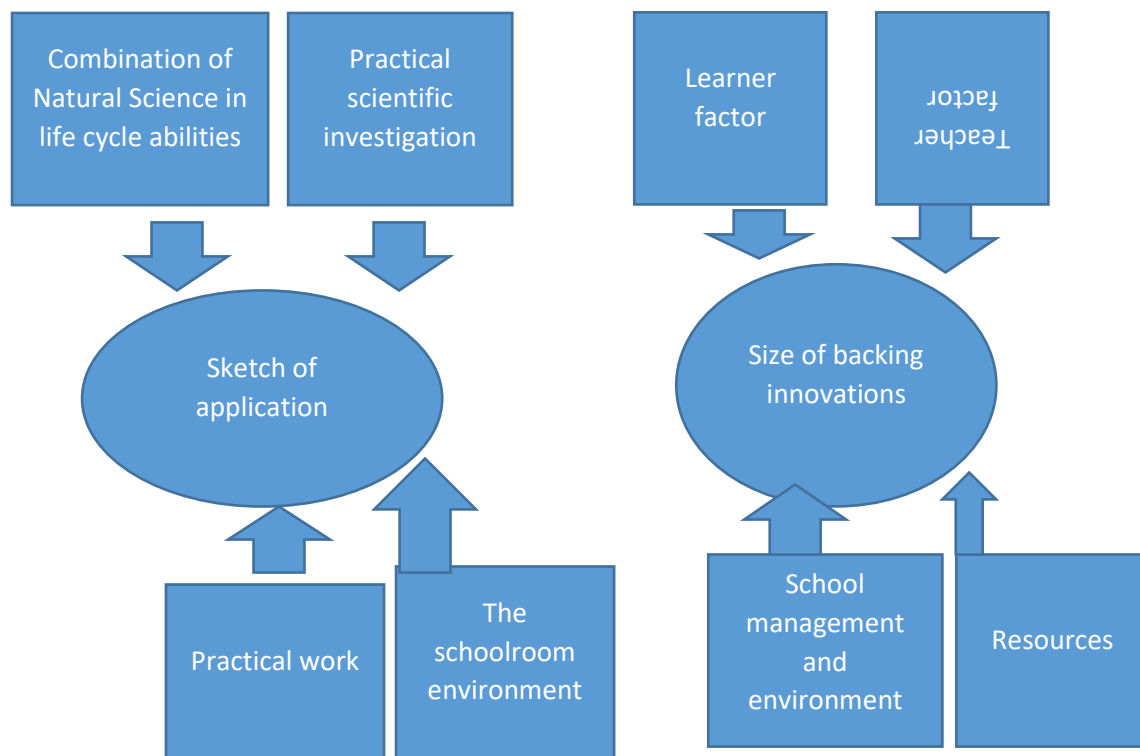
### **2.22.1 Theory of implementation called the Zone of Feasible Innovation (ZFI).**

Educators are anticipated to educate learners Natural Science in a coherent lifetime abilities plan by emphasizing on the practical and problematic resolving approach. That relies on their understanding of the curriculum, which will be guided by how they implement the curriculum (Beni, Stears, & James, 2012). Rogan and Gayson (2003), note that for curriculum alteration to happen, the following must be addressed the need for curriculum change ‘why and issues concerned with the implementation ‘how’. To fulfil this, a concept of application called the zone of feasible innovation (ZFI) has been suggested. This theory is built on Vygotsky’s idea of zone of proximal development (ZPD)(Rogan & Gayson, 2003). The ZFI, is a system of analogical thinking expanse among the range of an educator with influenced to application of an innovative syllabus and what extent of improvement needed by the innovative curriculum. According to the notion of the ZPD, context is a vital aspect in regulating the complications of improvement. While set of courses is deemed as macro level (DoE, 2003), the ZFI is planned to work at micro level. The zone of feasible innovation leaves an imaginary building in analogical thinking, which advocates that improvement ought not to overreach present practice by a huge gap among present performance and the command of the improvement.

According to Rogan and Gayson (2003) state that Natural Science curriculum relies on three major constructs, namely; backing from external agency, capacity to support implementation, and side view of application. The side view of application seeks to understand and understand the step to which the ethics of an establishment of curriculum suggestions is being implemented into exercise .To establish the dimensions to upkeep improvement needs an effort to

comprehend and enlarge on the aspects that are capable to survive or hamper the application of innovative thoughts as a school or institution (Rogan & Gayson, 2003). Not entire schools are capable of performing an agreed improvement in the similar way. The aim of my study is focused on the three major constructs.

A structure for my study established from the principle of application suggested by Rogan and Gayson (2003). Figure: 1



### 2.22.2 Nature of a teacher theory

In my study, I can use the theoretical framework that deals with relationship of teacher knowledge, views and practice. Shulman (1987), states that the nature of a teacher in classroom depends on various matters including subject matter, pedagogical knowledge, the nature of inquiry, as well as the knowledge of learners in a particular classroom. However, a teacher must work correspondingly with reform based approach and also have opinions and beliefs about schooling and knowledge (Crawford, 2007). Teaching Natural Science and inquiry is deemed as craft knowledge. This knowledge increases over time as a result of teacher previous education, continuing schooling and experiences (Van Driel, Verloop1, & De Vos2, 1998) and encloses teacher knowledge and beliefs. A teacher in order to be successful to teach science as an inquiry and Nature of science, a teacher needs certain knowledge and beliefs. For example,

a teacher's ability to involve learners in answering practical questions by using data as evidence and teachers' competence in helping learners to get thoroughly that science is experimental and understanding about learners in classroom.

Natural Science practical abilities, projects and investigation practise a serious part of Natural Science schooling and learning DoE (2011). The literature places of interest that real systematic skills progress in pupils is imaginable on the situation that lesson preparation is engaged care of; and that pupil are completely involved in actions demanding handling of tool or apparatus and improvement problematic resolving in factual life condition (Maree & Fraser, 2008).

Furthermore, demonstration of hands-on tasks strains that adequate time is dedicated to it (Frost, 2010). Furthermore, Frost (2010) argues that the provision of little period of interval for undertaking such hands-on actions may inhibit some actions from doing or may reason actions to occur at a quicker speed whereby it develops challenges for the pupils to obtain adequate practice (Frost, 2010). According to Barber, Chapman, Ellis-Sackey, Grainger, and Jones (2011), teachers opt for time-saving short cuts to learning once they realise that the time to do a particular practical exercise is limited.

The literature discloses that hands-on abilities progress in pupil's strains consistent assessment and rapid positive feedback (DoE, 2007b). To accomplish potential of controlling real application of Natural Science hands-on work, assessment and feedback, teachers must reliably show to capacity construction platforms (Van der Valk & DE Jong, 2009). The matter of capacity construction is revealed in the profile of application which reinforces the study (Rogan & Gayson, 2003).

To sum up, it must be noted that the application of the new programme is not what one may contemplate as an 'all or nothing' (Rogan, 2007). The suggestion is that it is not every interval likely to properly instrument all the modifications or any at all. According to Fullan (1991) practicability of programme application relies on the existence of the following step. The signal is that achievement in hands-on errands application relies on external impacts and also volume innovative.

### **2.22.3 Self Determination**

Theory According to Elise (2014), theoretical framework provides a clarity and direction to the study. In my study I used Self Determination Theory (SDT). The behaviour of teachers plays an important role regarding teaching competence and learners' motivation in Natural Science

education. Self-determination is based in an intrinsic and extrinsic motivation (Ryan & Deci, 2000). Self-determination is deemed as intrinsic (Elise, 2014). Ryan and Deci (2000), state that if a person does something for a pleasure experienced, this explanation was supporting learners who attend Natural science classroom for the fun and interesting for something new developed intrinsic motivated. This model suggests that Natural Science teachers' competence in teaching takes an important role in developing teachers' motivation as well as competence. Reeve (2006), notes that self-determination is a helpful teaching style and a teachers' teaching competence are a vital variable that is supplied to a high quality. This theory stipulates that beliefs, interest and values are adjustable rather than static, and they are strongly determined by what a teacher does and believes in, in the classroom. Learners' beliefs and values about Natural Science have been characterised by previous experiences in Natural Science classrooms. It is expected that learners' future beliefs about learning are hardly determined by their present experience in classroom. The evidence states that quality teaching by competent teachers can reshape learner' goals and beliefs. The motivation theory postulates that what a teacher does in Natural Science classroom is very important and remarkable.

#### **2.22.4 Conclusion**

The body of literature demonstrates that successful systematic development abilities in learners is promising in a situation where lesson design is taken care of and learners have to completely engage in actions that need apparatus, problem resolving in actual life context (Correia & freire, 2016). Additionally, demonstration of practical activities demands adequate time to be committed to it (Barber et al. (2011); Smith, 2014). Mthokwa (2014), observe time as a challenge in implementing science activities. Therefore, short periods of time allocated may hamper some activities from happening or activities may take place faster and learners do not get enough time to get practice. According to Mthokwa (2014), Natural Science implementation relies on outside influences and ability to innovate. The next chapter is research methodology which specifies the methods that were monitored in this study. Methodology describes data collection in the research.

## **CHAPTER THREE**

### **RESEARCH DESIGN AND METHODOLOGY**

#### **3.1 Introduction.**

The issue under study sought an understanding through qualitative study to produce explanatory data. Various tools were utilised in this research including semi-structured interviews and questionnaire because they helped the researcher to gather data and communicate. Therefore, the presentations of the various steps in qualitative approach including interpretivist paradigm in my study will give a summary of field of qualitative research. I administered an explanation of the sample method that were took the place when electing the inquiry site. The data collection presented accordingly for transporting out study, expression of the strengths and weaknesses of research instrument such as interview and questionnaires. I illustrate the procedures when analyse the data followed by trustworthiness

of the study. Lastly, I mentioned ethical consideration and limitation of the study followed by conclusion and summary of the study.

### **3.2 Research Paradigms**

There are ten research paradigms normally used to direct research methods and analysis: The Positivist, Critical theory, Critical Pedagogy, Critical applied linguistics (CAL), Postmodernism, Post structuralism, Marxist and neo Marxist, Pragmatism and Feminism, interpretivist. It is essential to understand these paradigms, their principles and to come up with a principle that suits a study.

#### **3.2.1 The Positivist**

According to Cohen, Manion, and Morrison (2007), state that the positivist paradigm is similarly to systematic paradigm. The aim of exploration in this paradigm is to validate or invalidate a hypothesis. Other features of positivist exploration cater an importance on the systematic method, numerical analysis, and generalizable results. Additionally, positivist exploration ordinarily has a mechanism and scientific group and a pre/test post method.

#### **3.2.2 Critical Theory**

Critical theory created from the criticism that scholastic research was too procedural and anxious with single competence and reasonableness of strategy, disregarding social imbalances and matters of power (Gage, 1989). The critical theorists, investigators ought to be considering for the “governmental and commercial basics of our building of information, syllabus, and schooling.” (Gage, 1989, p. 5). Schools take an open role in this building of information grounded on authority in people. In other words, teaching works the benefits of those who have authority, ordinarily rich white males. Schools purpose to replicate these imbalances and keep the status quo (Gage, 1989).

#### **3.2.3 Critical Pedagogy**

According to Shor (1992), state that critical pedagogy discusses Ways of thinking, reading, writing, and speaking which go under shallow sense, first imitations, main myths, endorsed

pronouncements, traditional clichés, received knowledge, and mere ideas, to comprehend the profound meaning, root sources, social background, dogma, and individual values of any achievement, affair, purpose, procedure, association, involvement, writing, theme matter, programme, mass media, or discourse. In other words, critical pedagogy needs learners to scrutinise their own public over the lenses of authority in order to interpret operational imbalances and demoted groups. The central aim of critical pedagogy is to pull on the powers of learners' existed knowledge to generate a setting for their investigation of the creation around them (Giroux, 1992).

