

**GRADE 9 NATURAL SCIENCES TEACHERS' EXPERIENCES OF CURRICULUM
IMPLEMENTATION IN SELECTED SECONDARY SCHOOLS IN EKURHULENI**

By

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GRADE 9 NATURAL SCIENCES TEACHERS' EXPERIENCES OF CURRICULUM IMPLEMENTATION IN SELECTED SECONDARY SCHOOLS IN EKURHULENI

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DEDICATION

This dissertation is dedicated my late loving Grandmother Thato Rosalia Mosifa, who played a substantial role in my life. Illiterate but an extraordinary and remarkably mentor. I also dedicate to my other half (Makhosazana) for the support she gave me during difficult times. I also dedicate this to my mother Mirriam (Ausimang) who will not acknowledge my work due to her conditions of health. My sister Naomi you were always there for me and my brother (Moeketsi) for your tremendous support.

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ABSTRACT

Teachers' teaching experiences form an integral part of actual teaching and learning. These experiences allow teachers to develop effective strategies for enhancing learners' development throughout the learning process. This qualitative case study explored the teaching experiences of six purposively selected teachers at identified schools in the Ekurhuleni District. The study, which was guided by Schoenfeld's theory of teacher decision-making, adopted the interpretivist perspective. Data were collected through semi-structured interviews and observation, before being transcribed and thereafter arranged into codes and themes using thematic data analysis. The findings revealed that the participating teachers faced challenges which included curriculum overload and difficulties with planning lessons. The participants acknowledged the support received at the school level and from subject advisors but specified that it was minimal. They also advocated for support from the district, as that would enhance their knowledge of teaching and learning the subject of Natural Sciences in particular. Another challenge that some participants reportedly faced was a lack of practical work, since many laboratory spaces are being used as classrooms. The majority of the participating teachers posited that the time allocated for them to teach was insufficient to cover the syllabus, therefore they felt despondent and tended to teach procedurally, bring in a hurry to finish the content. It is recommended that the Department of Basic Education (DBE) ensure that teachers are trained in the relevant content knowledge for their qualifications. The involvement of subject advisors, school management and parents must be prioritized, as these parties all play a significant role in supporting teachers. This study further recommends that the training workshops offered by the DBE focus on improving the guidance given to teachers. In conclusion, teachers who teach Natural Sciences should practice reflective teaching when making decisions, to enable them to explore more effective strategies for use in the teaching of their subject.

KEYWORDS: curriculum, curriculum implementation, Ekurhuleni, secondary schools, teachers' support, teaching resources

**BOIPHITHELELO BA MATITJHERE A DISAENSE TSA TLHAHO A KEREITE YA 9
BA HO KENNGWA TSHEBETSONG HA KHARIKHULAMO DIKOLONG TSE
KGETHILWENG TSE MAHARENG TSA EKURHULENI**

KAKARETSO

Boiphithlelo ba ho ruta ba matitjhere bo etsa karolo ya bohlokwa ya ho ruta le ho ithuta ha nnete. Boiphithlelo bona bo dumella matitjhere ho theha maano a sebetsang bakeng sa ho ntlafatsa ntshetsopele ya baithuti nakong yohle ya ho ithuta. Phuputso ena ya boleng e hlahlobile boiphithlelo ba ho ruta ba matitjhere a tshelletseng a kgethuweng ka sepheo se itseng dikolong tse kgethilweng tsa Setereke sa Ekurhuleni. Phuputso, e tataisitsweng ke kgopolo ya Schoenfeld ya ho etsa diqeto ha matitjhere, e amohetse pono ya theori ya bofetoledi. Dintlha di ile tsa bokellwa ka dipuisano tse hlophisitsweng le ho shebella, pele di ngolwa mme kamora moo di ile tsa hlophiswa ka dikhoutu le dihlooho ho sebediswa tlhahlobo ya manollo ya dintlha ya dihlooho. Diphumano di senotse hore matitjhere a nkileng karolo a tobane le diqholotso tse kenyelletsang kharikhulamo e dikateng di ngata le mathata a ho rala dithuto. Bankakarolo ba ananetse tshehetso eo ba e fumanang sekolong le ho baeletsi ba dithuto, empa ba bolela hore e nyane. Ba boetse ba bolela hore ba hloka tshehetso ho tswa ho setereke, kaha seo se ka matlafatsa tsebo ya bona ya ho ruta le ho ithuta thuto ya Saense ya Tlhaho ka ho kgetholoha. Qholotso e nngwe eo bankakarolo ba tlalehileng ba tobane le yona e ne e le kgaello ya mosebetsi wa boikwetliso, kaha dibaka tse ngata tsa dilaboratori di sebediswa e le diphaposi tsa ho rutela. Bongata ba matitjhere a neng a nkile karolo bo ne bo re nako e fanwang bakeng sa ho ruta e ne e sa lekana ho ruta mananeo ohle a thuto, ka hona ba ne ba ikutlwa ba nyahame mme ba atisa ho ruta ka mokgwa wa tsamaiso, ba potlaketse ho ruta dikateng kaofela. Ho kgothaletswa hore Lefapha la Thuto ya Motheo (DBE) le netefatse hore matitjhere a kwetliswa ka tsebo e amehang ya dikateng bakeng sa mangolo a bona a thuto. Ho ba le seabo ha baeletsi ba dithuto, tsamaiso ya sekolo le batswadi ho tlameha ho behwa ka sehloohong, kaha mahlakore ana kaofela a bapala karolo e kgolo ho tshehetseng matitjhere. Phuputso ena e boetse e kgothaletsa hore dithupelo tse fanwang ke DBE di shebane le ho ntlafatsa tataiso e fuwang matitjhere. Ho qetella, matitjhere a rutang Saense ya Tlhaho a lokela ho sebedisa mokgwa wa ho ruta wa ho nahana ha a etsa diqeto, e le ho ba nolofalletsa

ho batlisisa mekgwa e sebetsang haholwanyane eo ba ka e sebedisang ha ba ruta thuto ya bona

MANTSWE A SEHLOOHO: kharikhulamo, ho kenngwa tshebetsong ha kharikhulamo, Ekurhuleni, dikolo tse mahareng, tshehetso ya matitjhere, mehlodi ya ho ruta

**OTHISHA BEBANGA LESI-9 BESAYENSI YEZEMVELO ABAHLANGABEZANE
NAKO EKUQUALISWENI KOHLELO LWEZIFUNDO EZIKOLENI EZIPHEZULU
EZIKHETHIWE EKURHULENI**

OKUCASHUNIWE

Isipiliyoni sokufundisa kothisha siyingxeny ebalulekile yokufundisa nokufunda kwangempela. Lezi zipiliyoni zivumela othisha ukuthi bakhe amasu asebenzayo okuthuthukisa intuthuko yabafundi kulo lonke uhlelo lokufunda. Lolu cwaningo ngokuchaza lubheka ulwazi lokufundisa kothisha abayisithupha abakhethwe ngenhloso ezikoleni ezihlonziwe esifundeni sase-Ekurhuleni. Ucwangingo, obeluholwa ngumbono ka-Schoenfeld wokuthatha izinqumo zothisha, lwamukela umbono ogxile ebantwini. Imininingwane yaqoqwa ngezingxoxiswano ezihleleke kancane kanye nokubhekwa, ngaphambi kokuba ilotshwe bese ihlelwa yaba amakhodi nezindikimba kusetshenziswa ukuhlaziya imininingwane yengqikithi. Okutholakele kuveze ukuthi othisha abahlanganyele babhekane nezinsalelo ezihlanganisa ukugcwala kohlelo lwezifundo nobunzima ekuhleleni izifundo. Abahlanganyeli bakwamukele ukwesekwa abakutholile ezingeni lesikole kanye nakubeluleki bezifundo, kodwa bacacisa ukuthi kuncane kakhulu. Baphinde bagqugquzele ukusekelwa yisifunda, ngoba lokho kuzothuthukisa ulwazi lwabo lokufundisa nokufunda ikakhulukazi isifundo seSayensi yezeMvelo. Enye inselelo okubikwa ukuthi abanye abahlanganyeli babhekane nayo ukuntuleka kwemisebenzi eyenziwayo, njengoba izindawo eziningi ezihlomele ukuhlolwa kwesayensi zisetshenziswa njengamakilasi. Iningi lothisha abahlanganyele lathi isikhathi esabelwe bona sokufundisa sasinganele ukuthi baqedele isilabhasi, ngakho-ke bazizwa bedangele futhi behloselwe ukufundisa ngokwenqubo, bajahe ukuqeda okuqukethwe. Kuphakanyiswa ukuthi uMnyango Wezemfundo Eyisisekelo (i-DBE) uqinisekise ukuthi othisha bayaqeqeshwa olwazini olufanele lokuqukethwe ukuze baphothule izifundo zabo. Ukuzibandakanya kwabeluleki bezifundo, abaphathi besikole nabazali kufanele kubekwe eqhulwini, njengoba lezi zinhlango zonke zineqhaza elikhulu ekwesekeni othisha.

Lolu cwaningo luphinde luphakamise ukuthi izinkundla zokucobelelana ngolwazi ezihlinzekwa yi-DBE zigxile ekwenzeni ngcono iziqondiso ezinikezwa othisha. Sengiphetha, othisha abafundisa iSayensi yezeMvelo kufanele bazijwayeze

ukufundisa ngokucabangisisa kahle lapho bethatha izinqumo, ukuze bakwazi ukuhlola amasu aphumelela kakhudlwana abangawasebenzisa ekufundiseni isifundo sabo.

AMAGAMA ASEMQOKA: uhlelo lwezifundo, ukuqaliswa kohlelo wezifundo, Ekurhuleni, izikole eziphezulu, ukusekelwa kothisha, izinsiza zokufundisa

ACRONYMS

ACE	Advanced Certificate in Education
ATP	Annual Teaching Plan
B. Ed.	Bachelor of Education Degree
B. Sc.	Bachelor of Science Degree
CAPS	Curriculum and Assessment Policy Statement
CNE	Christian National Education
C 2005	Curriculum 2005
CK	Content Knowledge
DBE	Department of Basic Education
DoE	Department of Education
DHET	Department of Higher Education and Training
DSG	Developmental Support Group
FET	Further Education and Training
GEOG	Geography
GSI	Graduate Student Instructors
HET	Higher Education and Training
HOD	Head of Department
IQMS	Integrated Quality Management Systems
LTSM	Learning and Teaching Support Materials
NCS	National Curriculum Statement
NGSS	Next Generation Science Standards
NPDE	National Professional Diploma in Education

NQF	National Qualifications Framework
NSTECH	Natural Sciences and Technology
OBE	Outcomes Based Education
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
REQV	Relative Education Qualification Value
RNCS	Revised National Curriculum Statement
SA	South Africa
SAQA	South African Qualifications Authority
SP	Senior Phase
SMT	School Management Team
TIMSS	Trend in International Mathematics and Science Study

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CHAPTER 1

ORIENTATION OF THE STUDY

1.1 INTRODUCTION

The way in which Natural Science (NS) is taught in Grade 9 (the last year of the Senior Phase) has attracted interest among many researchers due to the fact that teaching science has been viewed as an important part of comprehensive schooling (Lamanauskas, 2017). Among guidelines on the Curriculum and Assessment Policy Statement (CAPS), the Department of Education in South Africa endorsed the necessity of teaching and learning NS (Department of Basic Education (DBE), 2011). Section 2.3 of the NS CAPS document, which is dedicated to teaching NS in Grade 9 states that NS at Grade 9 level forms a foundation of related subjects like Life Sciences, Physical Sciences, and Technical Sciences. Learners in NS should participate actively and have self-expression (DBE, 2011:9).

The aim of this study is to explore teachers' experiences in teaching NS. The rationale behind conducting the study was influenced by the report from Umalusi showing that most learners in Further Education and Training (FET) do not study science as compared to other streams. This, coupled with the findings of a study conducted by Fedulova, Popova and Korepanova (2019) that fewer learners are enrolled in FET as compared to SP, explain why there are fewer candidates that enroll for science at tertiary level. As a result, learners achieve marks that are below-par in their National Senior Certificate (NSC) exams. Therefore, this study aimed to explore the Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS).

1.2 BACKGROUND TO THE RESEARCH

Since 1994, South Africa underwent a series of transformations in its politics including in the education system. The transference in proposition to education had to do with the composition and application of the curriculum that was introduced then. In particular, the National Curriculum Statement (NCS) grade R-12 was instituted as a specified policy concerning curriculum and assessment within the education system. In November 2009, the Minister of Basic Education (Angie Motshega) announced that Outcomes-Based Education (OBE) would be abolished.

The announcement was made following findings, conclusions, and recommendations made by the Task Team for the State Review of enactment of the NCS. In their findings, the team highlighted that teachers were: confounded, overburden, anxious, and less interested (Mtsi & Maphosa, 2017), and as a result, they did not produce the desired results (DBE, 2011:14), therefore, recommendations highlighted that the NCS be revised. The suggested NCS Grades R-12 which was Curriculum and Assessment Policy Statement (CAPS) (2011) replaced the Amended National Curriculum Statement (RNCS) Grades R-9 (2002) and the NCS Grades 10-12 (2003 & 2005) (DBE, 2011:5, 8, 14).

The CAPS was intended to make provision for knowledge area teachers to implement through teaching as well as assess and promote learners' grades on a subject basis (Grussendorff, Booyse & Burroughs, and 2014:20). Since 1994, the school curriculum has undergone several revisions and amendments with the purpose of improving the value of basic content of further education in South Africa. As a comprehensive set of guidelines, CAPS is concerned with all the subjects taught at basic and senior education levels, from grades R to 12. Methods of teaching NS and guidelines on how NS should be taught, occupy a central place in the CAPS document Section 2 of the CAPS document is concerned specifically with teaching strategies of NS which is divided into: Life and Living, Matter and Materials, Energy Change and Planet Earth and beyond. These strands are considered as main streams of sciences because they provide the basis for Physical Sciences, Life Sciences and Geography in Further Education and Training (FET) (DBE, 2011:6).

Rank on percentage pass rate in South Africa revealed that the Gauteng province was number one (1), having obtained 48 % of learners who passed NS in 2022. However, a worrying trend has been that over the past years, the Gauteng Province has seen the number of learners who study science in higher grades decrease dramatically. Also, the province's results have not been satisfactory as the DBE pass mark is 30%. Analyses show that the decline in pass rates that the province has experienced is largely caused by problems associated with the teaching and learning of Natural Science (Department of Education annual report, 2021-2022). The Gauteng Department of Education (GDE) conducts yearly assessments for all Grade 9 subjects. Their reports reveal that the achievement of NS in the Ekurhuleni Assessments (EA) has been unacceptable from 2017 until 2021. For example, in

2017, the achievement was 32.9%, 28.7% in 2018, 28.2% in 2019, and 28.1% in 2020 (Umalusi, 2020). The results plummeted further to 26, 9 % in 2021 and such is attributed to the COVID-19 pandemic. According to Smith (2021), the challenges in teaching and learning of the NS subject is because of its particularity and difficulty. Therefore, this study aimed to explore the Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS).

1.3 THEORETICAL FRAMEWORK

Often, educational research is framed within a specific theory or a set of theories that provide guidelines on how to advance towards the identified problems and how to achieve the research objectives constructs (Adom, Hussein & Adu-Agyem, 2018). The theoretical framework guarantees that the findings of a research are more meaningful and acceptable. Researchers use different theoretical frameworks, depending on the essence of the matter under study and the research methodology to describe, explain, and predict a phenomenon (Legault, 2016:1). This study used Schoenfeld's theory of teacher decision-making as a lens to investigate the teaching experiences of Grade 9 NS teachers.

1.3.1 Schoenfeld's theory of teacher decision making

Among all the theories providing a theoretical framework and background to especially educational studies, Schoenfeld's theory of teacher decision-making is the one from which the study drew the relevant components to link the research objectives to its empirical findings and to formulate subsequent recommendations. The theory is based on the presumption that a teacher's decision regarding the teaching process is predicted by his/her knowledge about the subject, and his/her beliefs. Schoenfeld's theory of teacher decision-making provided a valuable theoretical background to the study based on the assumption that effective teaching of NS depends on the knowledge the teacher possesses regarding the content of the relevant subject, the goals to be achieved by the entire teaching process, and the beliefs that guide the teacher's decisions. This theory is also suitable to the proposed study because it provided theoretical explanations in describing the notion of problem-solving, which constitutes one of the main goals behind the teaching of NS. Schoenfeld's three interrelated areas of teacher resources, orientations, and goals

allowed the researcher to investigate and acknowledge the complex character of teacher experiences in teaching Grade 9 NS.

1.4 PROBLEM STATEMENT AND RESEARCH QUESTIONS

Worldwide, 39 countries participated in TIMSS 2019 at the Senior Phase. The learners were required to write both a test in mathematics test and another in science. Of the participants, that from South Africa did not perform very well. In fact, of the countries that partook, results revealed that South Africa ranked among below-average performers (Ryan & Deci, 2017). The teachers' knowledge play an important part in a learner' fundamental understanding of the content of a subject. It is therefore that the teachers' lack of knowledge of NS may not produce the expected learning outcomes. Mofolo (2020) suggests that in this instance, support from the DBE and from the teachers' head of department could be instrumental in the implementation of a successful and supportive learning process of NS. Research on teaching NS in South Africa show that of suggested practices that can enhance the teaching and learning of NS, the experiences of teachers teaching NS have not received sufficient attention from researchers. The recommendations by the Department of Education on how teaching and learning of NS at Grade 9 can be enhanced, have attracted attention from researchers. Among studies conducted in other countries, some focused on methodological aspects (Mofolo, 2020), some reflect on how teaching and learning can be supported through the provision of resources that can enhance teaching and learning while other scholars have focused on experiences of learners learning NS (Netshivhumbe & Mudau, 2021). However, there has been less attention paid to the experiences of teachers who teach NS at the Grade 9 level. What we do not know is teachers' experiences and revelations about their resources, support, orientations, and goals. Therefore, the aim of this study was to explore the Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni.

1.4.1 Research questions

Main research question

What are Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS)?

The sub-questions

1. How do teacher resources, orientations, and goals affect teaching NS in Grade 9?
2. To what extent are Grade 9 teachers supported in developing resources, orientations, and goals for teaching NS in Grade 9?

1.5 THE AIM AND OBJECTIVES OF THE STUDY

The following are the aim and objectives of this study that was carried out in Ekurhuleni district.

1.5.1 The aim of the study

The aim of this study was to explore the Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni.

1.5.2 The objectives of the study

The objectives of the study are to:

- examine/assess the teachers' resources, orientations and goals when teaching NS in Grade 9
- investigate the extent to which the Grade 9 teachers are supported in teaching NS

1.6 RESEARCH METHODOLOGY

Creswell (2018) describes research methodology as the approach by which researchers explore their duty which includes identification, selecting, refining and analysing data about a specific topic. It is simply a structured way by which challenges are solved. In the next section, research design and research methods are described. The research methodology will be explained in much more detail in Chapter 3.

1.6.1 Research design

Research design is a strategic plan to reply to a set of questions (Belik & Yarden, (2019). It is a foundation that conceals the techniques and strategies to gather, interpret, and analyse data. To put it simply, the research design narrates the way a

researcher investigates the predominant problem of the research. Normally, research studies bring about ideas, paradigms, and sets of beliefs, orientations and goals and taken together, these inform the approach and transcription of the data. Once a researcher has identified a particular problem that need investigation, and has formulated research questions, they are able to set out the research design. Research can be conducted through the use of various methods and of these, the most common are the qualitative, quantitative, or mixed methods (Creswell & Creswell, 2018:60). The following sections describe the: research paradigm, research approach, research type, and research methods.

1.6.1.1 Research paradigm

According to Okesina (2020), a research paradigm is the researcher's worldview or beliefs that guide the research. It is a consignment of ideas, beliefs, or interpretations under which theories and applications can operate. It is declared as the researcher's reflective reasoning or theoretical orientation or viewpoint that pilots what to study, the way it should be considered, and by virtue of what the outcome of the study should be translated (Okesina, 2020). It is crucial to consider that paradigm aspects are important, and as a consequence, a researcher should note things about what paradigm illuminates and lead the way in their research (Guba & Lincoln, 1994:116). The purpose, inspiration, and assumptions of a research are guided by the researchers' paradigm. Okesina (2020) proclaims that without embracing a paradigm, there is no base for successive strategies with respect to methodology, design and method. In addition, Okesina (2020) states that it is therefore important to clearly state the paradigm in which particular research is located.

This study advocates the interpretive paradigm as an ideal approach that through its use, the teachers involved in teaching NS in Grade 9 would provide the researcher with a thorough understanding of their experiences. The focus of attention in the Interpretivist paradigm is to understand an individual's world of human experience (Nind, 2020). This denotes that a collective effort is made to understand the perspective of the participants. This paradigm confirms that significantly, emphasis is based on understanding individuals and their exploration of the world around them. Consequently, interpretive researchers start with individuals and try to understand their interpretations around their activities, while authentic words of individuals

become the verification of realities (Nind, 2020). This suggests that reality is transcribed through the individuals' testimonies, and this meaning can be determined through language or communication.

1.6.1.2 Research approach

Researchers broadly recognise three main research approaches, namely quantitative, qualitative, and mixed approaches. Each approach has its own strengths and weaknesses. A researcher needs to use an approach that aligns the research topic under investigation, the research objectives, and the nature of the data to be collected (Mouton, 2001:112). Babie (2001:69) suggested that the research approach should be concerned with answering the questions of WHO to invite in the research, WHY the research is being conducted, and HOW to answer the research questions. This study used a qualitative approach. One of the advantages of the qualitative approach is that, unlike the quantitative method, it does not require a large sample to support the research findings (Okesina, 2020:57).

1.6.1.3 Research type

This research type is a case study. A case study is a comprehensive study of a specific subject, including a person, place, group, event, and organisation (Nguyen, 2019). Case studies are frequently used in social, educational, clinical, and business research (Nguyen, 2019). A case study research design generally requires the use of qualitative methods, but quantitative methods are also used, occasionally. Case studies are prevalent for description, comparison, evaluation, and understanding different features of a research problem. The case study research design is most suitable when a researcher wants to obtain tangible, contextual, a detailed understanding about a particular real-world subject (Okesina, 2020). Furthermore, it permits the researcher to explore the key characteristics, meanings, and the significance of the case. Therefore, this case study explored the Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni.

1.6.2 Research methods

Research methods are the approaches, processes or techniques used to collect information that gets analysed to explore new data and to enable the researcher to

answer the research questions (Nind, 2020). Different research methods use different instruments in collecting data from the participants.

Qualitative research collects data about lived experiences, emotions or behaviours, and the meanings individuals attached to them (Stoecker & Avila, 2020). The approach gives assistance to enabling researchers to learn more about the subject to gain a better knowledge of interrelated concepts, cultural relationships or social activities. Of methods used in educational research, that discussed in this study are that concerning the selection of participants, data collection techniques, and data analysis process.

1.6.2.1 Selection of participants

The study population of this study were Natural Science teachers from the Ekurhuleni South District, Gauteng province. In this study, population alludes to a social group with some predetermined characteristics in common, such as location. These sites were chosen for the study as they were public schools that offer Senior Phase Natural Science. Several techniques for selection of participants exist, each of which has its strengths and weaknesses. Selection of participants in a case study research design may engage a purposeful sampling (Finley, 2019). In purposeful sampling, the researcher selects certain participants from the population that is going to provide data about the area of interest (Garba, Waweru & Kaugi, 2019). Six Grade 9 NS teachers were purposively sampled from three selected secondary schools. Two participants per school were purposively chosen since they were NS teachers teaching Grade 9 classes.

1.6.2.2 Data collection

This step is concerned with the gathering of necessary data and deciding on the nature of data, and on when and how to collect such data. In this study, observations and semi-structured interviews were used to gather information from the NS teachers so that the research questions can be answered.

1.6.2.3 Data analysis

Data analysis is described as a crucial step in research design concerned with analysing, interpreting and understanding the collected information (Gill & Baillie,

2018). In this study, data were analysed using the thematic analysis strategy. Thematic analysis method was suggested by Braun and Clarke (2016) consisting of six steps which are: Become familiar with the data, (2): Generate initial codes, (3): Search for themes, (4): Review themes, (5): Define themes, and (6): Writing-up.

1.7 MEASURES FOR TRUSTWORTHINESS

The research process has to be honest or truthful and convince the readers that the research findings are worthy of attention (Lincoln & Guba, 2007:272). The study used the widely accepted, and easily recognised criteria introduced by Lincoln and Guba (1985) to reveal trustworthiness in the study namely, credibility, transferability, dependability, and confirmability.

1.7.1 Credibility

This process is described as the belief which could be positioned in the reality of the research data (Gill & Baillie, 2018). In this study, credibility was used to verify that the findings are true and accurate (Lincoln & Guba, 1985). The analysed data was sent back to the participants for member checking.

1.7.2 Transferability

Transferability is the process of exchanging the findings in qualitative research to another context with other participants (Gill &, Baillie, 2018). The researcher gives a thick and rich description of the study to the point that the information and representation to warrant readers to assess the importance of the suggestions attached to the findings, hence constructing their own judgements with regard to the external validity of the inquiry results (Stahl & King, 2020). In this study the researcher provided a detailed description of the exploration and make certain that the participants were selected purposively to facilitate credibility of the investigation.

1.7.3 Dependability

Dependability refers to the firmness of the discoveries over time (Stahl & King, 2020). It inspires participants assessing the findings, and the explanation and guidance of the study to make sure that they are all supported by the data received from the informants of the study. Dependability could be noticed by participants assessing the results, and by the description and guidance from the research ensuring that they are all underpinned by the data obtained from the participants of

the research. Accordingly, it is a requirement that the researcher documents and the methodological approach show details and basic procedures and systems that build and shape the research results (Stahl & King, 2020).

1.7.4 Confirmability

Confirmability alludes to the level to which the results of an investigation could be established by other researchers (Spickard, 2017:2). The concept of confirmability is the qualitative researchers' approximate concern to fairness. The researcher must take steps to confirm that the findings are the result of the experiences and beliefs of the participants, rather than the researchers' preferences and characteristics. The researcher unsure that the participants were able to assess the results, to ensure that analysis and the propositions of the research are reinforced by the data derived from them.

1.8 ETHICAL CONSIDERATIONS

The researchers must be clear and sincere with participants regarding all features of the study. Spickard (2017) asserts that matters about secrecy, anonymity, privacy, informed consent must be considered in the research process. No activities to expose participants to any psychological or emotional and physical harm, including being subjected to any extreme stress or discomfort (Leedy & Ormrod, 2005) were undertaken. Participants were provided with informed consent for participation which argues that they were fully conscious of the aim and the process of the study (Creswell, 2009:89). An invite was conducted in such a way that the participants were not threatened or subdued to form part of the study. All the teachers that participated in the study were informed about a right to withdraw from the study at any time if they wished to do so.