### **3.2.4 Critical applied linguistics (CAL)**

Theorists address essential feature of real English language teaching to culturally and linguistically various schoolrooms. CAL are not only about stimulating main theories and the status quo, but fairly hovering a critical awareness in pupils, to query main cultural, governmental, and community areas (Freire, 1968). Hovering one's critical awareness is the first step required in the transformative progression in which an object lesson and ability is passed and experienced, otherwise known as a "praxis." Praxis clues to social change in the schoolroom and in the cooperative societal level (Stevens, 2009).

### **3.2.5 Postmodernism**

Research concentrated deeply on societies as conversational sites over which workers are created objects of decision-making knowledge. Concentrated governmental communication investigation has spoken both the wide-ranging, micro level speeches of administratively (Deetz, 1992b).

### **3.2.6 Post structuralism**

Post structuralism and post modernism has been mostly profitable, specified the importance of speech and communication to shaping processes ( Taylor, 2005) . According to Ashcraft (2007), states that post structural building legislative identities, rules of information, and power affairs.

### **3.2.7 Marxist and neo Marxist**

According to Alvesson and Willmolt (2002), Marxist considered by a worry with self-government and bias, individually while neo Marxist unbiased critical society studies defy and evaluate commercial work preparations by concentrating on intimidations to human self-

government and the individual and cooperative struggle to such threats in which labours engage. Therefore postmodernism, neo-Marxist, Marxist and critical theory matters of human subjectivity.

### **3.2.8 Pragmatism and Feminism.**

According to Ashcraft (2007), Pragmatism philosophical reproduction arises and ends with knowledge, like other various feminist. Together, knowledge is inseparably individual and communal. According to Charlene (2010) pragmatism and feminism convey out its own specified platform, since feminists are in the front position of philosophers speaking the social and political matters that upset women, and then feminist theory is about women (Charlene, 2010).

### **3.2.9 Interpretivist Paradigm**

Willis (2007, p. 4), Thanh and Thanh (2015) define interpretive paradigm as one that permits researchers to judge the world through perception and experiences of contributors. In looking for the answer for investigation, the investigator who tracks the interpretive paradigm utilise those understandings to construct and clarify his understanding from collected information.

In the following research, I would seek the Natural science teachers' experience of teaching Natural Science in grade seven under Mafukuzela Gandhi circuit and reality of their perspective. Creswell (2007), states that the aim of interpretive paradigm is to get deeper knowledge of the phenomenon not to generalize to the entire population. The advantage of using the interpretivist paradigm in this study is to understand various views from participants and look at problems from different angles. According to Riyan (2015), interpretivist treats people as participants in research not as objects. It tries to get different views from different angles. Interpretive paradigm leads me to use a case study because it allows me to get personal views with the group being studied. I gathered qualitative data through interviews to get interviewees' thought, views and feelings

In addition, Tuli (2010) interpretive paradigm uses a case study to allow a researcher to get individual interaction with a set being planned in command to get deeper understanding. Furthermore, interpretivist has popular methods of gathering data like the interview. Interview allows the expression of candidate's views, moods and perceptions (Wellington & Szczerbinski, 2007). The interpretive paradigm has its power in exploring particular phenomenon and providing deep understanding of information. Cohen, Manion, and Morrison

(2011), demonstrate that it has limitations like findings cannot be generalized to other people or other environments. In addition, Mack (2012) states that it focuses on grasping the current condition and not in an extended broad community.

### **3.3 Research Design**

According to Saunders et al. (2012), research design is how data gathering, analysis, summarisation, and interpretation of results are done in research. This research was a qualitative research. According to Creswell (2012), a qualitative approach is meant to get different perspectives from participants. I needed to get the in-depth realities and experiences of teachers. The qualitative approach is in line with interpretivist paradigm because it is seeking to understand phenomenon. It contrasts with quantitative research, which describes the world in numbers and measures instead of words. In my case I used a case study to examine a single entity (three schools) to get in depth information from teachers teaching Natural Science in grade even

#### **3.3.1 Research Methodology**

According to Mankar (2016), research methodology is a science of examining how the research is to be carried out. I needed to get in-depth of understanding and experiences from teachers. Creswell (2009), states that qualitative research explores and interprets the situation of persons or sets regarding a societal or human difficult. I deeply enquired into get in deepness understanding of teachers' experiences of teaching Natural Science in grade seven (Punch, 2009). In this case, I will use a case study to examine a single entity in three schools to get in depth information from teachers as Leedy and Ormrod (2001) state that case study method is useful because of the convenient enough time accessible. This simply means that as a researcher i would manage to interact with participants and compile data report on teachers' experiences of teaching Natural Science

#### **3.3.2 Case Study**

Case study would lead me to use interview to gather data. According to Bassey (1999) permits a researcher to target on sole incident in depth. In this situation, I was capable to target and obtain enough information completely on Natural Science teachers' experiences in teaching Natural Science in grade seven. Case study evaluated as a reasonable time to conduct a study (Leedy & Ormrod, 2001). This obvious means a researcher has adequate time to contact with participants. I managed to contact participants at their schools combining data as possible, due

to enough time. Case study also permitted me to utilise different data gathering methods. According to Yin (2014), interviews, documents and records are some sources of data for a case study, therefore records and documents would help to make themes and transcript as Bryman (2001) states that transcribe of data reorganize themes.

### **3.3.3 Strengths and weaknesses of using a Case Study**

The option of the research method relies on the research question. The case study is preferred for a research question that deals with questions like how and why. Additionally, case study method provides deeper understanding, explanations and description needed (Yin, 2014). Another advantage of using a case study, according to Zucker (2009), is that it can be used retrospectively and prospectively. According to Bryman and Bell (2011), state the weaknesses of a case research study is a lack of logical procedure and its subjectivity. Furthermore, in depth involvement of researcher in the study may disturb or affect the findings because case study is not easy to generalized findings to other same situation (Leedy & Ormrod, 2001).

## **3.4 Research Approach**

According to Flick (2009), research approach is a creation of new knowledge. The qualitative approach would lead me to obtain the result of emergence that has not yet been answered and obtain the meaningful information in exploring the Natural Science teacher's experiences in teaching Natural Science in grade seven.

### **3.4.1 Qualitative Approach**

According to Hammond and Wellington (2013), qualitative approach deals with information that is not in a countable form and also deals with meaning and relationship between participants. I tried to create logic or to understand problems in positions of meaning from participant by conducting interviews and questionnaires. According to Henderson (2016), state that qualitative research looks at the natural setting, seeking to create understanding or to clarify problem according to meaning participants convey to them.

Therefore, qualitative approach provided me a chance to be closeness and have exact contact with the participants especially in interview. In connection to the interpretivist paradigm, Qualitative research indicates the dynamic aspect of people experiences (Silverman, 2000). To sum up, interpretivist and qualitative approach are considering verbatim and actions.

Interpretivist and qualitative approach gave double advantages in this study: it provides a researcher a chance to connect with a participant and build findings from interview and document analysis. Therefore, listening of word from participants helped me to come up with concrete experiences of Natural Science teachers' in teaching Natural Science in grade seven under Mafukuzela Gandhi circuit.

According to Flick (2014), qualitative research is divided into three, but it depends on research interest. Language oriented approach relies on characteristics of language and communication between participants, Interpretive approach relies on discovering regularities through description of social phenomenon, and theory building approach attempts to get information on social phenomenon. In my research, I utilised Qualitative approach because qualitative approach permits the examiner to target on activities performed.

I used interpretive approach to solicit the experiences of individuals and reality of their perspectives.

### **3.4.2 Qualitative Data Analysis and Types of Qualitative Data Qualitative**

Data analysis is describing issues in detail or comparing various cases on what they have in common (Flick, 2013). I analysed and explained the information over content analysis, and themes and transcription were developed and connected to each other. I would play audio record to ensure the quality of transcript and to ensure that transcript answer the research questions. Thereafter I would read transcript verbatim while listening to audio record to keep the accuracy of the transcript of semi structure interview. Lastly I coded the whole transcript text to get meaning from the data. I dealt with meanings asking such questions as why, what in contrast with numbers. According to Bryman and Bell (2011), qualitative research can be carried out using various sources like group interview, unstructured and observation. I conducted interviews and administered questionnaires to come up with a new knowledge about Natural Science teachers Experiences in teaching Natural Science in grade seven.

### **3.4.3 Approaches to qualitative data analysis**

I used content analysis and triangulation in my study. It helped me to see how issues related each other. Triangulation is the use of data generation from various sources applying several methods (Bryman & Bell, 2011). In conducting this study, I would obtain knowledge that is reliable from the approach. The advantage of triangulation is to expand trustworthy and learning opportunity and disadvantage of triangulation is that the researcher cannot always

relate each other and it needs more effort on the part of the researcher. I designed interviews questionnaires to follow up some of the aspects raised in the semi structure interview so that interview data complimented questionnaires data. According to Franzosi (2007), although content analysis originates from quantitative approach, it can be conducted in qualitative data analysis .It helped me to recognise the importance of understanding the meaning of phenomenon through an item being analysed. According to Treadwell (2014), data can be written or recorded material. Since the qualitative content analysis needs to be written down, I firstly formulated research questions, to reduce data to manageable amounts. Coding of data is preparing and organizing data so it would be usable for data analysis.

#### **3.4.4 Advantages and Disadvantages of content analysis.**

Content analysis' main advantage derives from the point that is rational, replicable technique for minimising a lot of words of a script into minor content sets constructed on clear guidelines of coding. It has good features of being noticeable and being useful in working with large volume of data (Stemler, 2001). Additionally, it is transparent because it can be used for various unstructured information (Bryman & Bell 2011).

#### **3.5 Sampling and Method of Data Generation.**

##### **3.5.1 Schools Sampling.**

Three schools were purposively sampled. Each school was situated in township, semi-rural and urban area and sampled schools were under diverse economic status and environment. I conceded out an appointment of each of three schools to get a permission to conduct research within the school. After I ensured clearly clarified the aims of the research I embarked my research to participants (teachers) without hesitation.

##### **3.5.2 Teachers Sampling.**

Participants have selected purposefully. Etikan (2016) demonstrates that the benefit of purposive specimen is to get people who can readily provide the information because of the qualities they possess. I was able to stick to channel my focus nearly selecting Natural Science teachers in grade seven. The qualifying teacher should have an experience in teaching Natural Science, all teachers from diverse race group; school environment, different teaching qualification and gender were considered as a participant. Furthermore, the importance of participant willingness will help to communicate experiences, opinions in a reflective manner.

Purposive sampling helped me to get Natural Science teachers experiences in teaching Natural Science in grade seven under Mafukuzela Gandhi circuit.

### **3.5.3 Methods of data gathering.**

In this study, as a qualitative researcher, I decided to relate several of exploration procedures and tools to conduct or to collect data (Silverman, 2000). I used the semi structured interview and semi structured questionnaire method for gathering data. According to Sreejesh et al. (2014), interview is an individual conversation between researcher and participant. I chose interview to get deep understanding of Natural Science teachers about their experiences, feeling and beliefs in teaching Natural Science in grade seven. In addition, Gill, Stewart, Treasure, and Chadwick (2008), state that interview provides in depth understanding about beliefs, motivation and feelings of the interviewee. I used various methods of data collection because many methods gave me an opportunity to use triangulation an important technique to detect patterns (Schumacher & Mcmillan, 2006). According to Henderson (2016), interviews are divided into three types. There is structured, semi-structured and unstructured interview. Semi structured is a flexible order of questions, structured is suit the research question no open ended questions while unstructured is narrating whatever is relevant to question. Therefore, i used semi-structured interview to allow a participant to be flexible.

### **3.5.2 Key Steps of Analysing Data**

I used document analysis to presents discussion. Document analysis was the way used in supporting semi structured interview and semi structured interview during data gathering. These methods fairly contributed nearly the findings. The data gathered from documents shown an important role throughout the whole study and presentation of findings presented in chapter four using tables. Data analysis helped me to get deeper understanding of Natural Science teachers' experiences to make judgment of their teaching and to discuss findings, recommend ideas drawn from the study and arrive at appropriate conclusions. Punch (2013), states that data analysis is an interpretation phase where a researcher gets deeper understanding of the research background to make judgment and to sum up appropriate conclusion. I interpreted data by explaining and generating new understanding though qualitative analysis. According to Mayring (2002), non-numeric data are more varied and help the researcher to consider the same information from various perspectives by using various techniques such as content analysis and hermeneutics. Data analysis is an interpretation of information to get new knowledge from different techniques. The data gathered from participants contributed accordingly creating me

aware of or assisting me to comprehend issues of Natural Science Teachers experiences in grade seven.