1.9 KEY CONCEPTS, TERMINOLOGY, AND DEFINITIONS

Schoenfeld's theory brings together a number of diverse but interrelated concepts such as teacher goals, resources and orientations. Important concepts that form part of teacher experiences and decision-making involve: Curriculum Policy Statement (CAPS), teacher resources, teaching goals, teacher's beliefs/orientations, teaching and learning, and NS.

1.9.1 The curriculum and assessment policy statement

The curriculum and assessment policy statement (CAPS) is an important official document of the DBE in the South African post-apartheid history. The document was designed to amend the National Curriculum Statement (NCS) aimed in improving the standard of education in South Africa (Mavuru & Ramnarain, 2017). The purpose of CAPS is to ensure that learners receive and apply skilful knowledge in a meaningful way which is relevant to their life experiences (Department of Basic Education (DBE), 2011:6).

1.9.2 NS teachers' resources

Teachers' resources mainly consist of knowledge presumably possessed by a teacher about a particular subject and regarded as means deemed necessary in solving a given problem (Schoenfeld, 2015:215). According to Schoenfeld (2015, 215), teachers' resources consist of metacognition or monitoring and self-regulation which can be useful in problem-solving, implementing plans, and evaluating progress made. This implies that the teacher's knowledge is very important in bringing the content into the classroom. Netshivhumbe and Mudau (2021) indicate that the teacher with relevant resources has a greater advantage over the teacher with limited resources. For example, the teacher who uses technology in the classroom as a resource for teaching has a different set of options available than the teacher whose classroom lacks such materials (Netshivhumbe & Mudau, 2021).

1.9.3 NS teacher goals

Farmer and Farmer (2021) define goals as intended learning outcomes that education should plan based on the competence teachers are intended to develop. In the process of achieving effective learning process, it is important to define these goals as this will enhance learning outcomes and motivate the entire learning process (Xia, 2019:19). This definition of learning goals is in line with the conception of the notion of goals and their role as provided by Schoenfeld (2015:229) where goals serve the purpose of fostering critical thinking in subjects such as Mathematics and NS.

1.9.4 NS teacher orientations

According to Xia (2019), it is expected that views of a teacher about the role of teaching, and the way in which knowledge is generated, scrutinised and validated, are evident in the decision-making. Cheng (2017) found that there is often a very close alignment of teachers' orientations about teaching science, and beliefs about learning science as well as the views about the nature of science. The proposed study refers to teachers' self-determination and their views that the subject to be taught will help learners draw experiences from the learning process and that such experiences will help them in solving problems (Schoenfeld, 2015:216).

1.9.5 Teacher support

The Department of Education (DBE) emphasises that teachers should be guided by Subject Advisors who are found in districts as well as by school management and such ensures that the NS curriculum implementation is achieved, and it can be achieved by supporting teachers (DBE, 2011). Mavuru & Ramaila (2017) highlighted roles of Subject Advisors and the School Management among them is parental support. Consequently, this affect teachers' decision making. According to the Department of education, teachers need more support from their facilitators so as to apply the necessary skills to the learners (DBE, 2011; 6).

1.10 CHAPTER DIVISION

Chapter 1 presents guidance and intention to the study. It involves description, individual engagement and the logical reasoning for the study. Moreover, it affirms the scenery, background and the theoretical perceptions that lead the study and key concepts. Furthermore, it provides a statement of the problem, aim and objectives, research methodology as well as the division and summary of the chapters.

Chapter 2 outlines an in-depth literature outlines the theoretical framework and it sets for the literature in the teaching of NS internationally, African countries, and South African context.

Chapter 3 provides a comprehensive narration of the research methodology. Research design involves the research paradigm, approach and research type. The research methods included procedures, tools and techniques to collect and analyse data. Trustworthiness and ethical considerations are discussed.

Chapter 4 outlines the analysis and clarification of the empirical research data. This includes detailed discussions on the findings of qualitative data collected. It covers differentiation of the research findings with literature.

Chapter 5 gives explicit arguments on the qualitative findings from the data collected. It includes comparisons of findings with literature.

1.11 CHAPTER SUMMARY

This chapter provided an orientation to the study. It provided the background of why the study was conducted, exploring the teachers' teaching experiences in selected secondary schools in Ekurhuleni District. The next chapter presents in detail the contextual factors and theoretical framework of teachers' experiences during teaching and learning. Chapter 2 presents the literature review and theoretical framework underpinning this study.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

Chapter one presented the scientific orientation of the research. This chapter discusses some theories and perspectives which are relevant to the teaching experiences of Natural Science (NS). First, the researcher defines NS as a subject. The contextual framework of NS as a subject is presented while the factors that affect decision-making by teachers who teach Natural Sciences is explored. The study examines the resources that teachers who teach NS have access to, their orientation as well as their goals and suggest strategies and methods that can be used in order for them to cope with challenges that arise when they teach NS. This chapter highlights the complexity of teaching NS since it derives from both natural phenomena and abstract mathematical ideas. An NS classroom is a challenging space, but the improvement of NS teaching and the advancement of NS as a chosen field of study is of importance in the South African landscape.

2.2 NATURAL SCIENCES AS A SUBJECT

Natural Science is defined a systematic way of looking for explanations and connecting the ideas we have. In general, when teaching Natural Science, certain methods of inquiry and investigation are used. The methods include formulating hypotheses, designing, and carrying out experiments to test the hypotheses. Repeated investigations are undertaken, and the methods as well as results are carefully examined and debated before they are accepted as valid (Romankina, Kuznetsova & Fedulova, 2020). Even though NS is divided into strands such as Life and Living, Matter and Materials, Energy and Energy change and Earth and Beyond, it appears as an interconnected school subject, both hypothetically and realistically (DBE, 2011). These disciplines are considered as main streams of sciences because they provide the foundation (Green & Condy, 2018). Du Plessis (2020) argues that awareness of experiences in nature can help build a desire to preserve natural assets, safeguard biological variety, and put up to support development. In this context, the San and other tribes considered as early settlers in southern Africa have knowledge of nature that is important to admire. Dagar and & Yadav (2016) maintain

that NS help learners to achieve knowledge and form views that give them a clear understanding of the relationship between nature, people, scientific knowledge, community, and experimentation. It is therefore important for learners to understand concepts' concerning NS as such knowledge equips them with the basis for taking part in society (Mtsi & Maphosa, 2017). Visser, Juan and Feza (2015) declare that NS prepares learners for active involvement in a democratic society that advocate for the respect of human rights and encourages accountability towards the environment while also preparing learners to partake in profitable activities in the economy.

NS in the senior phase prepares learners for subjects that are offered in the Further Education and Training (FET) including Life Sciences and Physical Sciences (Chemistry and Physics) (DBE, 2011). These subjects are presented through the knowledge areas including Life and Living, Matter and Materials, Energy and Change as well as Planet Earth and Beyond (DBE, 2011). In Grade 9, teachers ought to use much time teaching NS and overseeing learners do NS activities, tasks, and the practical, which are the fundamentals of the teaching and learning process (DBE, 2011). According to the DBE (2011), time that is allocated for NS is: 10 weeks per school term, with 3 hours per week. The entire curriculum of NS in Grade 9 ought to be taught and completed within 34 weeks. During each school term, six hours are used for assessment including 2 weeks for revision of the syllabus as well as preparation for examinations.

For that reason, teaching of NS along other subjects, requires that it be done by qualified teachers as such leads to better development of learners for the outside world of science. Equally important is the need for teachers to specialize, as Mavuru and Ramnarain (2017) append that teachers who specialise on specific subjects including NS, are better equipped to convey out the much-needed teaching strategies. NS, in the SP, serves to prepare learners for the FET subjects, giving rise to a need to explore teachers' experiences in this phase. While there are published studies that focussed on the teaching of NS, few have addressed the experience of Grade 9 teachers teaching Natural Science (Ramnarain, 2016; Bantwini & Feza, 2017; Christensen & Rasmussen, 2017).

2.3 AN OVERVIEW OF HOW NATURAL SCIENCE IS TAUGHT INTERNATIONALLY

Polly, Allman, Casto and Norwood (2017) assert that attaining research-based inquiry in science for all is encouraged in a host of reports based on data collected in the United States of America (USA) as well as in Australia, Canada, Britain, Turkey, and the Netherlands. According to the International Science Council (ISC) (2018), to become scientifically literate, learners should have an understanding not only of concepts on NS but also an understanding of the undertaking of NS and the nature of science. Innovations in NS instruction can be carried out in various ways (Bogar, 2019). Bogar (2019) further pronounce that the current strategies to instruction in schools are distinguished mostly by the presiding position of the teacher. Spaul (2013) accedes to NS educational content and multicultural aspects and how to incorporate different social, cultural, religion, and historical, ethical contexts into NS classroom.

Research by Schreiner (2018) pointed out a decline in students' interest toward science. It was also highlighted that the development of students' conceptual understanding, critical thinking skills, and their expectations of studying for a career within the field of science are highly related to how science is being taught in schools. Together, these findings have resulted in initiatives that aim to provide students with science activities that are both effective and inspiring. The most recent PISA assessment from 2019 reported promising results in comparison to these previous outcomes (e.g., OECD, 2018; Schreiner, 2018) in terms of students' interest toward science. These outcomes lend support for the European Union's decision to continue funding research and development projects that aim to reform the science and mathematics education across Europe. The project aims to support teachers by providing training and resources for implementing inquiry learning in science education. The project also aims to make inquiry learning accessible to all students and educators due to an increasing consensus that science teaching should be based on an inquiry learning approach with a focus on developing understanding about scientific inquiry instead of only focusing on the traditional subject matter (Lamanauskas, 2017). More specifically, the project aims to increase students' interest in science by providing ideas and resources for implementing inquiry learning in schools.

2.4 TEACHING IN A SOUTH AFRICAN CONTEXT

After South Africa attained democratic dispensation in 1994, the country incorporated the largely segregated education system. In particular, schools that were formerly preserved for particular races were made accessible to other races (Spaull, 2013). As a result, township schools were populated with Black learners, who were from poor socio-economic standings, a practice that Shepherd (2013) damned as preserving ethnological separation. A Township school refers to a formation of learning which is in the then undeveloped urban areas located for Blacks during the apartheid era in South Africa. Spaull (2013) perpetuate that most parents are not profitably employed, they subscribe very little through school fees; consequently, majority of schools are normally insufficiently supported and bursting in number of learners. In certain circumstances, learners are continuously terrified of violence and crime.

In addition, studies have shown the frustration that teachers had with the Revised National Curriculum Statement (RNCS) of 2005 (Umalusi, 2018). According to the Human Sciences Research Council (HSRC) report 2019, lack of resources, insufficient time to train teachers as well as poor implementations ranked among concerns that were raised by teachers. When faced with such challenges, teachers rarely perform to their utmost best in the classroom. These include a lack of inspirational programmes and motivation stress teachers, which affects their performance. In addition to that, researchers' show that the RNCS was aggravated the alienation in the results rather than relieving it (Mavuru & Ramaila, 2017). The concerns and challenges about the RNCS made possible for the Curriculum and Assessment Policy Statement (CAPS). CAPS is a learner-focussed curriculum where the teacher's part is to command the learning process in line with the curriculum plan of action (DBE, 2011b). Netshivhumbe and Mudau (2021) assert that the teacher's role in the CAPS has declined. Netshivhumbe and Mudau (2021) added further that teachers can carry-out their responsibilities in classrooms by adhering to the curriculum designers. Nevertheless, they tend to lose their entitlement to implement their type of lessons or regulate by altering the learning programs to suit the circumstances in class or encounter different learning kinds of learners. As a consequence, teachers are underprivileged of their will of being

independent. This indicates the level of difficulties the teachers face when dispensing knowledge in class.

According to Umalusi (2018), there is a decline in the number of learners enrolling in the FET. Poor performance in science has been reported in national, regional, and international tests. The release of the 2015 and 2018 Trends in International Mathematics and Science Study (TIMSS) reports for Grade 9 produced once more tougher debates as South Africans grappled with the grounds behind the recognised below par performance in NS. There exist concern about standards used to assess learners doing science education and science, as shown by the fact that South Africa was ranked exceedingly low in the 1993, 1998/9, 2003, 2007 and 2015. TIMMS (2015) shows that the country is ranked last behind other African countries that spend far less of their budgets on education compared to that spent in it. In addition, Bantwini and Feza's (2017) study serves as clear evidence that teachers in the lower grades need to attend workshops frequently so that they are kept abreast with needs of the curriculum.

2.4.1 The NS curriculum in South Africa

According to Grussendorff, Booyse and Burroughs (2016), in its initial conception, the CAPS were intended to make provision of what teachers are supposed to teach and how to implement assessment. As a comprehensive set of guidelines, the CAPS is concerned with all the subjects taught at basic and senior education levels, including Grade R to Grade 12. Section 2 of the CAPS is concerned with the content and assessment of NS. NS CAPS content is divided in 4 knowledge areas namely: Life and Living, Matter and Materials, Energy and Change, Planet Earth and Beyond (DBE, 2011). Each command area is designed increasingly across the 3 years in the Senior Phase. The knowledge areas are a tool for organising the subject content. According to the CAPS, when teaching NS, it is crucial for learners to link topics to enable them to accomplish a detailed level of understanding. These links must also be made increasingly across grades to all knowledge strands (DBE, 2011:9). Mainly, the main content areas in Grade 9 NS are: Physical Science, Earth Science, and Life Sciences. Among aims of the DBE (2011), effective teaching and learning in Grade 9 NS should improve learners' capacity to complete experiments, analyse problems,

use investigative practical skills in constructing and analysing solutions; gaining knowledge scientifically, and be able to grasp new concepts.