### **3.6 Document Analysis**

I used semi-structured interview because it is not standardised. I could change the order of questions to suit participants. Edwards and Holland (2013), state that semi-structured interview is personal dialogues among the researcher and a participant, with the intention of attaining participants' views and insights about a certain phenomenon. The interviews were piloted at school through the teachers' spare periods. I utilised a tape recorder to take records. Research data such as audio tape and transcript obtained from the research will be kept safely in supervisors. The participants were advised of the interview and the intended recording prior to the commencement of the interview.

Edwards and Holland (2013), state that tape audio recording and note taking is endorsed and permitted for semi-structured interview, nevertheless, the participants must be informed in advance earlier and grant consent agreement. Gill et al. (2008), state that interviews must be conducted in a place free from distractions and at times and places that are most convenient for participants. The semi structured interview took take 45-60 min per participant; and the length of interview depended on the topic between researcher and participant. However, the interviews lasted 20- 40 min (Gill et al, 2008). During the interview process I was patient with participants to clarify and probe information. Gill et al. (2008), state that clarification and probing are very important.

#### **3.6.1 Semi structured**

Interview I was attracted to conduct semi structured interview and I also attracted to get teachers thoughts and experiences about teaching Natural Science in grade seven (Patton, 1990). In order for me to find what really these teachers experience, I conducted one semi structured interview and one semi structured questionnaire in each participant in different days. Each interview took 20minutes to 40minutes with each participant. Conrad and Schober (2008), state that structured interview is a structured ways of asking questions are viewed to lead to responses that can be estimated across participants. Interviewer is supposed to analyse questions exactly as asked to every respondent (Leavy, 2014). I used digital recorder as an important instrument to get information in the form of reply to semi structured interview

questions. Therefore, semi structured interviews were organised at a suitable period and day for participants and myself. According to Opdenakker (2006) state the advantage of face to face interview that can be recorded but with the permission of interviewees. Using tape recorder has an advantage. It is more accurate than writing down notes and semi-structured interview is a flexible way communication between interviewee and interviewee. Tap recording is time consuming during transcription because one hour of tape recording consumes five to six hours of transcribing.

### **3.6.2 Advantages and Disadvantages of Semi Structured Interviews**

According to Gray (2013), semi structured interviews create progressive connection among examiner and examinee. It is much hands-on and simple. Interviewer and participants are capable to raise concern about anything in detail and deepness. Interviewer is flexible, also allowed to probe any time to resolve issues discussed. It is not reliable because it is hard to replicate firm interview and it's not easy to maintain the validity like the examiner has no actual method of be aware if a participant is or respondent is lying. The interviewer might give prompts that instruct participant to provide responses anticipated by examiner and due to the situation of interview might create results difficulty to simplified.

### **3.6.3 Semi structure questionnaire**

Rowley (2014), states that closed questions are fast and easy for respondents and the answers to closed questions are much easy to code and interpret. Open questions are useful or helpful for gathering in depth understandings, and permit participant to utilised own abilities or language and present their individual feelings. However, open questions are time consuming to complete and interpret. Bryman and Bell (2011), state the benefit of using questionnaires in a research is to get information from big population and information collected produces findings that are more generalizable. In addition, most questionnaires mix open and closed questions. An amount of alternatives from which to select always supports closed questions. Open questions allow participants to produce data or offer comments freely according their preference. Closed questions are not easy to plan because a researcher desires to identify enough about respondent people (Bryman & Bell, 2011). Semi-structured questionnaires are cheaper but the disadvantage of questionnaires is that they should be short and clear because there is no chance to probe like in personal meeting (Phellas, Bloch, & Seale, 2011).

### **3.6.4 Advantages and Disadvantages of Questionnaire**

According to DeFranzo (2014), semi structured questionnaires are open questions used to obtain qualitative information about particular phenomenon. They allow the participant an unlimited several answers and also responses can be used to enlarge on and clarify closed response. Lastly it shows how the respondents act or think about question. Furthermore, disadvantages of semi structured questionnaires normally are that it is time consuming and spent more effort to respond to questions. Participants may find some difficulties in responding due to unfamiliar expression. Some questions might be left unanswered because respondents may find them difficult. Also answered may differ in level of details or scope.

**3.6.5 Data Generation Plan Table: 1**

<b>Data generation Plan.</b>	<b>Research question: 1</b>	<b>Research question: 2</b>
	What are teacher’s experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit?	How nature of science impacts Natural Science teachers’ classroom and practice?
Why data generated was generated?	To explore the Natural Science teachers experience of teaching natural science in grade seven.	To understand what informs Natural Science teachers in teaching Natural Science in grade seven.
What was the data research strategy?	Face to face semi-structured interviews were held and participants also completed semi-structured questionnaire.	Face to face semi-structured interviews were held and participants also completed semi-structured questionnaire.
Who were the sources of data?	For the collection of data, grade seven experienced Natural Science teachers in three schools.	For the collection of data, grade seven experienced Natural Science teachers in three schools.
How many data sources were used?	Three teachers who were teaching Natural Science in grade seven.	Three teachers who were teaching Natural Science in grade seven.

Where was data gathered?	Data was gathered from three different schools under Mafukuzela Gandhi circuit.	Data was gathered from three different schools under Mafukuzela Gandhi circuit.
How long was data gathered?	Interviews took about 50 minutes.	Interviews took about 50 minutes.
What instrument was used for data gathering?	Audio recorded, face to face, semi-structured interviews and semi structured questionnaires. Audio recorded, face to face, semi-structured interviews and semi structured questionnaires.	Audio recorded, face to face, semi-structured interviews and semi structured questionnaires. Audio recorded, face to face, semi-structured interviews and semi structured questionnaires.

### 3.7 Data Analysis

Procedure According to Polit and Beck (2004), data analysis is interpretation of data or information to establish patterns and meaning. After data was collected, I transcribed the audio recording, organised field notes in a narrative format to make easy their sorting and interpretation. Polit and Beck (2004), audio recording and transcribing facilitates the classification and interpretation process. Seers (2011), states that transcripts from an interview are usually routed taking place between the participant and the researcher. I made sure that I kept the recording safe as well as all documents by using a password, in all electronic documents such as laptop to minimise the risk of unauthorised access. Polit and Beck (2004), state that a researcher has to maintain confidentiality and security using password, antivirus software, and safe custody of recording.

In my study I used thematic analysis to interpret data gathered. Sgier (2012), defines thematic analysis as an ordinary kind of qualitative analysis that pursues to recognise designs in information and narrative analysis: a “family” of considers that express fewer (exclusively) at what the data collected say than at what they “do”, and how they build worlds of sense. Once I collected data from participants, I sorted and organised through coding. Paragraphs were organised according to their themes, which helped me to describe data in a way that summarised it. Seers (2011), states that themes are abstract concepts that display interpretation of data and provide the richness of data.

**To sup up my data analysis procedure, I followed the following steps:**

**Step 1:** I played an audio tape recorder while listening then I started to transcribe audio tape to my note book

**Step 2:** I replay audio tape record to keep correspondence with transcribed words so that research question would be answered.

**Step 3:** I coded the whole body of recorded document to get sense from the data gathered. The coding procedure helped me as a researcher to relate information gathered through semi structured interview. According to McMillan and Schumacher (2006), state that information gathered need to be coded to create views of participants (teachers) and to catch meanings or ideas that may contract themes.

### **3.8 Issue of trust worthiness Trustworthiness**

Declaration is essential when piloting research. By the way, investigator is obliged to demonstrate the stepladders engaged to confirm that the study completed is of worthy condition. In this study four criteria have been used, i.e., credibility, dependability, conformability and transferability to confirm that the results existed truthful (Shenton,2004).

#### **3.8.1 Credibility**

Helps a researcher to relate his or her understandings as an investigator and certify the investigation results through the contributors (Polit & Beck, 2012). Credibility can be expressed in many methods, nevertheless, Graneheim and Lundman (2004) state that reliability is focused mostly to examine up whether the data gathered and the process proceed from analysing information are authentic. To keep reliability in my research, I maintained the recorded information gathered harmless for indicating and constantly displayed the information gathered from respondent. In performing this, I suggested adjustments and any add-ons to the transcription from teachers as respondents. Harrison, MacGibbon, and Morton (2001), refers to process as participant glance. Participant glance grants the respondent to comment, omit, recite or improve nearly present information before the information gathered treated as an ending product. To sum up, I constantly took my recorded work and manuscript analysis for auditing back to respondent. I found only remarks that were very important as portion of my investigation study were presented.

#### **3.8.2 Dependability**

Discusses the uniformity of the source above related situations (Polit & Beck, 2012; Tobin & Begley, 2004). This tells a researcher that findings must persist the similar even though various procedures utilised to get the information. To reach this, I used what Shenton (2004:71) refers as ‘corresponding method’. The various procedures assisted each other and connectivity of data yielded showed. Additionally, audit trail has been used as a plan to boost dependability (Merriam, 2002). An inspection trace granted me to label the way in which information collected, how classification was completed and how I reached at the last conclusions. Inspection trace helped a lot to confirm dependability of my study.

### **3.8.3 Conformability**

(Polit and Beck (2012); Tobin and Begley (2004)) state that conformability defines the researchers’ capability to show that source represent participants response not researchers biases. To keep this point, I maintained the raw data gathered through semi structured interview, semi structured questionnaire and document analysis in a safety place. In addition, conformability in qualitative study peaks important elements that the study has been accordingly conceded out adores quality and maintain, not solely from investigator, but widely from other investigators who may be interested to carry out similar study (Vivar, McQueen, Whyte, & Armayor, 2007).

### **3.8.4 Transferability**

Discusses results that can be workable to new sets (Houghton, Casey, Shaw, & Murphy, 2013; Polit & Beck, 2012). Nevertheless, Shenton (2003) disputes that qualitative study conclusions remain exact toward a minor quantity of certain situations and individual instead of common ones. From the above arguments, I did not transfer or generalise the study results to a new environment, I tried to present a pure and heavy explanation of exploring Natural Science teachers’ experiences in teaching Natural Science in grade seven in Mafukuzela Gandhi circuit in three schools that contributed in this research. I was doing this to deliver the researcher a chance to get full understanding of information gathered, which would frame it cool for them to correlate the results with what they have experienced (Shenton,2003).

### **3.8.5 Triangulations**

According to Polit and Beck (2012), triangulation is the use of several parts of data gathering or data sources. I utilised semi structured interview and semi structured questionnaires to develop more understanding of the study focus. Patton (1999), states that data collection in a

qualitative study is to develop understanding of all aspect of phenomenon. Furthermore, the data gathered were transcribed, document analysed, classified, compare, coded to confirm triangulation. Patton (1990), also states that triangulation has been deemed a qualitative research plan to test validity through the gathering of information from different sources. Denzin (1978), also stated those triangulations used in qualitative studies include interview, observation, and questionnaire and field notes. To sum up, I related the information gathered from the different information sources, different environment and procedures to discover out if same designs repeated (Cresswell, 2005).

### **3.9 Ethical Issues**

McMillan and schumacher (2010), state that respondents need to be secured. Admission to respondents' characteristics, replies, behaviour and other information was limited to the researcher. In my study, I would not harm any participant and not force participants to participate. Participant could withdraw at any time. All ethical issues have to be followed like this: Your privacy is assured, participant effort is not allowed be credited in an individual, but informed solitary as a populace affiliate view. The interview would approximate take 1 hour and could be divided relying on preference. Any data provided by respondent would not be utilised against them. Data gathered would be utilised for aims of this investigation only. Information would be kept in safe storage and demolished next 5 years. Respondent had an option to join, or not to join or discontinue joining in the investigation. Participants would not be reprimanded for taking decision in any such action. The researcher aimed at founding the experiences and challenges of Natural Science teachers in teaching Natural Sciences. Participant involvement was purely for educational purposes only, and there were no commercial benefits engaged. If a participant was enthusiastic to be interviewed or recorded, they had to give written consent.

#### **3.9.1 Permission to conduct research**

Authorization of conducting an investigation was sought out from the proper commission of the Faculty of Education at the University of KwaZulu Natal and schools leaders to make investigation study in the chosen schools before to the initiation of information gathering (see appendix B). After I have received an approval credential from university of KwaZulu Natal, I initiated with information gathering in February and March 2018.

#### **3.9.2 Informed Consent**

I tried by all means to adhere with entirely proper and legal needs that were enforced for my research study. I admit entire information directing the whole investigation process. I updated the respondents in words and in writing that their involvement in this investigation was on freely basis and there will be no remuneration. I made entire participants to be alert of his or her legal right to pull out at any interval if participants request to do so. Nevertheless, if respondent decided to discontinue, there would be no fine. In addition, respondents were alert of the purpose of the study, together with an entire detail explanation of how information gathering would reveal and how digital recorder would work. I made all participants to beware of transcripts and final research would be available.

### **3.9.3 Confidentiality**

I specified clearly to the respondents that the privacy would be constantly maintained through the progression. This referred to maintaining the data about their name as well as the schools private. I was very friendly with the respondents in order to energise extreme involvement and what suitable information that they can offer.

### **3.10 Limitation of the study**

The research was firmly restricted to educators who had an experience teaching Natural Science to grade seven classes, particularly at free schools within Mafukuzela Gandhi circuit, nevertheless, respondents from diverse places, gender and race were not segregated. Teachers could be limited in the study due to their mental discomfort of the schools. Length of time during the data gathering, replication of researchers who coming at school for different studies. Confidentiality and privacy of teachers could hinder data gathering in particular schools and also the radical changes of curriculum, poor workshops, and teacher is end up on demotivated to participate in any curriculum matters. Lack of English fluency could affect the responses as teachers had diverse academic preparation.

### **3.11 Conclusion**

To sum up my section, the correct procedure and research design to this investigation helps a researcher to conduct the study. The interpretive paradigm was used to secure the truth. To show this authenticity, I decided to use qualitative approach and interpretive because both include considerate word understanding and action. I used a case study in my research because case study provides an investigator to stick on particular episode in deepness (Bassey, 1999). Appropriate specimen methods were succeeding when choosing the respondent for research.

Lastly, I made clear in detail the information gathering procedures and instrument, information analysis, and proper consideration in my research. .

## **CHAPTER FOUR**

### **DATA PRESENTATION AND DISCUSSION**

#### **4.1 Introduction**

This is a data presentation chapter of my study. The results were produced from a sample of three grade 7 Natural Science teachers from three schools in Mafukuzela Gandhi circuit in KwaZulu Natal. The schools selected had different backgrounds that allowed me to compare

what teaching of Natural Science was in these schools. The aim of the research was to explore Natural Science teachers' experiences in teaching Natural Science. The nature of the study conducted is qualitative approach and a case study was used. The procedures utilised for gathering information were semi-structured interview and semi-structured questionnaire. Literature was reviewed to inform grade 7 Natural Science teachers' experiences in teaching Natural Science. The sources contributed insight about Natural Science teachers' experiences in teaching Natural Science in grade seven, inadequate time allocated for teaching Natural Science in grade seven, lack of resources, internal and external factors, and also the demand of teaching Natural Science, workshop assistance, and Natural Science teachers specialization.

The purpose of the study was to explore teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit.

**The following research questions were raised and they formed the themes and sub-themes of data analysis.**

- What are the teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit?
- How nature of science impacts Natural Science teachers' classroom and practice?

#### **4.1.2 Demographic characterisation of participant and schools Schools:**

**Schools** had sufficient classrooms and toilet amenities. The schools were captivated such as electricity, well fenced with paved entrance and. They had running water and security guards at the gate. These three schools were in township, semi-rural area and semi urban area. Their enrolment was not the same.

#### **4.1.3 Table: 2 Participants across the three selected school Participants**

<b>Participate</b>	<b>School A</b>	<b>School B</b>	<b>School C</b>	<b>Total</b>
<b>Teachers</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>

**Participant (P1)** was a male teacher. Participant (P1) was very flexible, friendly, and respectable and an experienced teacher in Natural Science. He taught Maths and Science in high schools for 5 years after which he shifted from high school to primary school. He taught primary school for 10 years in teaching Maths and Natural Science in grade seven permanently

teacher. He was an energetic teacher who loved learners, brilliant and well known in the school. He was 40 years and qualified teacher with some several teaching qualification.

**Participant (P2)** was a female teacher attended several workshops like Toyota Teach, and she was a permanent teacher. She was an old but, well dedicated teacher noticeable by school principal and HOD. She taught in primary schools for 13 years teaching English and Natural Science in grade seven. She was a qualified teacher with a Bachelor’s degree and honours and was a permanent teacher. She was 38 years old, energetic, loved learners and she assist other new teachers in technology in grade seven.

**Participant (P3)** was a female teacher with 30 years’ experience in teaching. She was a dedicated teacher teaching Natural science in grade seven for 5 years. She had energetic teacher and well known in a school with an age of 55 years. She is a qualified teacher with senior primary Diploma, BA degree and B.Ed. honours.

**4.1.3 Table: 3 Demographic characterisation of educators (participant). A= African**

Participate	Age Range	Nationality	Race	Gender	Qualification	Employment Status	Years Of teaching natural science	Teaching Experience
P1	40	SA	A	Male	B.Ed. B.Ed. Hons.	Permanent	10Years	15 Years
P2	38	SA	A	Female	B.Ed. B.Ed. Hon Current: Business Management (UNISA)	Permanent	5Years	13 Years
P3	55	SA	A	Male	BA ,Ed	Permanent	5 years	30 Years

#### **4.2 Data Presentation and Discussion.**

The purpose of the research was to comprehend experiences of Natural Science teacher’s experiences in teaching Natural Science in grade seven. The first aspect of the interview of

teachers from Mafukuzela Gandhi circuit solicited their experiences of teaching Natural Science in grade 7. Table 4 below sums up teachers' experiences of teaching Natural Science in grade seven under the following research question:

#### 4.2.1 Research Question: 01

What are teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit?

**4.2.2 Table: 4 Natural Science teacher's experiences in teaching Natural Science in grade seven**

<b>Focal question</b>	<b>Themes</b>	<b>Subthemes</b>	<b>Issued raised</b>
What are the teachers' experiences of teaching Natural Science in grade seven?	Necessary competences for teaching Natural Science.	Understanding content knowledge	Respondents said that successful teaching of Natural Science requires teachers who have the background knowledge of content, understanding of concepts, and someone with a passion. Understanding of concept and some with passion.
		Understanding Learners	Respondents remarked that a Natural Science teacher should take cognisance that learners are from different environment. Patience is very important, check prior knowledge that they have and move with them to the level that you want them to be and the learners will be interested.
	Challenges experienced when teaching Natural Science.	Curriculum coverage	Participants indicated that teachers experienced hindrances along the line when teaching Natural Science. The department itself provides more work to do regardless of internal factors those teachers are facing with in schools. Office bearer takes their own decisions regardless of view of teachers who are disseminating the curriculum in schools.
<b>Focal Question</b>	<b>Themes</b>	<b>Sub-themes</b>	<b>Issued raised</b>
What are the teachers' experiences of teaching Natural	Challenges experienced when teaching Natural Science.	Time Constraints	Science teachers do not move with their learners efficiently due to the limited time. They are unable to link previous, knowledge, develop their learners because a teacher is responsible of paperwork. Maybe paper work and

Science in grade seven?			content in grade seven should be minimised.
		Lack of Resources	resources Respondents indicated that they are not well equipped. A successful Natural Science teacher needs resources to carry out investigation and practical activities with learners because learners learn easily when they see things. Teachers need science room with equipment, not only the mobile science kit that were donated by particular sponsors. Learners will develop the interest to go in Science room and to carry out investigation and practical.
		Language Barrier	Participants remarked that learners are from different backgrounds and Natural Science in grade seven has more words while learners are still struggling with vocabulary and have to learn Natural Science in foreign language (English).
	Opportunities to improve knowledge of teaching Natural Sciences.	Useful Of workshop	Natural Science teachers would be rich in teaching Natural Science with expertise from department of Education because teachers are from different backgrounds and they need some assistance with teaching .Facilitators should extend more time in workshops. It is very important to work in line with other teachers like to get books, methods of teaching and practical knowledge.
		Time frame of development.	Participants remarked that Natural Science teachers are interested in workshops but workshop end up not being useful because of limited time .The workshops could be more effective if they extend time like week or more to fulfil the needs of teachers

### 4.3 Theme: 01 Necessary competence for teaching Natural Science.

#### 4.3.1 Subtheme: 01 Understanding content knowledge.

Grade seven teachers from Mafukuzela Gandhi circuit indicated their experiences of teaching Natural sciences in grade 7 as demanding. The following teachers commented on the demands of teaching Natural Science as follows:

*Background knowledge also it will help to all you want to achieve in a science lesson because with these two love and patience you will be successful and with good background towards... .. to your subject matter, you will become a successful science teacher P1*

*I think he or she would be not able to teach without the concept. You need to know the concept because science is not like you are teaching language. Yea, there are terms that are expected to the learners, there are the activities that must be done by learners so if you do not understand the concept it will be difficult P2*

The above participants indicated that a successful teacher of Natural Science must have the background content knowledge, understanding of concepts, and passion in teaching science. Love and patience to learners are important as well. Teachers do not only need to have good content knowledge, but also have knowledge of how to unpack topics and content appropriately. Ramnarain and Schuster (2014), state that to teach science efficiently, teachers need to have good content knowledge and knowledge of how to interpret subject matter appropriately in particular topics. That is why a teacher has to comply with CAPS policy documents. Motshekga (2011), states that CAPS outlines specific aims to supply learners with skills that need investigation, collecting and analysing data. Nowicki et al. (2012), state that teachers lack in science background knowledge and may inadequately guide learners in developing both science content and process skills, and they end up passing their misconceptions on to their learners. According to Sadler et al. (2013), teachers with the proper SMK (subject matter knowledge) of a given concept can achieve larger gains with their students than those lacking that SMK; a teacher without knowledge may teach the concept incorrectly, and students may end up with the same incorrect belief as their teachers.

#### **4.3.2 Subtheme 02: Teachers understanding of learners.**

Teachers interviewed indicated that learners are not the same and a teacher must play the crucial role of understanding learners. The following teachers commented regards to understanding of learners in grade seven.

*Ey, have learnt to understand that no., our learners are capable. They are capable. They just need our love, our "isneke" patience. If you can have this love and patience, you can be successful in science P1*

*Eyi, then it becomes ....., there is something that I have learnt while I was studying; called didactic flexibility. Didactic flexibility it said you have to be flexible when you get in the class.*

*If you get in the class then discovered that your learners don't have this knowledge that you think they have, you should be doing pose and rewards. Take them back to where they think they are, then take them where they are now, and move with them where the level you want them to get because there is no use to be there while your learners are somewhere at the back. So you should move with your learners as well. Move with them ...but before you move with them you have to develop the love of them. While you develop the love for them, then they will develop the love of subject. Once they hate you, they will hate the subject as well, then they will fail your subject, but once you start develop the love of loving them then they will give thank you **P1***

*...our learners are not coming from an environment that is privileged that is exposed to reading. I've got a problem as a science teacher. There is new technology, there is too much content for the learners, and at the same time this is not the only subject that they are learning in grade 7. They are doing nine subjects which have got a lot of demand on the side of learners **P3***

The above participants indicated that a Natural Science teacher should take cognisance that learners are from different environments. Patience is very important. Check the prior knowledge that they have and move with them to the level that you want them to be and automatically the learners will be interested in the subject and develop. To pose and rewards means a teacher should include gifted learners and slow learners in a classroom and deals with them according to their needs in teaching and learning. Preparedness of learners and the way the Natural Science is taught from grade to grade may create negative or positive impact on learners' work or performance in the examinations (Stols, 2013). Learners are required to learn nine subjects in grade seven and there is much content for them teachers as well are required to teach all subjects and face the challenge of teaching the content and also literacy.