2.5 THEORETICAL FRAMEWORK

In research, a theoretical framework serves different purposes: it assists the researcher to link the study to relevant models and perspectives (Saïdo, Siraj, Nordin & Amedy, 2018). It also enables the researcher to describe the paradigm under which the study is being conducted (Kinvunja & Kuyini, 2017), and it provides guidance regarding the choice of an appropriate research design. Research conducted in the field of teaching can take different perspectives, depending on the objectives the researcher intends to achieve. The current research intends to add to the existing scholarly knowledge on teaching and learning by focusing on the Grade 9 (The third and final year in senior phase) natural sciences (NS) in selected public secondary schools in the Ekurhuleni district of South Africa.

For this study, the intention was to explore grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni. The focus was therefore on theories underlying teachers' experience in the teaching of NS, the resources and tools used in the process of teaching NS at Senior phase, the support needed by teachers of NS, the goals that should orientate teachers' actions, and the teaching strategies to be adopted to achieve these goals (Schoenfeld, 2015).

Among all the theories providing a theoretical framework and background for the current study, Schoenfeld's (2015) theory of teacher decision-making is that from which this study drew relevant components to link the research objectives to the empirical findings and to formulate subsequent recommendations. Schoenfeld (2015) suggested a theory that initially focused on the teaching of mathematics, but which can also be applied to the teaching of other subjects including NS.

Schoenfeld's theory of teachers' decision making is a teacher-oriented approach designed to facilitate the teacher's decision on WHAT a teacher can draw from to facilitate this process (resources), WHY does the person need the resources (goals), and WHAT shapes the decision the person is making in the teaching process (beliefs) (Schoenfeld, 2015). Schoenfeld's theory is therefore based on the assumption that a teacher's decision regarding the teaching process is shaped by

his/her knowledge of the content of the subject to be taught, the goals to be achieved, and his/her beliefs. Schoenfeld's theory of teacher's decision-making provide a valuable theoretical background to the current study based on the assumption that effective teaching of NS largely depends on the knowledge the teacher possesses regarding the subject content, goals by the whole teaching process, and the beliefs that guide the teacher's decisions. Additionally, this theory provides theoretical explanations that describe the notion of self-inquiry, which constitutes one of the main goals behind the teaching of NS.

The strength of Schoenfeld's Theory of Teacher Decision making resides in its assumption that a teacher's decisions (no matter how big or small) are a result of the interaction of resources, beliefs, and goals to be achieved in the teaching process. Sometimes the goals override the teacher's orientations, for example – the teacher knows that group work is a good teaching method, but because they have to finish a section of work for an upcoming term test – their decision would be "chalk and talk" in order to reach the goal which is more pressing at the time. According to Schoenfeld (2015), the concept of planning plays a crucial role in the process of thinking ahead, goal setting, and using methodical strategies to achieve goals and positive outcomes. This theory supports the notion that teaching is a goal directed because the teacher enters the classroom with a lesson plan and certain goals that he /she intends to achieve. During the lesson, the teacher may deviate from the plan due to factors that make themselves apparent - so the teacher makes certain decisions during the lesson. The following concepts are important in understanding teacher decision making resources orientations and goals.

2.5.1 Natural Sciences teacher resources

Teachers' resources mainly consist of knowledge presumably possessed by a teacher about a particular subject and regarded as means deemed necessary in solving a given problem (Schoenfeld, 2015). In addition, Schoenfeld (2015:215) maintains that a teacher's resources consist of metacognition or monitoring and self-regulation which can be useful in problem solving, implementing plans, and evaluating progress made. Schoenfeld (2015) also asserts that a teacher's knowledge is very important in bringing the content into the classroom. A teacher

with relevant knowledge resources has a greater advantage over the teacher with limited knowledge resources.

However, resources also refer to the physical teaching resources at the disposal of a teacher. The nature of NS teaching requires that a teacher use resources that add value to the subject and relate to the environment that is outside the classroom (Department of Basic Education (DBE), 2016). In determining what resources teachers have available to them, the following are relevant and need to be discussed: curriculum and policy; content knowledge and pedagogical content knowledge; physical resources; assessment; and practical work. This is not an exhaustive list of teachers resources, but deemed broad enough to include most resources needed for teaching effectively.

2.5.1.1 Curriculum and assessment policy statement as teacher resource

In the Policy statement on Curriculum and assessment (CAPS) (2011) documents, content is specified which to a large extent prescribes what, when, and for how long teachers must teach certain topics on NS. Having such a document as a resource can be both useful and constraining in teacher decision making. Garba, Waweru & Kaugi, (2019) argue that there are various reasons that affect teachers planning, both inside and outside the classroom. According to Durdella (2019), curriculums play a vital role in the teachers' decision making in the classroom. The curriculum specifies certain criteria through policy guide. Most teachers feel restricted by such policies and documents. Teachers perceive that the Department makes all the decisions concerning their work schedules. Durdella (2019) put forward a strong argument that teachers form the basis for policymaking as they are the front-runners of the curriculum. In my experiences as a teacher, teachers find the content tightly packed and time frames rushed. The nature of the curriculum has an impact on their decision making in the classroom.

Miller and Crabtree (2023) explain that investigative realities obstruct successful teacher planning such as the gap between the curriculum and the classroom requirements; disparities between guidance and strategies; difficulties in using a format that is standardised for all the required processes in planning; and teacher development, resources and time allocated for NS teaching including classroom management. All these problems have the potential to derail the effectiveness of

teachers' planning practices, and as a result, plans may not accomplish the intended teaching outcomes. Bryne (2021:76) argues that during the decision-making process teachers make changes to the curriculum to suit the needs of the learners. This allows the teacher opportunities to formulate decisions about the curriculum implementation.

2.5.1.2 Content knowledge

According to McMillan and Schumacher (2010), a teacher's decision making can be influenced by: attitudes about the subject, the beliefs of the teacher, his or her perceptions, and most importantly the knowledge a teacher has about the subject. McMillan and Schumacher (2010) argue that teachers with strong knowledge of a particular subject develop a pool of inquiries to explore the learners' knowledge. Bangao (2020:72) argue further that if teachers have problems in understanding some of the topics in the subjects that they teach, it gives cause for concern around their content knowledge. It is distinctly possible that the level of content knowledge a teacher has, affects the decisions make in the classroom.

2.5.1.3 Pedagogical content knowledge (PCK) decision-making

Shulman (1987) commended PCK as a special combination of content and pedagogy incorporating knowledge of the presentation applicable for teaching a subject and knowledge of misunderstanding and problems with the subject commonly experienced by learners. Shulman (1987) define PCK as comprising: The most applicable forms of demonstration of those ideas, the most powerful ideologies, illustrations, examples, explanations, and exhibitions in a word, the most applicable ways of representing and drawing up the subject that make it accessible to others. According to Shulman (1987), pedagogical content knowledge also incorporates an understanding of what constructs the learning of particular topics, easy or difficult, and an understanding of the formation and assumptions that learners of different ages and frameworks bring with them to the learning of those most regularly taught topics and lessons. The main belief of PCK is that in order for learners to grasp whatever content that is taught and achieve positive outcomes of any teaching process, the teacher's ability to integrate the content of what is being taught to the method of teaching play a vital role (Fedesco, Bonem, Wang & Henares, 2019). PCK can provide a meta-analytical explanation on why it is important for teachers of NS to

master the content of the subject and to use appropriate pedagogical process in ensuring a successful teaching and learning of the subject (Fedesco, Bonem, Wang, & Henares, 2019).

In the context of the current study, the notion of PCK is used from a teacher's experience perspective, where it refers to knowledge about how the subject's content is to be taught. This knowledge is only possessed by teachers and is often hidden. Most of the time, teachers do not realise that they have it or that it is important (Rollinick & Mavhunga, 2019). According to Schoenfeld (2015), teaching needs that a teacher possesses the requisite knowledge in all forms. It affects immediate and long-term decision making in the classroom. Decision-making involves goal-oriented behaviour drawing on available resources and making decisions in order to achieve outcomes teaching value.

Figure 1: Teacher's decision-making process

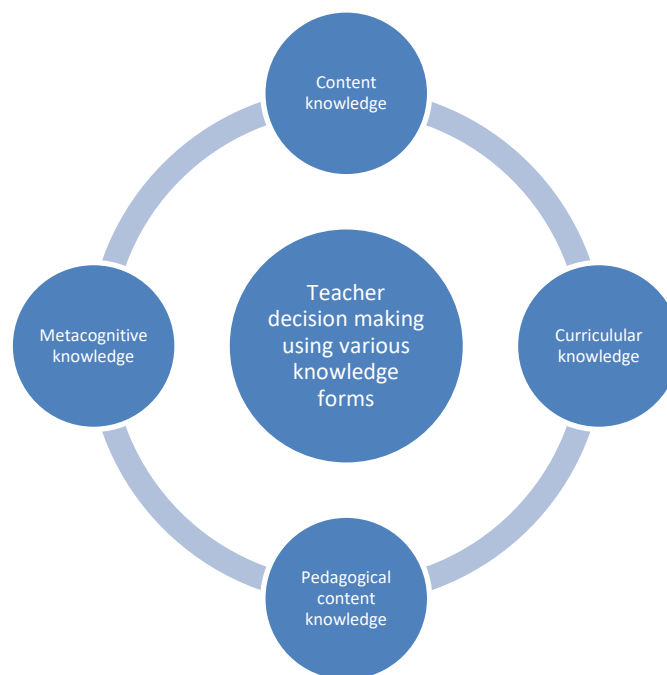


FIG. 1: A model of teachers' knowledge

Fig.1 represents how teacher knowledge influence a teacher's decision-making. The teacher's knowledge may have an impact on the learners. The depth of content knowledge that a teacher has tend to influence teaching goals, supported by the subject matter, knowledge of curriculum and Metacognition which aid the teacher to make thoughtful decisions.

2.5.1.4 NS practical work

According to the National Earth Science Teachers Association NESTA (2019) survey, 99% of the selected NS teachers were of the belief that exploration learning determines learners' performance and achievement. According to Bryne (2021), some educators who teach Natural Science denoted that practical work tend to assist learners to understand the subject better. On the other hand, other teachers suggested that a science-based approach process (this means, a teaching strategy that is concerted on investigative skills) would lead to a much better understanding of NS concepts. Bryne (2021) lays out confirmation of successful practice in the use of practical investigation. Their study recommends that teachers should allow learners to orchestrate projects as well as handle laboratory equipment. According to Christensen and Rasmussen (2021), various researchers emphasised that learners would be cognizant of the nature of NS if they were to acknowledge the limitations and importance of practical assessment activities. Christensen and Rasmussen (2021) further elucidate that a teacher plays an important role in helping learners to differentiate their findings with their peers. Essentially, it is important to acquire knowledge from the teacher based on the teachers PCK practical work. Practical tasks enhance learners' proficiency and add value to the knowledge and skill for NS (CAPS, 2011). In addition to that, during a practical, learners are afforded an opportunity to utilise materials, construct, and handle equipment. Through practical investigations, learners are able to demonstrate specific practical skills (Mavuru & Ramaila, 2019). The CAPS (2011) document advocates that any practical task should make provision to present various opportunities for learners to perform diverse practical skills. Mtsi and Maphosa (2017) assert that in NS, when projects and investigations are executed correctly, they can stimulate and construct the learners' enquiry and their ability to initiate. Mavuru and Ramaila (2017) further append that practical can encourage monitoring and realistic proficiency while building up the inquiring skills and the comprehension of the interaction between NS, technology, society and natural habitat.

2.5.1.5 Assessment as a teacher resource

According to the CAPS (2011) document, assessment forms a part of teacher resource in NS as it promotes exploratory study, for example, science excursions

and practicals. Tests and examinations can promote the acquisition of knowledge and concepts. Mtsi and Maphosa (2017) attest that assessment provides the teacher with important information about how learners are progressing and how they understand a particular topic. Teachers use this information to plan and prepare for successful NS teaching and therefore assessment is an important teacher resource. In other words, assessment forms part of the resources teachers can use to make decisions about teaching in their NS classrooms.

Singh, James, Paul, and Bolar (2022) assert that assessment intends to inform teachers on the learners' progress. Singh *et al* (2022) identified that written tests and examinations can help a teacher to improve learning. According to the DBE (2011, 2016), these test-based instruments are effective when used along other mechanisms such as projects, research tasks as well as scientific investigations. The Department of Basic Education informs teachers to understand the importance of assessment by conducting workshops. In 2016 and 2017, the Department of Education organised PLC (Professional Learning Communities') workshops to empower NS teachers in assessment practices. The magnitude of these assessment workshops were not interpreted into actuality. Somehow, this assessment practices still remains largely unknown at township schools (Mavuru & Ramaila, 2017).