Furthermore, teachers have problems of new technology that is occupying the space in our schools. They are illiterate regarding technology. Many teachers in South Africa, especially in primary schools, are in charge of teaching all learning areas in grade seven (9 learning areas per grade). So, one can argue that, because of being overburdened with a lot of subjects, teachers tend to stick to their preferred subject or topic, to the possible harm of others (Kokonyane, 2015). It is helpful to find out whether the Natural Science provided enough time as required for successful learning in primary school (Kokonyane, 2015). The content that is used in grade seven is too much for learners to master while the teachers are struggling to

prepare learners with a meaningful science content Nowicki et al. (2012), Also state that natural science teachers are still faced with the challenge of providing learners with authentic science processes developing their science knowledge, vocabulary and concept when the teachers themselves are not confident in science content.

#### **4.4 Theme 02: Challenges experienced by teachers when teaching Natural Science.**

##### **4.4.1 Subtheme 01: Curriculum coverage**

The teachers indicated curriculum coverage as a challenge in teaching Natural Science in grade seven .The teachers revealed some factors that disturbed the process. The following teachers commented on curriculum coverage in grade seven.

*We have to cover the whole curriculum in a space of the year all to find that by fourth term the school has their own activities which we have to go along with. We are teaching grade seven, most of the time you find that grade seven is in the school choir. They need to do some practices in the morning while you still need to have time with them. It becomes a little bit of difficult **P1***

*The curriculum as a whole is changing. The only thing that seems to challenge more is when they change the curriculum and do not consult us. They are there at talk management the strategies what they want to improve to us at school level regardless of what backgrounds are we facing with and type of learners we're dealing with. It makes it so difficult to cover the curriculum because of all changings **P3***

The department provides more work to do regardless of internal factors that teachers are facing within schools because sometimes learners in grade seven are in school choir for practice and there is insufficient time to cover the curriculum in a space of the year. Office bearers are implementing programmes of teaching and learning in their own regardless of classroom situations and different environments of our schools. The department of education should be considerate about coordination challenge between the teaching of the subject and extra mural activities. The department should do more consultation with teachers and learners. Teachers spend time doing paper work (administrative work), and end up working under pressure to ensure curriculum coverage at the expense of doing practical work. This weakens effective teaching and learning in Natural Science. Teachers are also responsible for marking scripts, compiling mark list and schedules of marks to department. Normally teachers end up using teaching time to engage in these duties (Motlhabane, 2014). Fisher (2010) and Motlhabane (2014) state that time as a hindrance in doing practical work and suggests that those responsible

for developing the curriculum have erred in putting more work than what can be fulfilled or taught by the teacher in a calendar year.

#### **4.4.2 Subtheme: 02 Time constraints**

Natural Science Teachers who are teaching Natural Sciences faced with a challenge of time. More work to do with little time.

*..... time is a factor because there is much to do or say but time is less. There is less time .If we can get much time, enough time to spend with learners, explain because we are teaching in a foreign language not in their mother tongue, we are also teaching the concept which they have to understand so somewhere along the line, we need to be able to explain the words so that they will understand. We must try to link it with previous knowledge. Time constraints might have negative impact in curriculum..... time, time that is what I'm worried about because there is so much to do with little time, so little time. P1*

*There is a variety of topics which are confusing to learners even to the educator as such because the time frame to finish that specified work for the term is too limited. So, if work was reduced, some of the topics...or minimize the content, maybe it will be better because our learners have got language fear. It takes time to understand, you need to use a drilling method and it takes time on its own.P3*

The teachers observed that Natural science teachers are failed to accommodate all different learners in classroom and to fulfil their needs efficiently due to limited time. They were unable to link previous knowledge, develop their learners because they had to do paper work as well. Correia and freire (2016), note that shortage of time leads to assessment of learners' or a text. Maybe paper work and content in grade seven should be minimized. Grade seven needed enough time to spend with learners and content should be minimized to accommodate all needs of learners in a classroom. According to Barber et al. (2011) and Mthokwa (2014), time is a challenge in implementing science activities. Due to time constraints teachers end up not visiting all groups of learners during practical work. Learners end up being limited from learning important skills. Rybakova (2008), states that teachers with enough time for science activities did better than those who did not have enough time. In Russia learners are given enough time to do Natural Science work ranging from sixteen to fifty hours per week in different periods and terms (Rybakova, 2008).

#### **4.4.3 Subtheme 03: Lack of resources**

The interviewed teachers in grade seven indicated a challenge of resources in teaching Natural Sciences. The lacks of resources disturb the process of teaching and learning. The following teachers have commented regards to lack of resources as follows:

*The challenges the one that I have said, we need to have science room or laboratory, we need to have enough resources, yae, those are my challenges. P2*

*As one knows science is not a theory subject so it is not easy to carry out practical lessons or activities like making experiments, there is no flow of space. P3*

Successful Natural Science teachers need resources to carry out investigations and practical activities with learners because learners learn easily when they see things. Teachers need science rooms with equipment, not only the mobile science kits donated by particular sponsors. Government does not assist in building science laboratories in schools, and schools end up being sponsored. Capps et al. (2012), says learners will develop interest to go in science rooms and to carry out investigations and practical themselves if the resources are available. In US, DoE (2009), observes the vital role of resources in doing practical work. However, Mthokwa (2014), disagree that involvement of practical work relies on availability of resources like, equipment and laboratories. Hattingh et al. (2007) and Mthokwa (2014), argue that without supportive intervention, access to resources will produce minimal outcomes.

The aim of curriculum 2005 was to shift content mastery to practical abilities in real life context. According to Correia and freire (2016), primary teachers perceive inquiry as being hindered by shortage of resources and teachers' insecure content.

#### **4.4.4 Subtheme 03: Language barriers**

The teachers noted the Language barrier as a challenge in teaching Natural Science in grade seven .The teachers revealed that more technical words are used in grade seven when learners are not good in vocabulary. The following teachers commented on the language barrier in grade seven.

*Language barrier might be difficult one but there are times whereby you say ok, let me become lenient here, let me put little bit Zulu here and there so they may understand the concept. P1*

*Yes, that is the problem. They are not good in English so we have keep on talking in Zulu which is not right and good. They need to understand what you are talking about and you need time because they are not good in vocabulary. P2*

*Yes, it has effect and a negative one. Why do I say so? If our learners don't understand their language, it is likely English will be difficult for them to follow. They will not understand what is expected of them because of the language.***P3**

Learners are from different backgrounds and Natural science in grade seven has more content words learners are still struggling with general English vocabulary. They have to learn Natural science in foreign language (English). Teachers sometimes end up code switching in Zulu because learners learn easily through their native language. Osborne (2010) and Nowicki et al. (2012) state that teaching inquiry learning (science practical ) in grade seven is a difficult task because teachers has to use inquiry pedagogy and involve learners in genuine scientific, teachers must be prepared to generate practical questions such as investigation, problem solving , result analyses and draw conclusion. Learners are still struggling with vocabulary and science concept that are introduced to grade seven learners and more content while teachers are still struggling to create scientific exploration and evaluating scientific based evidence to equip learners with knowledge, make them think and synthesize all science skills for effective teaching (Nowicki et al., 2012; Osborne, 2010).

#### **4.5 Theme 03: Opportunities to improve knowledge of teaching Natural Sciences.**

##### **4.5.1 Subtheme 01: Useful of workshop**

The teachers noted that the workshop had an important role to revive their knowledge in teaching Natural Science in grade seven. The following teachers commented regarding workshops in grade seven.

*Workshops do help us to revive our knowledge because you get some understanding and some networks with other schools and also the methods that they are using, and methods that are used when they are preparing lesson planning, like how to do some practical's and you mix some different people in workshop. You tend to network while you network you mix from others so they are saying two hands are better than work. So, your idea, you share your ideas, give*

*them your idea and then you get their ideas when you bring their ideas it's prove your teaching skills P1*

*Yes, workshops are assisting us a lot. There are no coordinators. There are what you call facilitators, they pass a lot sometimes if you don't have the resource if they do have, they can take you through to it, use this if don't have this you may use this .. P2*

*You get a lot of expertise you also invite them to come and do some demonstrations so you learn a lot from them but I'm not denying the fact that the department of basic education has got some provisions because they do have some district workshops where we attend and we also gain some information, but one cannot rely on one source. We need to engage in a variety of sources so that you become rich in the subject that you are teaching. P3*

Natural Science teachers would be rich in teaching Natural Science with expertise from department of education because teachers are from different backgrounds and need some assistance in teaching. It is very important to work in line with other teachers, to understand the lesson plan used by teachers, method of teaching and their practical knowledge. The resourceful workshops would bring a positive change in teachers' confidence and competence in the teaching of science, as well as their attitudes to teaching science (Smith, 2014). In South Africa, workshop development in science teaching is indispensable (Mthokwa, 2014) and the route to reduce old fashioned practice of teaching science is to provide teachers with enough knowledge of new curriculum content and methods (Mthokwa, 2014; Van der Valk & DE Jong, 2009).

#### **4.5.2 Subtheme 02: Time frame of development.**

Natural Science teachers have a challenge of time regarding workshops where there is much work to do and little time. The following teachers said:

*Mostly workshops are prepared for half a day normally 12 to 3pm so we have only 3 hours to learn many concepts in a short time. P1*

*No, time is not enough because it is matter of two hours while you find that they are teaching matter and materials, life and living and planet and beyond in two hours. It is very short time.P2*

Natural science teachers are interested in workshops but they end up unprofitable because of limited time. The workshop could be more effective if they extended to a week or more to fulfil the needs of teachers. Teachers are usually not given time to incorporate knowledge and skills acquired at workshops into their classroom practice (Smith, 2013). Though teachers are graduates, they need more support from department and time to apply knowledge gained (Smith, 2013). Another problem with workshops is that they provide teachers a short period of time to share and gain support. According to Daniel et al. (2013), some teachers need enough time to gain the content matter.

#### 4.6 Data Presentation and Discussion

The second aspect of the interview of teachers from Mafukuzela Gandhi circuit indicated why grade 7 teachers had particular experiences of teaching Natural Science in grade 7. The table below sums up the viewpoints of teachers in teaching Natural Science in grade seven. 4.6.1

##### Research Question: 02

- How nature of science impacts Natural Science teachers' classroom and practice?

##### 4.6.2 Table 5: How nature of science impacts Natural Science teachers' classroom and practice?

Focal question	Theme	Subtheme	Issued raised
How nature of science impacts Natural Science teachers' classroom and practice?	Skills and knowledge required in teaching Natural Science	Understanding Of practical Content	Participant said that Natural Science required teachers who had the background knowledge of content, understanding of concepts and with a passion, as well as resources so that the learners would understand, link their knowledge and interpret.
		Teacher specialisation	Respondents indicated that Natural Science teacher should specialize in Natural Science and must have Science background to teach efficiently. A teacher who teaches all subjects does not have

			enough knowledge of a particular subject
		Natural science content in grade 7	Natural Science teacher should take cognisance that the learners are from different environments. Natural Science in grade seven has more words whereas learners are still struggling with English vocabulary. Content in grade seven should minimise.
	Teachers attitude towards teaching Natural Science	Negative Attitude	Science background and love of the Natural Science can overcome bad attitudes from teachers. A successful Natural Science teacher cannot teach Natural Science with a negative attitude. A teacher should create interest and love of subject in learners.
	Contextual factors	Internal	Respondents indicated that teachers experienced hindrances in teaching Natural Science. The department provided more work to do regardless of internal factors that teachers were facing in schools. More teachers with Science background should be employed to overcome the crowding of learners, especially in public schools. More classrooms with Science equipment and paper work for teachers should be increased so that Natural Science

			teachers can teach Science efficiently.
		External	The department itself provides more work to do regardless of internal factors that teachers are facing in schools. The office bearers make their own decision ignoring teachers who disseminate the curriculum in schools. The department should consult teachers first in order to fulfil the needs of teachers who are teaching Natural Science and learners as well. Workshop
		Workshop Assistance	Natural Science teachers would be rich in teaching Natural Science with the help of expertise from Department of Education because teachers are from different backgrounds and need some assistance in teaching. Facilitators should give more time in workshops. It is very important to work in line with other teachers to get books, methods of teaching and practical knowledge. The workshop could be more effective if they extend time to a week or more to fulfil the needs of teachers.
	Professionalism	Teaching Approach	Respondents said that Natural Science teachers should create a lifelong learning desire in learners by creating authentic presentations of subject matter. A teacher should include enough and relevant resources for learners to understand and create their own knowledge by interpreting findings and analysing data themselves. A successful teacher in Natural Science should not use narrative method.