2.5.1.6 Physical instructional resources

Learning and Teaching Support Material (LTSM) required for teaching NS in South African secondary schools are stipulated for each topic in order to assist teachers with teaching strategies. According to Bantwini (2015), most teachers prefer using textbooks as a standard tool for basis of teaching NS. According to the Department of Basic education (DBE, 2012), a list of available resources has been suggested as a guide, but this does not limit teachers from being innovative in finding alternative tools and methods. According to Mudau and Tabane (2015), workstations for practical work are important for teaching and learning in NS. Learners' participation in practical in the laboratories helps them to improve greatly comprehend scientific investigations. In this regard, the quality of teaching NS would improve where there are available resources and infrastructure.

Using technology in NS classroom could help the teacher to emphasise new concepts by conducting practical as a self-inquiry strategy. This includes overheard

projectors and computer simulations. Garba, Waweru and Kaugi (2019) propose that using new technologies can improve in the transmission between teachers and learners but highlighted that using technology may not be achieved in underprivileged circumstances. When using Practical simulations in the classroom, for instance, allows learners to comprehend with practical instruction. Consequently, learners may understand the concepts better and can practically illustrate their skills (Garba, Waweru & Kaugi, 2019), and using technology can ensure the level of NS is well presented where learners thinking can be stimulated to complete their given tasks.

NS teachers access to and competence in using LTMS would impact decision making and how the NS curriculum is implemented in the classroom.

2.5.2 NS teacher orientation and beliefs

According to Cui and Zhou (2018), beliefs are propositions and manifestations of the real world. This verifies how individuals view themselves and others. They are personal verification about how an individual sees himself/herself and others, and have an emotional and reflective component. Furthermore, they are established from separate derived knowledge, which are distinctive experiences.

Nind (2021) asserts that beliefs have an effect on the accession and description of understanding. In education, beliefs control how the teachers design teaching and learning activities. Nind (2021) further added that beliefs influence a teacher's practices since beliefs work as formations that assemble thinking. This influence teachers' intellect of the real world and could affect teachers' decision-making in association with others. Teachers need to acknowledge their beliefs and to have a meaning of experience in order to interchange their beliefs with others (Nind, 2021). In this regard, Cui and Zhou (2018) added that when teachers are confronted with more challenging beliefs, they interrogate their own beliefs and accept that their beliefs are not acceptable: and simultaneously they get provided with guidance oriented towards their personal goals. Dhurumraj, Mavuru and Ramaila (2020) contend that teachers are faced with a difficult task in interpreting practices that are new as they tend to grip with their initial ways of doing things. This can prove to be a challenge to compel teachers interprets experience based on different perspectives.

The study investigate teachers' beliefs influence their decision-making when implementing teaching and learning strategies when teaching Grade 9 NS based on the CAPS curriculum.

2.5.3 Goals

Xia (2019) contends that in the process of achieving effective learning, it is important to define teaching goals as these enhance learning outcomes and motivate the entire learning process. Bangao (2020:172) concur that in the teaching and learning context, goals can be defined as intended learning outcomes that education should plan based on the competence learners are intended to develop. This definition of learning goals is in line with the conception goals provided by Schoenfeld (2015) where goals serve the purpose of fostering critical thinking in subjects such as mathematics and NS. Teachers may set goals beforehand when they write up a lesson plan, but these may change as the lesson unfolds and the teacher does in some case make decisions based on resources and orientations.

Schoenfeld (2015) explains that a teacher's decision-making process forms a central core of many events observed in the classroom. Schoenfeld (2015) further illustrated that sometimes teachers' decision is based on what is actually happening i.e. it is influenced by current situation. A study by Nguyen (2018) found that teachers deviate from their lesson planning due to the dynamic changes in the classroom. According to Mavuru and Ramaila (2017), teaching appears to be a complex challenging practice where everything happens rapidly in a changing environment. According to Schoenfeld (2015), the basis for decision-making is constructed in simplified reality models and in most cases, teachers should follow their instructional objectives. Schoenfeld (2015) as cited by Bozkuş (2021) found that teachers make decision in the classroom to execute their plans to attain the level of self-confidence, direction, and classroom management. Mavuru and Ramnarain (2017) further explain that what happens in the classrooms is the result of actively and compound set of interplay and relations between arrangement both outside and within the classroom. A teacher's selection of content is prescribed by policy (DBE, 2011). The decision-making for lesson plans is highly influenced by teachers (Schoenfeld, 2015). According to Bantwini (2019), in most cases teachers hardly give any

documented lesson plans and consequently concentrate meeting the schedules that the department requires them to teach according to prescription.

2.4.3.1 Curriculum goals

The promulgation of CAPS emphasises that teachers need to plan and develop lessons that include objectives, tasks, assessment, teaching strategies, integrated school timetable which accommodates NS time allocation (DBE, 2016). Mtsi & Maphosa (2018) proclaim that the curriculum urges the teacher to cover the knowledge area within a specified timeframe. According to DBE (2011), teachers must design a planning structure for the classroom, in which particular topics and assessment activities are designed for that particular school calendar, and that lesson plans must be carried out weekly, quarterly per term and year plan. The planning of CAPS Grade 9 NS in a school year is prescribed by both short term and long-term objectives. For example, the ATP is relevant on a long-term basis and lesson plans on a short-term basis. Part of teaching and learning curricular is a blend of the work schedules for Grade 9 as stipulated in the policy document. Lastly, curriculum goals play a crucial role in the teachers' decision –making (Schoenfeld, 2015).

2.5.3.2 The role of district subject advisors

Bantwini (2018) asserts that teachers need to be supported, including by their district, in terms of their professional growth, in order to be developed professionally. Bantwini further explains that visits to classrooms by district advisors should focus more on supporting teachers than on criticising their efforts. As curriculum specialist, Subject Advisors must act as the mediators linking the curriculum policy and policy implementation in the classroom (Bantwini & Feza, 2017). According to Umalusi (2017), currently, subject advisors act as intermediaries between curriculum policy and implementation of the policy in the classroom. Bantwini (2018) further added that most teachers who teach in basic schools in South Africa do not plan their lessons before going to teach in their classrooms. This lack of lesson planning is due to teacher unions restricting access subject advisors from visiting teachers when teaching in classrooms. The teachers' unions believe that the process of district subject advisors visiting teachers in their classrooms is unfair and victimises teachers. Irrespective of the subjects, advisors play a dual role namely, support and

training and/or adding administrative tasks. Subject advisors are far more than a resource for NS teachers that influence NS teacher decision-making (Mudau & Tabane, 2018).

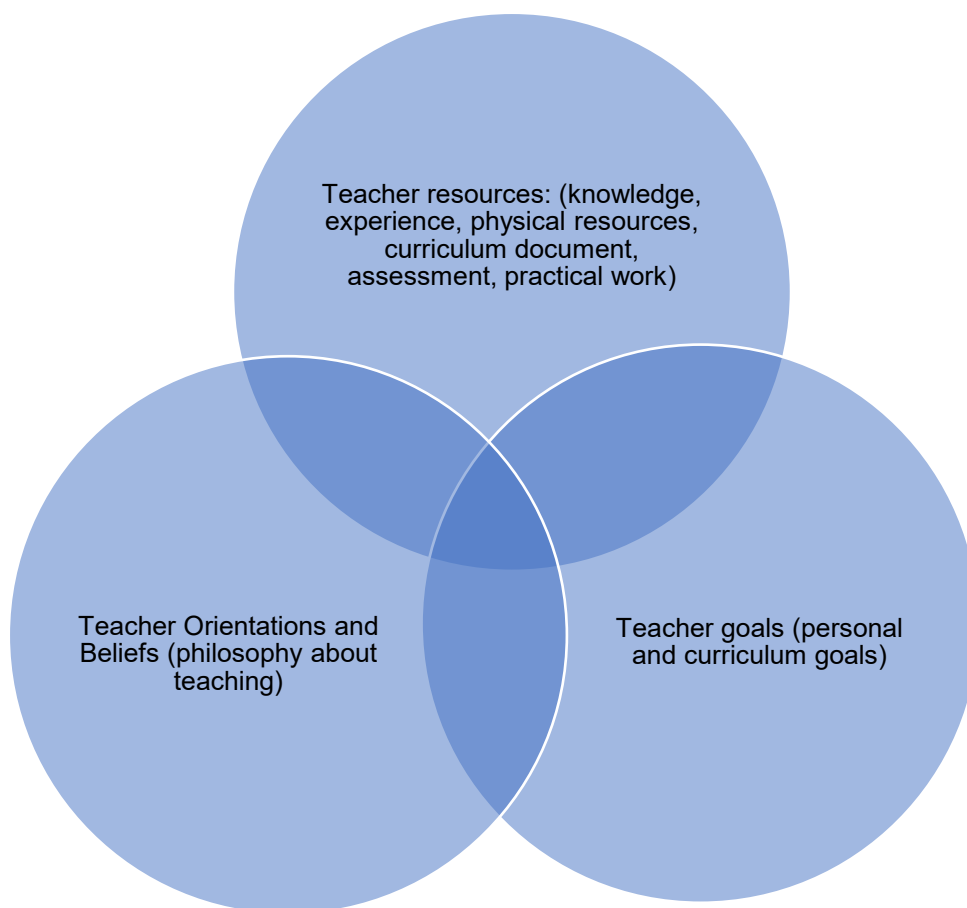
2.5.3.3 School management

A study by Heeralal (2017) found that there is inadequacy of training and professional development of teachers as well as a lack of accessible resources and support for teachers within science departments. Taylor (2018) argues that school principals and School Governing Bodies (SGB) should appoint heads of department on the basis of subject knowledge and given opportunities for to enhance their content knowledge as well as pedagogic content knowledge. Reports show that in some cases, HODs are appointed without the requisite subject expertise or knowledge, which is an improper appointment. A report by Umalusi (2016, 2017) revealed that several teachers are not teaching within their scope of practice. School management teams should ensure that teachers are suitable for their positions as NS teachers or NS heads and should provide support and advocate for regulate professional development of all their NS staff.

2.5.3.4 Parental support

Klenke, Martin and Wallace (2016) assert that the involvement of parents and family in the education of children play a crucial part in moulding their behaviour towards the learning of science. A study conducted by Sitole (2018) indicated that parents rarely get involved in learners' academic programmes. The researcher revealed that parents that are engaged in their children's work show a much improved academic performance and brings a much more sense of confidence to the learners. Topor, Keane and Sheltoon (2019) admitted that parents influence learners to choose science due to family background as opposed to their children's choices. The family history has an impact in learners choosing certain fields and courses. Eventually, children grow up being forced to study that is neither of their choice or interest. This according to Klenke, Martin and Wallace (2016) in return reduces the learners' ability to think independently and motivation to study. The researchers further attest that parents should know their children's interest and aspirations with their developments, so that proper plan of action can promote their future career.

Figure 2: Teacher resources, orientations, and goals



*FIG.2 showing teacher decision making for Natural sciences
(Adopted from Schoenfeld, 2015)*

2.6 TEACHER DECISIONS FOR EFFECTIVE STRATEGIES IN TEACHING NATURAL SCIENCE AT SENIOR PHASE

Teachers' decisions in teaching NS involve techniques, methods, and procedures to achieve desired learning objectives (Bhalli, Sattar & Asif, 2018). Bhalli, Sattar and Asif (2018) argue that the most effective teaching strategies are that which involve learner participation in the learning process. That is to say, the teacher must ensure that when delivering the content, learners are actively involved. This was expressed by AbuGado & Isha (2020) who posited that teachers could engage in subject content by being flexible and that way, they are able to gain knowledge and be equipped with various teaching strategies. Learners are unique, so generalising in all lessons would not ensure or promote equal learning opportunities among them. Bangao (2020) added that appropriate interactions between the learners create

learning opportunities. The contexts for strategies in teaching NS are discussed as below:

2.6.1 Hands-on inquiry-based practical activities

According to AbuGado and Isha (2020), significant improvements in learners' academic performance are brought about by hands-on activities and bring positive attitude towards science. Therefore, there is no doubt that practical activities ought to be performed on a regular basis. Furthermore, the practical should be one that is hands-on as such practical work contributes to meaningful learning when performed on a regular basis. According to Makhubele and Luneta (2018), hands-on classroom activities lead to self-discovery, exploration, and experimentation, which help learners to be active participants. The researchers added that motivation of learners is enhanced through experiencing new activities when performed in laboratories. It can be said therefore that the adoption of a hands-on practical is a brilliant way to promote effective teaching of NS, and can be conducted various ways to build models (building models of different planets).

2.6.2 Real-life physical environment

Van der Berg (2018) indicates that when the NS teachers formulate or plan to teach, they must consider contextual factors that differ from school to school, and from class to class. This is crucial as the plan ought to take into consideration the likely varied physical environment. Van der Berg (2018) further reiterates that during NS lessons, learners must conceptualise that science is what they experience in their daily lives (photosynthesis). Visser, Juan, & Feza (2018) add that whether natural or human-derived, every aspect of a learner's life involves science. Learners can also relate science from their own bodies and the immediate environment.

2.6.3 Interaction between teachers and learners

Cui and Zhou (2018) suggest that teachers can motivate their learners by building relationships through interactions. A study by Ohlson de Fine (2017) confirmed that building strong relationships can motivate learners. According to Ohlson de Fine (2017), interaction between teachers and learners motivate learners to take part in school activities, especially that which happen in the classroom. Moreover, when learners are learning in the classroom, a teacher can initiate a level of interaction

between the teacher and learners as well as between learners. Sangma, Shantibala, Akoijam, Maisnam, Visi and Vanlalduhsaki (2018) suggested that teacher-learner interaction is a reckoning force that could play a crucial role in the development of the learners. Hofstein (2017) asserts that it is crucial for teachers to encourage positive interactions with and among learners and encourage their participation in class. Hofstein (2017) concludes that teachers' behavioural activities can have an effect on learners' social and academic achievements.