		Lack of knowledge	Universities should teach teachers to specialize in primary schools because a teacher cannot teach effectively without specializing. They should be taught the relevant content that is needed in practical situations. The school should employ a teacher who is relevant to that particular field of specialization.
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#### 4.7 Theme: 01 Skills/ knowledge of teaching Natural science.

##### 4.7.1 Subtheme: 01 Understanding of practical content.

Grade seven teachers from Mafukuzela Gandhi circuit indicated why grade seven teachers have particular experiences of teaching Natural sciences in grade 7. The following teachers commented on skill / knowledge of teaching Natural Science as follows:

*Ok, I will just quote one example of earth planet and beyond that concept when you tell your learners that earth is round. To in some learners, that concept will be an abstract one but if you bring the globe , bring some charts with solar system each basically will tell that ok the centre of universe has got the sun then all planets revolve around the sun in different positions. Then it will become easier for learners to understand because what you tell should be a something that they will see, physically. P1*

*For the learner basically to understand, it will be easier if you bring the magnet in class, then they will know that this is south pole and north pole, if you bring north pole closer to north pole will repel but if you bring north pole close to south pole attract then for the learners it will be easier and they will be able to understand because leaners learn easily when they see things so when you bring bar magnet in the class. P2*

*I was explaining that there are some topics of learners in grade seven Natural Science that you can't run away in doing practical activities like the energy and change, like the planet earth and beyond. In the energy, and change, we need to do some practicals .....we need to do that practically, where you are supposed to take the learners outside having your apparatus in hand like if you want to demonstrate radiation which is the energy coming from the sun, you have to use the hand lenses, then there are some demonstrations or practical's that you are supposed to do where you're going to draw closer the sun rays. They must see the paper burning. Another*

*activity in the same topic is energy change that deals with energy transfer, so in those topics, you are compelled to do practicals to show which objects are poor and good conductors of heat. P3*

According to Crawford (2014), a teacher with science concepts asked almost twice as many questions relating cause / effect, in contrast to the teacher with less subject matter. A teacher teaching the topics for which their knowledge was greater asked more demanding questions and gave learners more opportunities to speak (Crawford, 2014). Ramnarain and Schuster (2014), state that to teach science efficiently, teachers need to have good content and also appropriately teaching in that particular topics. That is why a teacher has to comply with CAPS policy documents as Motshekga (2011), states that CAPS outline specific aim and to supply learners with skills that need investigating investigations, collecting and analysing data. If a teacher does not have good background in science regard content knowledge and science teaching knowledge, the teacher will fail to impart the knowledge. Ramnarain (2015), states that inquiry is whereby learners build meaning for themselves and teachers plan constructivist activities that will clearly reflect such questions as; learners actively involved in understanding rather than memorizations.

#### **4.7.2 Subtheme 02: Teacher specialisation.**

The teachers noted lack of teacher specialisation as a reason why teachers have particular experiences in teaching Natural Science in grade seven.

The teachers made the following comments regarding teacher specialisation in grade seven.

*You find sometimes a teacher is teaching Natural science they never been to a science lesson before but they are brought to science because there is a shortage of teachers then you just come to school and you are asked to teach science. You have never taught science. It becomes a bit of a difficulty P1*

*I was doing natural science and technology in grade seven for the past five years now, I'm doing NST as well in grade 4 and English but the one that is doing technology in grade seven, I have to teach here and go there and help him, the one who is teaching natural science P2*

*It's because they are under concerned. There is this school of thought that says if you are a primary educator you are capable of teaching all subjects and yet there are some getaway subjects such as science, mathematics, EMS and economics that are very challenging. So they*

*are under qualified not that they are lazy, they don't have enough insight or knowledge for the subject. P3*

A successful Natural Science teacher should specialise in science and must have Natural Science background to teach efficiently. Many teachers in South Africa teach in all learning areas in grade seven (9 learning areas per subject) besides any specialisation (Kokonyane, 2015). A teacher who teaches all subjects does not have enough knowledge of a particular subject. The reason is that teachers are sometimes forced to teach Natural Science even when they are not specialised in NS in university or at teacher training.

#### **4.7.3 Subtheme 03: The amount of grade 7 Natural Science**

*Content the teachers indicated the Natural Science content is packed in grade seven as a reason why teachers have particular experiences in teaching Natural Science in grade seven .The teachers made the following comments regarding to Natural Science content in grade 7 Life and living, and planet and beyond in two hours is very short time. Because life and living is very long, life and living uwodwa is taking time. P2*

*The content is too much for grade 7, especially in term one, where we are dealing with life and living. P3*

Content in grade seven should be minimised. Preparedness of learners and the way the Natural Science is taught from grade to grade may create negative or positive impact on learners' work or performance at the of examinations (Stols, 2013). According to Kokonyane (2015), an everyday complaint by grade seven teachers is that fellow worker who teach lower class from 1-6 are unable to finish curriculum coverage, which impact negatively on the performance of learners in grade seven .

Secondly, learners are required to learn nine subjects in grade seven and much content for them and teachers are required to teach all subjects.

#### **4.8 Theme 02: Teachers attitude towards teaching Natural Science**

##### **4.8.1 Subtheme 02: Negative Attitudes**

The teachers indicated the negative attitude from science teachers' as a reason why teachers have particular experiences in teaching Natural Science in grade seven .The teachers revealed following comments regards to attitude in teaching Natural Sciences in grade 7

**They are saying hard; hard beat to swallow because they are saying science is reserved for**

*..... I will say “iqenqe”, yae they are saying science is for the brilliant one, then I say no everyone is brilliant because you got to this far , you got this in grade 12, you got this in grade 8 then from grade 8 to 12 then you can learn science but! With good teachers as well you can become a good scientist teacher, so teachers that taught me made me to become a good science teacher, my teachers who taught while I was in a school they made me to become a good science teacher . I had bad science teachers I wouldn't become what I am today, so they made me what I am today because I regard them as good science teachers. Even though our school was not ever have much equipment and all but they tried by all means to make sure that all our lesson are to the limit.**P1***

*There are normally like when in some part of science ask how do you teach this because as I am I can't teach this parts like as I have said matter and material ,yae, they are saying , I can't teach this part ,how do you teach this . I say just take your time and understand the content, then it will be easy and I give myself time and I love science from high school level, science was my favourite subject.**P3***

Science background and love for Natural Science can overcome bad attitudes. Seemingly, teachers prefer to teach certain topics and they find some topics difficult to teach due to the Science background and negative attitudes. They see science as subjects reserved for 'iziqenqe'. Science is not reserved for 'iziqenqe'. It's only about dedication and giving you much time to prepare. A successful Natural Science teacher cannot teach Natural Science with a negative attitude. A teacher should create interest and love of subject in learners.

The attitude of a teacher can have an effect on the result of learner in a classroom, that is why I say Natural science teacher teach the science but not really expose the learners to science. Avraamidou (2013), states that science teachers interpret experiences through their existing knowledge and beliefs about learning, teaching and subject matter, and it is very important how the teacher teach. Daniel et al. (2013), also argue that teachers have limited knowledge about inquiry and poor background about the nature of science. It is clear that teachers just teach Natural Sciences as a subject not really put learners in concrete understanding. Capps et al.(2012) and Daniel et al. (2013) state that teachers only concentrate on basic abilities rather than exposing learners to practical situations.

## **4.9 Theme 03: Contextual factors**

### **4.9.1 Subtheme 01: Internal**

Grade seven teachers from Mafukuzela Gandhi circuit indicated why grades seven have particular experiences of teaching Natural sciences in grade 7. The teachers indicated contextual factors in teaching Natural Science.

**The following teachers commented on contextual factors in teaching Natural Science as follows:**

*You have to mark also and assess as well load of learners as well. How are you going to teach 70 learners in four sections. That means I have got 280 learners, so how many scripts I have to mark at the end of the day? You are expected to meet deadlines as well, mark sheets are expected to be submitted, schedules are due in district offices at a certain date, so time factor has a lot of impact in our teachings. P1*

*There is no flow of space because one is handling a bulk of learners, 50 learners in a class so whenever you want to carry out the experiment, it eventually becomes chaotic because of the number of learners that we are handling. So if maybe they don't change the curriculum now and again and there is a lot of paperwork that is needed. P3*

Teachers are also responsible for marking scripts, compiling mark list and schedules of marks to the department. Normally teachers end up using teaching time to engage in these duties (Motlhabane 2014). More teachers with science background should be employed to overcome the crowding of learners especially in public school, more classrooms with science equipment and less paper work for teachers should be considered so that Natural Science teachers can teach science efficiently. Teacher is expected to teach while administrative work is expected of the teacher as well. Internal factors and external factors disturb natural science teachers in grade seven to instil inquiry learning and inquiry needs time and financial resources. Daniel et al. (2013), say external and internal factors such as lack of time (external) and financial constraint (internal) hamper teachers from using best strategies. Some schools do not even have the class for science laboratory and science kits due to financial constraints.

### **4.9.2 Subtheme 02: External**

The teachers indicated the external factors in grade seven as reasons why teachers had particular experiences in teaching Natural Science in grade seven.

**The teachers made the following comments on external factors:**

*There is another baby that has come by the name JikiMfundo .That one has a lot to do because it doesn't consider potential or the pace of the child. You are told or expected to do one aspect a day. P3*

*Time constraints might have negative impact in curriculum as its own, time, time that is what I'm worried about because there is so much to do with little time, so little time so little time we have to cover the whole curriculum in a space of the year. P1*

The department itself provides more work to do regardless of internal factors that teachers are facing in schools. JikiMfundo has a lot of work to do with little time regardless of potential or pace of learner. Office bearers make their own decisions without regard for teachers who are disseminating the curriculum in schools. The department should consult teachers first in order to fulfil the needs of teachers who are teaching, and the learners'. In South Africa, what was intended is far from full implementation (Fraser & maguvhe, 2008; Mthokwa, 2014). Howie et al. (2008) and Mthokwa (2014), state that the education in South Africa experienced various changes since 1994 but the curriculum improvement done is not yet producing the fruitful outcomes.

**4.9.3 Subtheme: 03 Workshop assistance**

The teachers indicated workshop assistance as a reason why teachers have particular experiences in teaching Natural Science in grade seven.

*.....very little time. Mostly workshops are prepared for half a day normally 12 to 3pm so we have only 3 hours to learn more concepts in a short time. Then I will say if time could be extended let say a workshop could be around a week or so than it will be more profitable for other educator to learn because you find sometimes a teacher are teaching Natural science they never been to a science lesson before but they are brought to science because there is a shortage of teachers then you just come to school and asked to teach science, you have never teach science. It becomes a bit of difficulty, if they can just extend bit periods of workshops it might help those teachers who are or don't have Natural Science background to get more clarity on the subject matter P1*

*No time, it is not enough because it is matter of two hours while you find that they are teaching matter and materials, life and living, and planet and beyond in two hours it is very short time***P2**

According to Smith (2014), states that if teachers actively engaged in application of skills and knowledge during their own learning, identified a strong relationship between professional development programmes and the enhancement of quality in pedagogical practice, teachers may obtain more in science content and in practical work. Workshops give teachers a chance to build their content knowledge and to try out activities from workshops in their classrooms.

#### **4.10 Theme 04: Professionalism.**

##### **4.10.1 Subtheme 01: Teaching Approach**

Natural Science teachers who are teaching Natural Sciences in grade 7 had professionalism concerns.

*I make them talk, I engaged them, and so it means that all my lessons are planned in such a way that there are learners entertained. My teaching is done on clarity purposed than I let them to observe.***P3**

*..... but I don't jump, I try to explain orally although we do not have the real object because they are doing grade seven, it's not like we are teaching grade 4 or grade 2 it is easy for them to understand what you are talking about although they are not able to see really what that thing looks like.***P2**

Natural Science teacher should create a lifelong learning desire in learners by creating an authentic (practical) understanding of subject matter and bringing resources so that each and every learner will be entertained because learners learn Natural Science easily when they see things. A teacher should include enough and relevant resources for learners to understand and create their own knowledge by interpreting findings and analysing data themselves. According to Ramnarain and Schuster (2014), state those teachers who are limited in specialist content knowledge are unwilling to implement practical work strategies with their learners. Instead, they end up depending on textbooks. Curriculum documents recommend that a teacher use strategies that expose learners to scientific questions, investigations, and data analysis etc. (Crawford, 2014). A successful teacher in Natural Science should not use narrative method.

##### **4.10.2 Subtheme: 02 Lack of knowledge**

The teachers indicated lack of knowledge from Natural Science teachers as a reason why teachers have particular experiences in teaching Natural Science in grade seven.

*So they do say sometimes you are a teacher, you learnt the didactic only find that you are encountered problems like I was doing natural science and technology in grade seven for the past five years now I'm doing NST as well in grade 4 and English but the one that is doing technology in grade seven, I have to teach here and go there and help him the one who is teaching natural science .by the WAY although you do have qualification from university sometimes you find difficulty. P2*

*So they are under qualified not that they are lazy. They don't have enough insight or knowledge for the subject. Although they do have their degrees and diplomas? Yes, it is different from what they are supposed to do now in the practical situation they were learning some different subject.P3*

Universities should teach teachers to specialize in primary school because a teacher cannot teach well without specializing. They should be taught the relevant content that is there in the relevant subject. The school should employ a teacher who is qualified for that particular field of specialization. According to Nowicki et al. (2012), practical science helps learners to develop strong skills in problem solving and critical reasoning while also acquiring science knowledge. A teacher with high science knowledge will do more practicals with his or her learners but a teacher with less science knowledge will do less practical work.

However, schools have a shortage of practical work resources to teach learners. Correia and freire (2016), note that adequate science content knowledge guides the planning of an effective inquiry lesson, helps a teacher respond effectively to comments and questions, and increases a teacher's confidence and fluency when leading discussions. A teacher that teaches engaging in scientific inquiry promotes the development of more appropriate understanding of science and scientific inquiry (Correia & freire, 2016). However, teachers struggle with what practical's should look like and how they should be taught. This is a challenge faced by teachers because they do not have content knowledge skill to and knowledge teach science through practical work so that learners do not learn about science but do science (Gillies & Nichols, 2015).

Brígido et al. (2013), state that Natural Science teachers in primary school show a low level of knowledge of science an obstacle to its effective teaching. They have a low level of scientific knowledge (practical work) and difficulties in carrying through educational changes. They

avoid teaching topics that they do not understand or know sufficiently well, and lack confidence in teaching Natural Science.

## **5. Conclusion**

All participants (teachers) revealed their positive and negative experiences in teaching Natural Science in grade seven. Teachers highlighted some challenges in teaching Natural Science. They noted that they faced constraining internal and external contextual factors. The teachers were expected to teach Natural Science content and implement inquiry learning when they were not specialised in Natural Science. Teachers needed time to incorporate knowledge and skills obtained in workshops. One participant revealed that the background and experience in Natural Science is essential in teaching learners. Teachers highlighted that the positive attitude and enough time in preparing for the subject were also essential. Experienced teachers noted that their patience in doing inquiry learning in their classrooms was due to positive experiences acquired in their own learning. The development of teachers for inquiry learning in classroom should include practical work so that teachers recognise the value of inquiry and are able to build an understanding of science concepts in learners (Tseng, Tuan, & Chin, 2012). I value all information acquired from the school and discussion and recommendation would be presented in the next chapter.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.**

#### **5.1 Introduction**

My study explored teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit. It also examined the critical questions guiding this study including teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit, such as demands of teaching Natural Science, challenges experienced when teaching Natural Sciences, and opportunities to improve knowledge of teaching Natural Sciences, why grade

seven teachers had particular experiences of teaching Natural Science in grade seven, knowledge of teaching Natural Science, teacher attitude towards teaching Natural Science, contextual factors and professionalism. This chapter sums up the findings according to research questions and themes from data presentation.

## **FINDINGS:**

### **5.1.1 RESEARCH QUESTION 01**

What are teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit?

#### **5.1.1.1 Demands of teaching Natural Sciences.**

Participants (P1 & P2) indicated that successful teacher of Natural Science must have the background knowledge of content, understanding of concepts and someone passion in teaching science. Love and patience are important as well in your subject matter. Teachers do not only need to have good content knowledge but also knowledge of how to unpack topics and content appropriately.

Participant (P1 & P3) indicated that a Natural Science teacher should take cognisance that learners are from different environment. Patience is very important. Check the prior knowledge that they have and move with them to the level that you want them to be and automatically the learners will be interested in the subject. Secondly, learners are required to learn nine subjects in grade seven and there is too much content for them. Teachers are required to teach all subjects and are faced with the challenge of teaching both the content and also the literacy. Furthermore, teachers have problems with new technology in schools, for which they are illiterate. A teacher should include gifted learners and slow learners in a classroom and deal with them according to their needs. Preparedness of learners and the way the Natural Science is taught from grade to grade may create negative or positive impact learners work or performance at the of examinations (Stols, 2013).

#### **5.1.1.2 Challenges experienced when teaching Natural Science.**

Participants (P1 & P3) experienced hindrances in teaching Natural Science, and the department provide more work to do regardless of internal factors that teachers encountered in schools. Sometimes learners participated in school choir practice and there was insufficient time to cover the curriculum in the year. Office bearers implemented programmes of teaching and

learning without regard for classroom situations in the schools and the teachers who were disseminating the curriculum in schools. This weakens effective teaching and learning of Natural Science. Teachers are also responsible for marking scripts, compiling mark list and schedules of marks for the department. Normally, teachers end up using teaching time to engage in these duties (Motlhabane, 2014).

Participants (P1 & P2) revealed that Natural Science teachers failed to accommodate different learners in classroom and to fulfil their needs due to limited time. They were unable to link previous knowledge of a subject. Mthokwa (2014), points out time as a challenge in implementing science activities. Therefore, short periods of time hampered some activities from happening or made activities take place faster than the learners could cope with.

Participants (P2 & P3) revealed the challenge of resources. Successful Natural Science teacher needs resources to carry out investigation and practical work with learners, because learners learn easily when they see things. Teachers needed science room with equipment, not only the mobile science kit that was donated by sponsors.

The teachers demonstrated the Language barrier as a challenge in teaching Natural Science in grade seven. The teachers noted that more content words were used in grade seven when learners did not have adequate and requisite vocabulary. Learners are from different backgrounds and are still struggling in English and Natural Science has much technical words. Teachers sometimes end up code switching in Zulu as learners learn easily through their native language.

### **5.1.1.3 Opportunities to improve knowledge of teaching Natural Sciences.**

The teachers indicated that the workshop had an important role in reviving their knowledge and in teaching Natural Science in grade seven. Natural science teachers would be rich in teaching Natural Science from the expertise of the department of education because teachers r from different backgrounds and they need some assistance in teaching. It is very important to work in line with other teachers in developing lesson plans, in methods of teaching, and in practical knowledge. The resourcefulness of workshops brings positive change in teachers' confidence and competence in the teaching of science and teachers attitudes in teaching science

(Smith, 2014). They also indicated that Natural Science teachers who are teaching Natural Sciences have a challenge of time frame for the workshop with more work to do and little time.

## **5.2 RESEARCH QUESTION 02**

How nature of science impacts Natural Science teachers' classroom and practice?

### **5.2.1 Skills and knowledge required in teaching Natural science.**

Successful teaching of Natural Science requires teachers who have the background knowledge of content, understanding of concepts, and passion and together with resources so that the learners will understand, link their knowledge and interpret information themselves in such a way that the learner understands, gets more clarity on scientific concepts, and actively participates in scientific skills but not in rote memorisation of work (Mthokwa, 2014). The teachers indicated teacher specialization as a reason why teachers have particular experiences in teaching Natural Science in grade seven. A teacher who teaches all subjects will not have enough insight and knowledge of a particular subject. Teachers are sometimes forced to teach Natural Science even when they are not specialised in NS at university or teacher training (Mthokwa, 2014). Avraamidou (2013), states that if teachers are not specializing with their subject, they end up with less knowledge, subject matter and knowledge to conduct inquiry learning.

The teachers indicated the amount of Natural Science content in grade seven as a reason why teachers have particular experiences in teaching Natural Science in grade seven. Natural science in grade seven has more content words yet learners are still struggling with English and NS vocabulary. Preparedness of learners and the way the Natural Science is taught from grade to grade may have negative or positive impact on learners' work or performance at the of examinations (Stols, 2013).

### **5.2.2 Teachers attitude towards teaching Natural Science.**

The teachers indicated negative attitude from Natural Science teachers as a reason why teachers have particular experiences in teaching Natural Science in grade seven. Science background and love for Natural Science can overcome bad attitudes to teachers. Seemingly, teachers prefer to teach certain topics and they find some topics difficult to teach due to the Science background and negative attitudes. They see science as a subject reserved for 'iziqenqe'. A successful Natural Science teacher cannot teach Natural Science with a negative attitude. A

teacher should create interest and love of subject in learners. The attitude of a teacher can have an effect on the performance of learners in a classroom.

### **5.2.3 Contextual factors.**

Grade seven teachers from Mafukuzela Gandhi circuit indicated why grades seven teachers have particular experiences of teaching Natural sciences in grade 7. The teachers indicated contextual factors of teaching Natural Science. The department itself provides more work to do regardless of internal factors and external factors that teachers are facing with in schools. Jiki Mfundo has a lot of work to do with a little time regardless of potential or pace of learner. Office bearers make their own decisions regardless of teachers who are disseminating the curriculum in schools. This opportunity gives teachers a chance to build their content knowledge and try out activities from workshops in their classrooms.

### **5.2.4 Professionalism.**

Natural Science teachers who are teaching Natural Sciences in grade 7 are under concern regards to professionalism. Natural Science teacher should create a lifelong learning in learners by creating an authentic (practical) understanding of subject matter and bringing resources so that each and every learner will be entertain because learner learn Natural science easily when they see things. A teacher should include enough and relevant resources for learners to understand and create their own knowledge by interpreting findings and analysing data themselves. According to Ramnarain (2015), teachers who are limited in specialist content knowledge are unwillingness to implement practical work teaching strategies. Instead, they end up on depending on heavy textbook while a good teacher in Natural science has been deemed as a daily curriculum goal in science schools in South Africa and entire world. Curriculum documents recommend that a teacher has to use strategies that cater learners in scientific questions, investigations, collecting and data analysis. Furthermore, Brígido et al. (2013), state that Natural Science teachers in primary school show low level of knowledge of science; an obstacles to its effective teaching. Low level of scientific knowledge (practical work) poses difficulties in carrying through educational changes. These problems lead to teachers that they teach to test not for making learners to understand particular science concept and exposing learners in scientific (Sadler et al., 2013).

## **6. Conclusion.**

To sum up my study, teachers were teaching Natural Science as a subject in grade seven without really instilling concrete understanding. Ramnarain (2014), state that teachers only concentrate on basic abilities rather than exposing learners to practical situations. There have been many radical changes of curriculum but the education system intended is far from being realised because teachers struggle with what practical's should look like and how they should be taught.

## **7. Recommendations**

I hope the following recommendations will what needs to be done in Natural Science grade seven.