2.6.4 Equipment and laboratories

NS is different from other subjects largely because learners understand its concepts through the use of and exploring scientific tools. Equipment and laboratories go beyond conventional classroom teaching (AbuGado & Isha, 2020). A study conducted by Mavuru and Ramnarain, (2017) affirm that shortage of equipment along the lack of laboratory spaces make the development of scientific skills in NS impossible. The teaching and learning of NS involves handling, seeing and manipulating real object as well as learning materials. Learning in the classroom would be enhanced when learners actually used their practical skills through physical processes (Makgato & Mji, 2018). Furthermore, conducting laboratory experiments help encourage a deeper understanding and learners are able to retain much of the knowledge. Bantwini & Feza (2018) argue that some basic school environments such as laboratories, libraries, and basic services stimulate learners' interest. In addition, this could have an influence on the competence of learners in NS. As noted by Ngema, lack of resources in schools does not allow teachers to teach and conduct a practical or experiment especially with a larger group of students due to lack of space.

A recent study by Dhurumraj (2023) explains that it is hard to imagine learning about NS without doing a practical or investigations. Dhurumraj added that investigation underpins all scientific skill and interpretation, and those laboratory spaces are pragmatic set-up for teaching and learning science.

2.6.5 Seating arrangement

Findings of a recent study by Green and Condy (2018) suggest that learners prefer more flexible classroom settings and learning spaces that are more learner centred. The focus is on the learners' construction of knowledge. Generally, arrangements

constructed in a learner-learner design, focuses on the learners constructing knowledge. However, in reality, most township schools (as in the context of this study) are designed to accommodate large and overcrowded learners. Green and Condy (2018) elucidate that arranging the classroom in small groups can enhance interaction between learners due to accessibility and proximity positions between learners. For instance, it is useful during analysing data and group tasks.

Seating arrangement can have an effect in the learners' academic progress and development; however, this depends on the type of activities the learners partake in. Consequently, the nature of the activities imposes the behaviour of learners, and seating arrangements are not only important for learners' academic development, but also for their social development and behaviour in the classroom (Heeralal, 2017).

2.6.6 Projects as co-operative strategy

Nkosi (2018) argues that collaborating on projects is also good methods that enhance teaching of NS. It involves assembling and arranging information about a belief and denoting it in a tangible form. Learners can complete projects individually, in pairs or as a group; such an approach encourages cooperative learning. Nkosi (2018) considered that a preferred teaching strategy among NS teachers is co-operative learning. Teachers that are experienced in teaching NS consider co-operative learning as one of effective instructional methods that permits learners to work together in solving NS problems, as it improves their level of thinking and promote academic achievement. Zimmerman and Smit (2014) suggest that major aspects in project learning strategy is interconnection when learners work together to achieve the group objectives; Individuals to account, when each team member is considered accountable for his or her own mastering of the work, successively asserts to the purpose of the team objectives.

2.6.7 Field trips

Undertaking field trips is considered one of mechanisms by which learners acquire knowledge of NS, and how the subject can be learned (Rapley & Rees, 2018). Fairly, each school when NS is taught should make arrangements for learners to undertake the trip for educational purposes. Often, during field trips, learners interact with the outside world and experience the reality of how things operate. This allows them to

interact with the real world outside the settings of their classrooms. Rapley and Rees (2018) further state that field trips improve the cognitive and effective development of learners, the quality of education, motivation and positive attitude towards the subject. Sitole (2018) reiterates that this method is successful towards teaching especially when field trips involve taking learners to nearby Science Centres and in the case of schools in Gauteng, the Johannesburg Water purification site, Scie-Bono as well as the Cradle of Humankind near Maropeng in Sterkfontein caves. Learners get an opportunity to watch demonstrations and exhibitions linked to NS.

2.7 CHAPTER SUMMARY

In Chapter two, the researcher reviewed literature on NS teaching and outlined the theoretical framework of the study. The discussion was centred on the role of factors relevant to NS teaching. Also, cited literature included a theory for understanding NS teacher experiences in teaching NS. The theory discussed in this chapter provides a meta-analytical explanation of NS teachers' experiences in their day-to-day teaching. The claim made by Schoenfeld (2015) is that the theory of teaching-in-context brings forth a widespread investigative setting for understanding why and how teachers make the choices within their teaching settings, as a function of their knowledge, goals, and beliefs. The conclusion that can be drawn from the content of this chapter is that teachers' experience is a complex and important notion. The research methodology, research design, research methods, are presented and analysed in chapter three of the study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter two described the literature review and theoretical framework within the investigation of the experiences of Natural Sciences (NS) teachers when teaching Grade 9 learners. In this chapter, a qualitative inquiry is made and encompasses the process of making choices by identifying a decision, understanding and implementing of NS curriculum by teachers in Ekurhuleni. To address the identified research issues, this study intended to answer the following research questions.

The main research question:

- What are Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS)?

The sub-questions are as follows:

- How do teacher resources, orientations and goals affect Natural Sciences teaching in Grade 9?
- To what extent are Grade 9 teachers supported in developing resources, orientations, and goals for teaching NS in Grade 9?

3.2 RATIONALE FOR THIS EMPIRICAL RESEARCH

Okesina (2020) asserts that empirical research emanates from noticeable and measurable eventuality and knowledge acquired from actual experience comparatively from theory. Empirical research can also be described as a qualitative technique of data collection that intends to observe, interrelate, and comprehend people while they are in a natural setting (Durdella, 2019). For example, in this study, the researcher considered to observe the behaviour of teachers in their natural surroundings. This type of research determines the major issue of gaps in data. Very frequently, there is a restriction to no data about a topic in research, especially in a particular environment. According to Durdella (2019), the challenge might be known or suspected but there is no way to verify this without primary research and data. Furthermore, Durdella (2019) adds that conducting field research helps to plug in gaps in data and helps in gathering supporting data which was why it was regarded

appropriate in this study. The benefits of this empirical research are the close cooperation between the researcher and the participants while allowing participants to ascertain their experiences (Kivunja & Kuyini, 2020). Through their testimonies, the participants were capable to narrate their perspective of actuality and this permitted the researcher to get the better of the participants' activities and behaviours (Hewson, 2021).

The researcher opted to go along with qualitative research which was interested in real and existing phenomena of science teaching in schools, was conducted within the school environment and its natural set-up. The researcher's motive for this was to explore profound data from the teachers as real entrants.

3.3 RESEARCH DESIGN

Research design is described as a proposition designed by the researcher to gather and examine verification that makes it feasible for a researcher to respond to the questions presented (Creswell, 2014). The research design's purpose correlates to the recognition of the course of action and related to the necessity essential to take on a study and to highlight the significance of features in these courses of action to guarantee their acceptability, fairness and correctness (Bhalli, Sattar & Asif, 2016). To address a study topic, Creswell (2014) asserts that the research design is a plan for choosing participants, research locations, and data collection methods. Therefore, the research design outlines the particular individuals that a research ought to focus on as well as when, where, and how. Research can be conducted using one of three ways: mixed methodologies, qualitative approaches, or quantitative approaches (Creswell & Creswell, 2018:61). Phenomenology, anecdotal biographies, case studies, grounded theories, or ethnographic research designs may be employed, depending on the research methodology (Creswell & Creswell, 2018:61). This study used a qualitative method and a case study design to investigate the Grade 9 NS teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni.

The paradigm, approach and strategy, data collecting and analysis, measures of trustworthiness, and ethical issues are outlined in the research design process chart (see Figure 3.1).

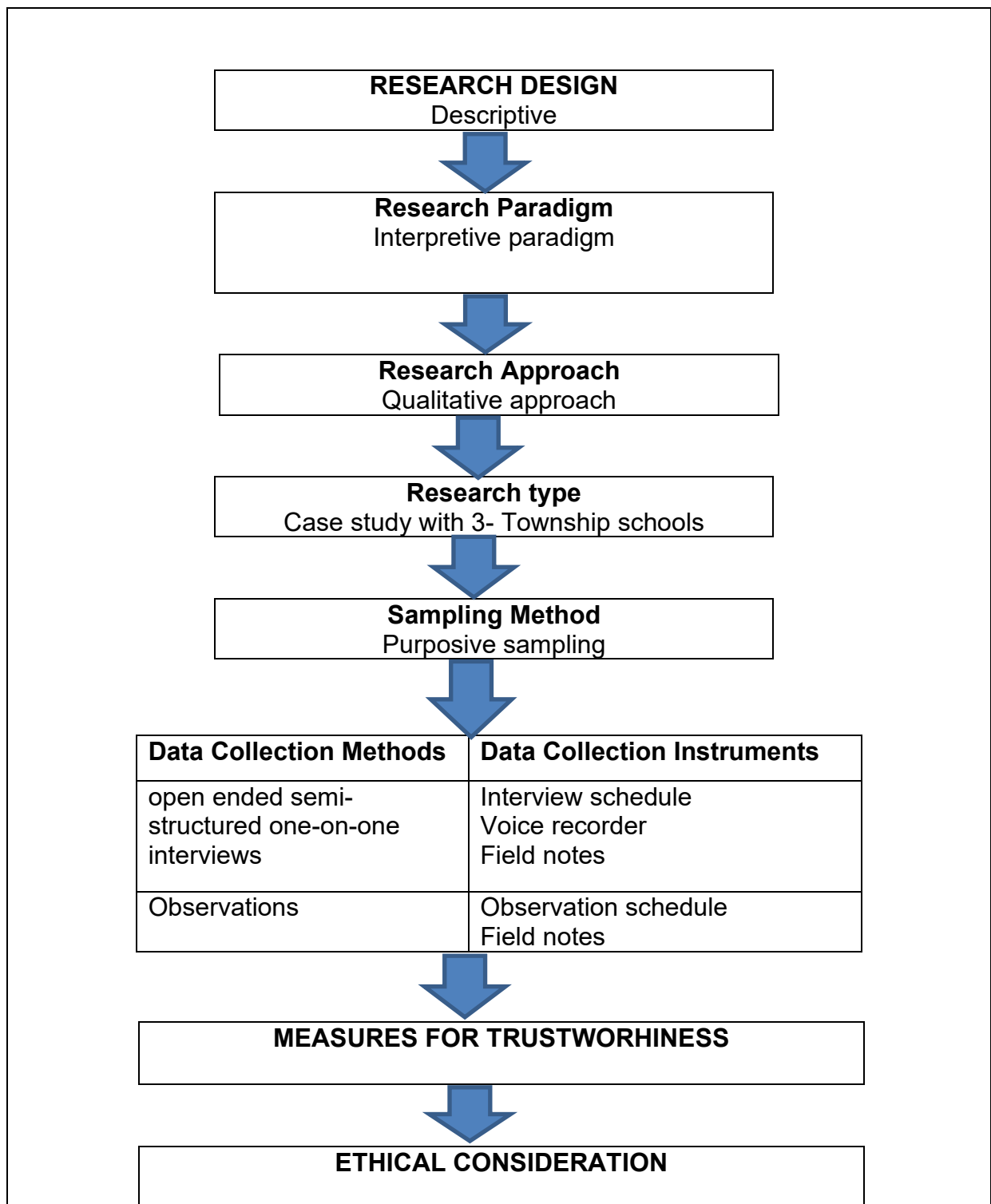


Figure 3.1: The chapter three diagrammatical summary

3.3.1 Research paradigm

Research paradigm is defined as a theoretical mind set (Kivunja and Kuyini, 2017). It guides the researcher on how the study should be conducted and interpreted

(Okesina, 2020). It is a way through which a researcher is influenced by philosophical orientation and thinking. Guba and Lincoln (1994) describe paradigm as a fundamental system or a perspective that counsels a researcher. According to Kivunja and Kuyini (2017), research paradigm is classified into three namely: Positivism, Interpretivism, and critical theory. Positivist paradigm adopts the use of quantitative research approach while critical theory provides a research approach that clarifies understanding of the actual behaviour of participants. This study followed an Interpretivist paradigm perspective. This paradigm confirms that attention is assigned on understanding the participants and their elucidation of their world. The Interpretivist paradigm was appropriate for this study since it concerns the personal feelings and opinions of participants of a research study (Okesina, 2020). In the case of this study, the researcher expected that the subjective experiences of teachers would give him a thorough understanding of developing resources, orientations, and goals in NS (Lincoln & Guba, 1994). Okesina (2020) states further that it is therefore very important that when conducting research, the paradigm is clearly defined.

3.3.1.1 Interpretivist

According to Nguyen (2019), interpretative research calls attention to the significance of comprehending participants' points of view. In addition, it permits a researcher to investigate the settings of participants. With the interpretive paradigm, the focus is to consider the conditions from the participants' viewpoint (Nguyen, 2019). The aim is to apprehend the reasoning behind and to give chances for contributors to express their viewpoints (Nguyen, 2019). This offers a researcher an in-depth understanding of the data from the research participants (Kivunja & Kuyini, 2017). Actuality in the Interpretivist perspective can be inspected and confirmed through human relations and significant actions. Reality is incidentally confirmed through participants' explanation and is instinctive (Okesina, 2020). The interpretation of participants is preferred more than the objective monitoring of the action (Ponelis, 2015:538). This paradigm advocates that it is obligatory to examine social activity from the participants' point of (Kivunja & Kuyini, 2017). It recognizes the rights of the participants to recreate their interpretations, to comprehend and keep away from misrepresenting them (Makombe, 2017). Assembling people's information encompasses meanings and apprehension they have (Miller & Crabtree,

2023). Understanding reality is consequently often considered throughout the research (Okesina, 2020). As a consequence of that, the researcher interviewed teachers to make it possible to comprehend the essence of the truth about the NS challenges they encounter every day.