- A Natural Science teacher should specialise in Science and must have science background to teach efficiently.
- The content in grade seven should be minimised because learners in grade seven are still struggling in English.
- Adequate resources for learning Natural Science in practical situations should be availed.
- Minimized paper work to ensure teachers do not end up working under pressure to fulfil curriculum coverage.
- More teachers with science background should be employed to overcome the crowding of learners, especially in public schools.
- The workshop time should be extended to fulfil the needs of teachers and allow them to incorporate knowledge and skills acquired at workshops into their classroom practice.
- Universities should make teachers specialize in primary school because a teacher cannot teach well without specializing.
- Revisit the radical changes of curriculum because it seems that education intended pre and post 1994 is far from full implementation.
  - The department should revisit coordination challenge between the teaching of subjects and extra mural activities.

## **8. Implications of the study.**

My study was limited to teachers teaching Natural Science in grade seven with experience teaching Natural Science. The locations of these schools were not close to each other. Teachers were afraid to leave their children unattended during the school hours. Sometimes i arrived at the negotiated time but with the school meeting taking place. Those problems resulted in many

postponements of interviews. The interviews were squeezed in during their break hours or any negotiated time. However, participants provided adequate information on their experiences in teaching Natural Sciences and felt interested in the study.

## **9. Conclusion.**

In South Africa, a lot of work needs to be done. In South Africa, once a new minister appointed is in office, the curriculum is altered while the poor result or performance of learners continues. Natural Science teachers are willing to increase the level of teaching Natural Science in grade seven while teachers were indicating various experiences distracting their work. Teachers indicated amendment in this new curriculum but skill development still remained in the curriculum 2005, RNCS or the NCS and then CAPS. So the same skill that was addressed in post 1994 curriculum still captured in CAPS.

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- Mdutshane, V. N. (2006). An investigation into implementation of curriculum 2005 in senior phase of a junior secondary school in the Lusikisiki district,s dessertation submitted for degree of Masters of Education. Durban: University of KwaZulu Natal.
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**APPENDX B**

**University of KWAZULU-NATAL**

**538 Marubi Noganga**

**Mount Royal**

**Phoenix**

4068

04 December 2017

**Vusukukhanya Primary School**

**P.O. box 187470**

**Engcongweni Area**

**Inanda**

**4309**

Application for the permission to conduct research in your school.

I, **Sboniso Pius Mngoma**, am currently studying for Masters in Education (course work) in curriculum studies at the University of KwaZulu. I am conducting a study exploring teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit in Kwa Zulu Natal (Edgewood campus), Pinetown in South Africa.

I am positive that this study may contribute and strengthen teachers to assist learners in primary schools in Natural Science. It will enhance learners' motivation, engagement and contribute to improve academic success. I hereby request permission to conduct this study in one school. Please note the following:

- The school and educators' confidentiality is guaranteed.
- The observation and interview questions may last for approximately 2 hours.
- Any information given by your educators cannot be used against the school, and the collected data will only be used for purposes of this research.
- There will be no incentive or benefit for participation in this project.
- Data will be stored in a coded computer and shredded after 5 years.
- Participation in this research project is entirely voluntary; participants are free to withdraw at any point if they wish to do so.
- Schools and educators' involvement is purely for academic purposes only, and there is no financial benefit involved

**Yours faithfully**

**Sboniso Mngoma**

**I can be contacted at: cell: 078553690**

**Email: somisopius@gmail.com**



**04 December 2017**

**Imbaliyamazulu Primary School**

**C216, box 60122**

**Inanda,**

**4309**

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- Schools and educators' involvement is purely for academic purposes only, and there is no financial benefit involved.

**Yours faithfully**

**I can be contacted at: cell: 0785536904**

**Sboniso Mngoma**

**Email: somisopius@gmail.com**

**Contacts:**

My supervisor is Dr Samukelisiwe Mngomezulu Tel.0312603017  
Email:Mngomezulus1@ukzn.ac.za

You may also contact the Research office through: Ximba Phumelele HSSREC research office, Tel.0312603587, email: ximbap@ukzn.ac.za

**Thank you in advance for your contribution in this research project.**

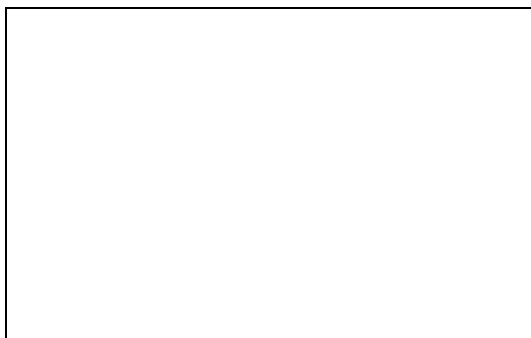
**Declaration**

I ..... (Full names of the school principal) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent for the school and educators/ teachers to participate in the project.

I understand that the school and educators/ teachers are at liberty to withdraw from the project at any time, should they so desire

..... Signature  
of school principal Date

STAMP



University of KWAZULU-NATAL

**538 Marubi Noganga  
Mount Royal  
Phoenix  
4068  
04 December 2017**

**Inanda day Primary School**

**Old Inanda Mission**

**Inanda**

**4309**

**Application for the permission to conduct research in your school.**

I, Sboniso Pius Mngoma, am currently studying for Masters in Education (course work) in curriculum studies at the University of KwaZulu Natal (Edgewood campus), Pinetown in South Africa. I am conducting a study exploring teachers' experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit in KwaZulu Natal (Edgewood campus), Pinetown in South Africa.

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**Yours faithfully**

**I can be contacted at: cell: 0785536904**

**Sboniso Mngoma**

**Email: somisopius@gmail.com**

**Contacts:**

My supervisor is Dr Samukelisiwe Mngomezulu Tel.0312603017  
Email:Mngomezulus1@ukzn.ac.za

You may also contact the Research office through:

Ximba Phumelele

HSSREC research office,

Tel.0312603587, email: ximbap@ukzn.ac.za

**Thank you in advance for your contribution in this research project.**

### **Declaration**

I ..... (Full names of the school principal) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent for the school and educators/ teachers to participate in the project.

I understand that the school and educators/ teachers are at liberty to withdraw from the project at any time, should they so desire.

..... Signature  
of school principal Date

STAMP



### **APPENDIX C**

#### **Interview Schedule**

I will first introduce myself; thank the participants for agreeing to be a part of the study. I will explain the purpose of the research, which is exploring teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit.

#### **BACKGROUND INFORMATION**

- How many years of experience do you have in teaching Natural Science?
- How many schools have you taught Natural science?
- How was your experience in teaching in this / these schools?
- Which content area of Natural Science do you enjoy and which one you do not enjoy?
- What were your major subjects in the University?
- Are you currently furthering your studies?

### **Interview question**

- What are teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit?
- Do you have necessary skills to teach Natural science and feel comfortable doing science activities in your classroom?
- What are your experiences of teaching Natural Science in grade seven?
- Do you understand science concepts well enough to effectively teach science or you find difficulty sometime to teach learners some science concept?
- Do you spend time setting or doing scientific exploration with your learners in the classroom? i. Comments about Natural sciences resources ii. Practical work iii. Efforts for workshops iv. What measures do you use in classroom to fulfil knowledge to your learners?
- Do you think science takes too much time; preparation for science teaching usually takes more times than other learning areas?
- Are you familiar with raising open-ended questions to encourage scientific exploration and hands on activities to help learners to learn science?
- Do you discuss science ideas and issues of teaching science with your colleagues? To what extent? What do they normally say?
- Are you not afraid to demonstrate experiment or conduct practical to your learners?
- Do you enjoy to collect materials and objects as your tools to teach Natural Science and comfortable to use those materials e.g. science kits?
- Do you think teacher subject matter knowledge, pedagogical knowledge and pedagogical content knowledge have an effect on teaching learners in primary school?
- In your opinion, is curriculum in use having an impact on teaching Natural science in primary schools?
- Do you consider Natural Science as one of important content area in primary school? Explain?

- Do you think the medium of instruction as a language has an effect in learner’s performance towards Natural Science in primary school? To what extent?

### **Conclusion**

I would like thank the school principal to allow me to conduct a study, participants for agreeing to be a part of the study, which was to Exploring teacher’s experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi.

## **APPENDIX D**

### **Semi- structure questionnaires.**

Thank you to being a part of research on Exploring teacher’s experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit. You may complete the following questionnaires about your experience in teaching Natural Science.

#### **Sex**

<b>Gender</b>	<b>Male</b>		<b>Female</b>	
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**Age**

<b>21-26</b>		<b>26-36</b>		<b>36-46</b>		<b>46-54</b>		<b>55-65</b>	
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**Teacher qualification**

<b>Qualified teachers</b>		<b>Unqualified teachers</b>	
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**Teaching experiences**

<b>1-5</b>		<b>5-15</b>		<b>15-25</b>		<b>25-35</b>		<b>More</b>	
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**Nationality**

<b>South Africa</b>		<b>Africa</b>		<b>Foreigners</b>	
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**Race**

<b>Black</b>		<b>Indian</b>		<b>Coloured</b>		<b>More</b>	
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**QUESTIONNAIRES**

- In Mafukuzela Gandhi circuit, what are the experiences of teachers who teach Natural Science in grade seven?

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Do you meet curriculum coverage at a given time; includes preparation, activities and practical in your learning areas (Natural science in grade seven)? Explain.

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What kind of methods do you use to encourage scientific exploration and hands on activities to help learners to learn science?

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Do you discuss science ideas and issues of teaching science with your colleagues? To what extent? What do they normally say?

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Do you enjoy to collecting materials and objects as your tools to teach Natural Science and comfortable to use those materials e.g. science kits

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Do you think teacher subject matter knowledge, pedagogical knowledge and pedagogical content knowledge have an effect in teaching learners in primary school?

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## **Appendix E**

**Ethical Clearance Application**

**Informed Consent Letter**

**UNIVERSITY OF KWAZULU-NATAL  
SCHOOL OF EDUCATION, EDGEWOOD**

Dear Research Participant,

Research title:

Exploring teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit.

**Researcher:**

MngomaSboniso (cell: 0785536904)

**Research Office:**

Ximba Phumelela (031 260 3587)

I, **SbonisoMngoma**, a teacher at Vusukukhanya primary, currently studying for Masters in Education (course work) in Curriculum studies at the University of KwaZulu Natal (Edgewood campus), Pinetown in South Africa. I am conducting a study exploring teacher's experiences of teaching Natural Science in grade seven in Mafukuzela Gandhi circuit. The research will involve your answering questions from interviews and questionnaire. All sessions will be held at your school and will be at a time convenient to you. The duration of each activity will be a maximum of 45mins.

We would like you to be aware that participation in this research is voluntary. You have the right to choose not to participate in this research or choose to withdraw from participation at any time. There is no benefit to your participating in this research. You will be required to sign a declaration of consent form. All records identifying you as a participant will be maintained by the School of Education, UKZN and strict compliance will be followed to ensure your confidentiality and anonymity. Information and analysis drawn from the interview in this research will be crosschecked with you for confirmation and validation and for other feedback in terms of agreement or divergence with the information given by you during the interview. The interview will be audio-taped. Access to the tape recordings will be restricted only to researchers working on this research project in compliance with the ethical permission granted for the research. The recorded tape will be transcribed only for the purposes of this research. The tape recordings and the transcriptions will be archived for a period of five (5) years by the School of Education University of KwaZulu-Natal and then destroyed thereafter.

Please do not hesitate to ask questions if you have further concerns you would wish to be clarified regarding participation in this research. You may also choose to contact me or my co-researchers at the numbers provided (see above).

We anticipate your consent.

Sincerely,

\_\_\_\_\_

Signature of Participant

Date: \_\_\_\_\_

**UNIVERSITY OF KWAZULU-NATAL  
SCHOOL OF EDUCATION, EDGEWOOD**

Thank you for your agreeing to participate.

**DECLARATION OF CONSENT**

I..... (full-names of the participant) having read and understand the contents of this document and the aim and nature

of the research project, hereby consent to participating in the research project. Furthermore,  
(please tick the relevant choice)

I do consent to this interview being audio-taped I do not consent to this interview being audio-  
taped

I have been informed and I am aware that I am participating in this research voluntarily. I  
understand that I am free to withdraw from the research project at any time without negative  
consequences to me.

**SIGNATURE OF PARTICIPANT**

**DATE**

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