- **Ontological perspective**

According to Stahl and King (2020), ontology is defined as the study of the essence of existence or reality. An ontological perspective deal with the nature and essence of the philosophy investigated and gives a researcher reality to understanding the data gathered. Furthermore, it provides an understanding of things that involves the reality to a paradigm. Okesina (2020) attests that the ontology of the research refer to the basic conceptualization which amount to arguments or themes that the researcher analyse to assimilate the data collected. Particularly, the research findings are collected on these themes for analysis and interpretation.

- **Epistemological perspective**

Nguyen (2019) proclaims that in research paradigm, what counts as knowledge and truth is the epistemology of how we know the truth or reality. It is the philosophical analysis of the nature of knowledge and the conditions required for a belief to constitute knowledge, such as truth and justification. This is followed by the subjective epistemology asserts that knowledge is brought by the interactions of the researcher and the participants (Kivunja & Kuyini, 2020). A comparative epistemology embraces the researcher who establishes what is applicable based on the research questions.

3.3.2 Research approach

Basically, there are three types of research approaches or strategies, that is; the quantitative approach, the qualitative approach, and the mix method approach. Accordingly, what is crucial is the choice of a suitable research approach for a specified inquiry of the research (Makombe. 2017). Makombe (2017) further added that each research approach has distinctive features with regard to research designs and methods. Although the research approach is the widespread technique the researcher seek to explain the problems heightened to link up the aims and objectives of the research (Melnikovas, 2018:39). The strategy a researcher selects to set out the research questions influences the philosophy employed in the

research. The experimental designs that are incorporated in the qualitative approach benefits the approaches, including numerical instruments for data collection (Makombe, 2017). This includes questionnaire, tests, and measurements. In addition, quantitative approach gathers numerical data and makes use of analytical statistics like theory of testing; include random sampling and also large samples (Creswell, 2014).

This study used a qualitative approach. The qualitative approach investigates a problem in deepness and comes up with comprehensive answers (Creswell, 2014). It assists with an understanding of how human beings perceive matters differently and different participants supply developing views with different information (Stahl & King, 2020). Stahl & King (2020) further added that qualitative research approach is a thorough and comprehensive description of the way people view the world, their communities and their organizations. Flick (2018) maintains that research enquiries should be drawn up plainly and unequivocal as conceivable. Consequently, the research questions should be answered by using qualitative data-collection instruments including interviews since a quantitative study could not address them adequately (Creswell, 2010). With regard to this study, individual semi-structured interviews with teachers were conducted.

According to Flick (2018), a qualitative approach is arranged through careful planning. In addition, it permits the participants to talk using their own expressions, and every behaviour expression and signal is notable in the qualitative researcher point of view (Belik & Yarden, 2016). The researcher obtains participants point of view because of the direct implication in the research (Belik & Yarden, 2016). This study used qualitative methods where real people (teachers) in real situations (class teaching) were involved, and it followed a methodology that allowed the teacher participants to reveal their experiences and perspectives of curriculum implementation. The researcher visited the sites to observe and elucidate actions, earned new information, and procured connotation from occurrences as observed by the participants (Belik & Yarden, 2016). The research strategy is discussed in the next part.

3.3.3 Research design

Crabtree and Miller (2023) define a research design as research methods that provide researchers chances to investigate or define a philosophical context using a various source data. This permits the researcher to investigate individuals or organizations, through complex mediations, programs, communities and relationships, communities (Crabtree & Miller, 2023). These authors further added that one of the benefits of this approach is the close interaction between the researcher and the participants while allowing participants to tell their stories (Crabtree & Miller, 2023). The participants narrate their experiences of their reality and allow the researcher to have a better understanding about the participants' activities (Cresswell, 2018). Consequently, this study observed a case study approach as it will investigate the participants' real stories and provided the researcher to acquire an in-depth of teachers' experiences.

3.4 RESEARCH METHODS

Christensen and Rasmussen (2021) assert that research methods are the strategies or techniques employed in the collection of data or proof for analysis in order to explore new data or generate a better understanding of a discussion. According to Makombe (2017), the center of research questions to be investigated lead the researcher on which instruments or methods to choose. The research methods in this study discussed how participants were selected and instruments used to collect data.

3.4.1 Selection of participants

Bryne (2021) argues that there is no one-size fits all technique or level of no preference and exception in selection of participants. Consequently, researchers have designed different approaches for selecting participants' samples. Bryne (2021) further added that various sampling techniques are applicable for different objectives in distinct settings. Typically, time constraints, accessibility and costs impose limits on the researchers from gathering data from the population (Bozkuş, 2021). So as to guarantee that the data collected is representative of the general population under consideration; researchers regularly collect data from smaller samples or subgroup of the larger population. Bozkuş (2021) refer a sample as a small group or subgroup.

3.4.1.1 Sampling techniques

Sampling techniques are methods for choosing a sample from a specific group of individuals (Hennink, Kaiser & Weber, 2019). Farrugia (2019) further explains that individuals are sampled carefully but not randomly. Additionally, these guidelines are predominantly selected qualitatively (Braune, Clarke, Terry & Hayfield, 2019). Non probability sampling was employed in this study, and this approach enabled the researcher to offer detailed information about the individuals with rich data (Farrugia, 2019). On the other hand, the purpose on sampling using no-probability is to find information-rich cases and sites from which the researcher can learn more about the research topic, and be able to collect data from the sample that represents the larger population (Farrugia, 2019). This study employed purposive sampling non-probability approach. For this reason, Grade 9 Natural Science teachers were purposively and conveniently selected from three township secondary schools in the Ekurhuleni District.

3.4.1.2 Selection procedure

Creswell (2012:206) declare purposeful sampling as a procedure where researchers purposely select people and locations to enquire or understand the natural phenomenon. Six NS teachers were purposely selected from three secondary schools in the Ekurhuleni District. McMillan and Schumacher (2010: 351) state that researchers purposively select a location that is relevant for their research. The researcher focused on NS teachers who were offering Grade 9 in the Senior Phase during the third term. Teachers were selected as they were teaching NS in the Ekurhuleni District secondary schools. In this study, teachers who underwent CAPS training in Grade 9 were sampled. Purposively selected teachers were current NS teachers teaching Grade 9. Of the six NS teachers, five were females and one was male. Four of the NS participants had more than eight years in teaching the subject; the remaining two had five years and three years respectively. Three of the teachers were qualified with a Bachelor of Science Degree, two with a Bachelor of Education degree in education, while one teacher was qualified with Secondary Teachers' Diploma.

3.4.1.3 Demographic profile of participants

According to Creswell (2009), it is crucial to analyse the demographical attributes of the participants as the characteristics of the participants have a strong bearing on the research findings. There were six participants in the study. The participants were from three participating schools (two from each school). The study only included Grade 9 Natural Science teachers as indicated in the research. The demographic description of the participants comprised of age, gender, teaching experience and educational achievement. The six teacher participants in this study are referred to as Teacher A, Teacher B, Teacher C, Teacher D, Teacher E and Teacher F. The researcher profiled their school context, age, subject teaching experiences and their qualifications.

The following are pseudonyms that were used to identify the teacher participants and the schools that participated in the study:

Teacher A at School 1

Teacher B at School 1

Teacher C at School 2

Teacher D at School 2

Teacher E at School 3

Teacher F at School 3

3.4.1.4 Age range

The majority of the participants were in the age range of 33 to 43 years old.

3.4.1.5 Gender

The participants comprised five females and one male teacher.

3.4.1.6 Educational achievement

Three of the teachers were qualified with a Bachelor of Science Degree, two with a Bachelor of Education degree in education, while one teacher was qualified with Secondary Teachers' Diploma.

3.4.1.7 Teaching experiences of natural sciences

Data collected during the semi-structured interviews revealed that all the participants had between three and 15 years of experience in teaching NS. The demographic profile manifests typical demographics at the schools.

Table 3.1: Biographical information of the participants

Teacher	School	Gender	Age	Years of experience	Qualifications
A	1	Female	42	8 years	<ul style="list-style-type: none"> • Bachelor of Education Degree (B.Ed.) specialising in NS
B	1	Female	33	3 years	<ul style="list-style-type: none"> • Bachelor of Science Degree (BSc) • Postgraduate Certificate in Education (PGCE) specialising in Maths and English (FAL) First Additional Language in teaching languages.
C	2	Male	43	8 years	<ul style="list-style-type: none"> • Bachelor of Science Degree (BSc-Hon), specialising in NS) • Diploma in Information Technology (Dip-IT, Network installation) • Postgraduate Certificate in Education (PGCE)

D	2	Female	48	15 years	<ul style="list-style-type: none"> • Secondary Teachers Diploma (STD). Advanced Certificate in Education (ACE) • Bachelor of Education Degree (B.Ed.).
E	3	Female	36	5 years	<ul style="list-style-type: none"> • Bachelor of Education Degree (B.Ed.), specialising in NS and Life Science
F	3	Female	40	12 years	<ul style="list-style-type: none"> • Bachelor of Science Degree (BSc) • Diploma in Building Construction • Postgraduate Certificate in Education (PGCE)

Table 1 represent the demographic profile of the participants which consisted of their gender, age range, educational achievement and experience in the teaching, and educational achievement of Natural Science. Data were collected during Term 3 in 2021 during the COVID-19 era (All health and safety protocols observed).

3.4.2 Data collection

Cresswell (2018) inform that data collection is a series of step to be followed through interviews or observation. Normally, the process involves the use of visual materials and documents which establish data collection. When collecting data from research participants, it is very crucial that the correct instruments are used when considering in improving the quality of the research findings. Hennink, Kaiser, and Weber (2019) suggested that various tools for collecting data depend on the purpose of the study. Different ways of collecting the relevant data vary greatly in the setting, time and other measures at a researcher's exposure (Hennink *et al*, 2019). The instruments for data collection that were employed in this study were semi-structured interviews and observations.

3.4.2.1 Interviews

This process for collecting data is regarded as the most fundamental approach in qualitative research as the researcher gain more in-depth data from the participants (Bryne, 2021). This is done by asking open questions and follow-up questions. Semi-structured interviews are planned conversations set from initial questions (Corbetta, 2018). As a result, these interviews provide rigidity to the research recordings. Semi-structured interviews were used in this study in order to extract, augment and underpin what was observed in the classroom and provided information that could not be provided through observation.

Structured interview

Bryne (2021) asserts that structured interviews are procedures in which participants are asked similar questions with similar phrasing in the same arrangement. This interview are occasionally standardised by nature. A significant feature is that it is mainly categorised throughout a set of prearranged direct questions that require immediate responses. Additionally, the interviewer and interviewees would have very little freedom (Berndt, 2020). Unstructured is also known as open-ended interview. According to Berndt (2020), unstructured interview is an open interview where freedom and greater flexibility is experienced between the interviewer and the interviewee. The Non-directive interview is the other type of data collection instrument in which interviews seek to find deep-seated problem and the inner self feelings (Ponelis, 2015) attest that in structured interviews there are no leading issues to explore which can pose problems when coding and analysing data.

Semi-structured interviews

Agbo and Oyelere (2021) refer semi-structured interviews as non-standardised, and are normally used in qualitative research. The objective of every study is to answer the research questions through interviews. Most likely, make a list of themes (patterns and categories) to be discussed. The researcher ought to draw up a checklist to cover all relevant areas (i.e. research questions or objectives). The advantage of a checklist is to give the researcher a detailed exploration while allowing an interviewer to keep the interview within the frameworks tracked down by the aim of the study (Chen, 2017). Semi-structured interviews were conducted to

lead but not to limit the interview proceedings (Appendix E). The researcher put together a set of questions in an interview schedule grounded on the research questions (Chen, 2017). Open-ended questions were asked during the interviews. Open-ended interview questions permitted participants to demonstrate their experiences more openly, within their own setting relatively apart from being restricted by pre-arranged questions (Chen, 2017). The advantage of using open-ended questions was that the researcher was able to gather in-depth data that was not even expected by the researcher (Gill & Baillie, 2018). In addition, the open-ended questions permitted the participants to talk openly in their own way about the topic of discussion and enabled further justification (Jackson-Kersey & Spray, 2016). Follow-up questions were requested from the participants to give tangible proof and validity when required. Through open-ended questions data assembling is more likely to give back the comprehensive thickness and complication of the perspective the participants have (Gill & Baillie, 2018).

Individual interviews with NS teachers were conveyed through their available time to get their experiences in NS teaching. Before the interviews in this study were conducted, the researcher piloted the interviews with a colleague to ensure that the questions are well asked, and the estimated time would be adhered to. Each interview lasted for 30 to 45 minutes. During these interviews, the participants were asked to openly relate their views freely. Furthermore, they were afforded a chance to give the details on how they reflected NS resources and teaching strategies affected learners' performance. Each interview was digitally-voice-recorded with permission from the participants (*cf* Appendix D) and later transcribed. Shaheen & Pradhan (2019) maintain that audio recordings can have their own failures, leaving the researcher exposed to having no data at all. According to (Jackson-Kersey & Spray, 2016), a researcher can avoid problems by taking notes all the time as well as video recording. In addition, this assisted the researcher to trace the data gathered and apprehension of the data. Hence, the field notes were taken. The interviews were conducted so as to gather data from the participants during free period depending on the availability of the participants. Most interviews were conducted in the staffroom. The interviews were conducted in consideration with the language of teaching and learning of NS, which in this case was the English language. This study however preferred one-on-one interview which depended on

the participants' availability and adherence to COVID-19 protocols. As a result, strict measures for COVID-19 were adhered to.

3.4.2.2 Observations

According to Sibley, Theodorakakis & Walsh (2017), observation strategies concerns collecting data using one's senses, especially looking and listening in a structured and meaningful approach. Stahl and King (2020) comparably argue that characterized observations are the bases all research strategies in the social and behavioural sciences. Additionally, observations can help a researcher to learn that which is more particular to participants as well as discover the amount of time to spend on different activities, validate verbal expression and feelings, and ascertain classroom interaction (Shaheen & Pradhan, 2019). Shaheen and Pradhan (2019) further added that through observation, a researcher get an opportunity to record field notes that can be used at a later time to recollect what would be observable in the research setting. In addition, a researcher may learn about activities that participants may have difficulty expressing during interviews.

In this study, the researcher designed an instrument for observation (Appendix I) he observed what related to the physical and environment settings within the classroom setting. The observational role in this study was a non-participant observer as described by Creswell (2012:206), that the researcher observes while not getting involved in the activities of the participants to avoid altering the behaviour of the participants which affect data collection. Observations might be utilized to presume data, that is, to confirm the discoveries acquired from one source to another source of data or another method of collecting data (Ngulube, 2022). In particular, the researcher intended to employ observation to validate what has been reflected by participants in the interviews. When conducting observations, a researcher requires different activities and reflections, including ethical matters, instituting agreement (rapport), choosing key participants, the practices for carrying out observations, determining what to observe and when to observe it, keeping field notes, and noting down one's findings (Garner, Wagner & Kawulich, 2012). For this study, the researcher informed participants about the purpose for observing their activities during the lesson, as posited in Garner, Wagner & Kawulich, and (2012).

The researcher visited the research site (Schools) to collect data of what was transpiring. Berndt (2020) allude to as first-hand data in contrary to collect data from someone else. Precedent to lesson observation, all participants signed an informed consent form (*cf* Appendix D). Lesson observations were conducted as a data collection approach. One lessons observation per teacher was conducted. It took eight days for the researcher to complete the observation: a day was allocated for each teacher, but observations were conducted on different days. The observations were conducted during Covid-19 pandemic, so strict protocols were followed. All the teachers were using the work schedule as CAPS guideline.

3.4.3 Data analysis

Rapley and Rees (2018) describe data analysis as a step that is crucial in research design and concern analysing, interpreting, and understanding the collected information. Under quantitative research method, analysis is about interpreting and analysing numerical information, whereas qualitative research methods focus on analysing the underlying information about people, trends, situations, emotions, and ideas (Yin, 2011). In this study, data was analysed using the thematic analysis strategy as a technique to analyse the collected data. According to Braun and Clarke (2013:77), thematic analysis needs to form a fundamental method for qualitative analysis; it provides basic expertise for administering numerous models of qualitative analysis.

A careful thematic analysis could provide reliable and thoughtful findings (Braun & Clarke, 2013:101). Thematic analysis was adopted to provide a highly adjustable approach as it could be changed for the needs of the study, which provided rich and detailed experiences of the teachers when teaching NS in Grade 9. The thematic analysis in this study ensured that the interpretations of the information from invited teachers were consistent with the theoretical framework. Thematic data analysis process suggested by Braun and Clarke (2006) was used following the six steps indicated below.

3.4.3.1 Step 1: Familiarisation with the data

During this phase, the researcher familiarised himself with the data. The researcher became an active listener by developing ideas in each interview before transcribing the data. As suggested by Braun and Clarke (2006), the interviews were transcribed

manually and notes were taken from the non-verbatim and were included in the transcripts. The researcher read the transcripts severally so as to make meaningful information of them.

3.4.3.2 Step 2: Generating initial codes

During the first phase, the researcher read each transcript many times. This was done to allow the researcher to find concise and thorough ideas for the relevant parts of information helpful in reaching the research objectives. As suggested by Braune and Clarke (2006), similar topics were grouped together to create meaning. The researcher started to organise data in a meaningful and systematic way. Thereafter, the researcher worked through the transcripts to generate new codes and altered that which existed.

3.4.3.3 Step 3: Search for themes

According to Bogar (2019), a theme is a sample that recognises event particularly through data and/or research question. Braun and Clarke (2006:96) clarify that, there are no difficult and easy patterns about what constitutes a theme. In this case, the researcher arranged different codes and sorted into potential themes. The codes were sorted, and then arranged into new ones. Potential themes were written on the researchers' notepad to find codes to the corresponding themes. Codes were recorded on different pages and those with the same meaning. Themes were developed within the coding process. In order to safeguard credibility of the data analysis, the researcher applied member checks to clarify responses from the participants (Braun & Clarke, 2006).

3.4.3.4 Step 4: Review themes

At this stage, the researcher used document from data analysis and field notes to get meanings from the participants' responses. All the themes (main themes) were purposely assembled as it was aimed at the filtering of those initially grouped from initial data. This presented a garnered significant analogy between themes. Eventually, themes that were generated due to similarity with different data set were further categorised into sub-themes (Braun & Clarke, 2006).

3.4.3.5 Step 5: Define themes

The initial step in this phase is aimed further in filtering and interpreting the themes by recognising what each theme is all about, and what each data aspect expresses (Braun & Clarke, 2006). The specified data of each theme were refined carefully. As a result, data was evaluated and placed to appropriate sections where each category corresponded. Furthermore, the themes were clarified by checking through all the main themes and subthemes, codes, and extracts. In conclusion, ultimate name together with its definition was allocated to each theme to interpret the data.

3.4.3.6 Step 6: Writing-up

At this stage, the researcher transcribed the responses of the participants mentioned in documents during data collection. Lastly, the researcher compiled a narrative report about the conclusions, as suggested by (Braun & Clarke, 2006).

3.5 MEASURES FOR TRUSTWORTHINESS

Lincoln and Guba (1985) argue that trustworthiness is a basis for assessing the quality of research design. The researchers further added that trustworthiness entail convincing the participants that the findings are worth paying attention to. To validate the credibility of this study, the researcher applied the four criteria as proposed by (Lincoln & Guba, 1985) namely, credibility, transferability, dependability, and confirmability.

3.5.1 Credibility

This process is described as the belief which could be positioned in the reality of the research data (Flick, 2018). Credibility institutes whether the research conclusions constitute believable data extracted from the participants' ingenious information and is precisely a connotation of the participants' genuine viewpoints (Graneheim & Lundman, 2004; Lincoln & Guba, 1985). A qualitative researcher initiates thoroughness of the investigation by embracing subsequent strategies, *triangulation*, and *member checks* (Stoecker & Avila, 2020). Analysed data was returned to the teachers for verification purposes, to validate the verbatim data prior publication of this study.

3.5.2 Transferability

Transferability is the extent to which the outcomes of qualitative research are transferable or generalizable into new phenomena beyond real study context (Stoecker & Avila, 2020). Consequently, it is important that the researcher documents and accounts for the scientific approach. In this study, the features of transferability was considered by contributing to rich, and thick narration of the study explaining all the research processes, methodology, data collection strategies, sampling, data analysis and findings. According to (Stoecker & Avila, 2020), data that is generated through research should enable readers to evaluate the implication of the definitions attached to the findings and use their own discretion regarding the transferability of the research findings.

3.5.3 Dependability

This concept conveys corroboration that the data is compatible and consistent through settings, and that similar data collection methods would produce similar findings (Stahl & King, 2020). For the purpose of facilitating the argument of dependability without deviation, the procedure enclosed in the research needs to be outlined comprehensively so as to give an audit trail to concede other research to draw comparable results (Bashan & Holsblat, 2017).

3.5.4 Confirmability

According to McMillan and Schumacher (2006:310), confirmability is the extent to which the findings of an investigation could be validated or verified by other researchers. Bashan & Holsblat, (2017) added that in confirmability, a researcher must confirm to a certain extent that the outcomes are the effects of the experiences of the participants' rather than the disposition and beliefs of the researcher. In order to validate this procedure, the researcher kept a reflective journal which included all incidents that occurred in the field and personal reflections related to the study.

3.6 ETHICAL CONSIDERATIONS

When considering ethical issues, the researcher should ensure that the research is ethically suitable and is regarded as a remarkable exposure of behaviour of impressive research (Baxter & Jack, 2008). McMillan and Schumacher (2010:117) assert that the researchers must be overt and sincere with participants regarding all

features of the study. Denzin and Lincoln (2018:358) explain that the research process must consider matters about secrecy, anonymity, privacy, and informed consent. Study panels in research are instituted in numerous institutions to confirm the immunity of all participants in the research process. In certain circumstances, a prescribed ethical analysis of planned work before beginning to gather data is required (McMillan and Schumacher, 2014:203). The University Of South Africa (UNISA) where the researcher was studying at the time the study was conducted, entrenched an ethics analysis panel, which congregates to consider each and every research proposal in advance of the data collection process. Prior to the commencement of the data collection process, the researcher applied for an ethical certificate from the University of South Africa (UNISA) research ethics committee. The application was approved, and a certificate (2021/05/12/44256892/25/AM) was provided (*cf.* Appendix D). Further permission to conduct the study was obtained from the Gauteng Department of Education as well as the relevant principals and teachers from the selected schools in Ekurhuleni South District. Participation in this study participated voluntarily. Following ethical guidelines, the researcher obtained participants' informed permission during the data collecting process, maintained the participants' confidentiality, privacy, and anonymity, and put them at no risk or risk of injury.

3.6.1 Informed consent

Informed consent guards the researcher against any probable allegations that he or she undertook action inappropriately in enlisting participants to participate in the research (McMillan & Schumacher, 2006:334). Participants should accede willingly to engage actively without any physical or emotional intimidation (Denzil & Lincoln, 2018:65). The researcher personally went to visit the three schools and requested permission to collect data from the teachers. The request letters were handed to the principals for permission (see Appendix E). The researcher gave a thick description of the intended study. As advocated by Flick (2019), transparency was guaranteed openly in discussing the aim, purpose, and objectives of the research. The principals in all the three schools verbally accepted the request before signing the consent form. All the Principals were eager looking forward to the research as it would benefit by enhancing the teaching and learning of NS in Senior Phase (SP) in their schools. All the Principals were concerned with the general performance of NS. Subsequent

meetings with the principals, the researcher made arrangements to meet with head of departments (HOD). This was followed by meeting with the Grade 9 NS teachers at each school.

3.6.2 Confidentiality, privacy and anonymity

McMillan and Schumacher (2010:122) explain confidentiality as the process whereby the researcher should not allow anyone to gain access to participant data or the names of participants. The participants rights were protected in the study and were not forced to participate and they have a right to withdraw at any time as suggested by Okesina (2020). The researcher gave a thoughtful consideration of the participants' self-worth, dignity and safeguarded their safety, sensible of their social background including gender, religion and cultural differences (Denzil & Lincoln, 2011). Confidentiality was preserved right through the study. Reducing risk should always be applicable to research data and the researcher should apply proper disposal for the conservation and non-disclosure of research records for a period of five years post-submission of the report (UNISA, 2007:16). It is the researchers' accountability to recognize the possible threads related in loosing confidentiality for participants in the research and construct ways to curb risks or to avert contravention of concealment from taking place and to control potential harm if they do (Bruce & Pine, 2010). Under no circumstances did the researcher reveal the name of the schools and the identity of the participants. Pseudonyms were used to identify the teachers and the schools that participated in the study. For example, School 1 (Teacher A & B), School 2 (Teacher C & D), and School 3 (Teacher E & F). The researcher ensured to be the only person to obtain the participants' identities. Participants are often regarded to be at risk if their confidentiality is at risk (McMillan & Schumacher, 2006). The researcher took preventive action to delete all the hard copies after deporting them to the personal computer (PC), and the files were encrypted with passkeys. This also included the audio recordings.

3.6.3 No harm or risk to participate

The researchers' aims and objectives should not precede at the cost of the participants' rights (UNISA, 2007:10). In compliance with ethical considerations, researchers have an obligation to contemplate further repercussions of participation and to take actions that will protect the concern of participants in helping to answer

the research questions (Flick, 2019). Additionally, all the participants were older than 18 years to avoid vulnerability. All three schools had two Natural Sciences teachers. Following the researchers' explanation about the risk involved in the research, all the participants agreed to participate in the study. The researcher then gave each of the participants an observation protocol (see Appendix G) requesting their willingness to participation in the study by permitting the researcher to observe. In agreement to this, the participants were guided on filling and signing the informed consent forms before the interviews could take place (see Appendix G).

3.7 CHAPTER SUMMARY

The aim of this chapter was to introduce reasoning for the ideal foundation of this qualitative research. The research resemblance was established and centralised on the research methodology, as well as the research design and approaches. Furthermore, this chapter examined the research paradigm and the inspiration for selecting the research method. The population and sampling criteria were also discussed as well as the motives for using interviews, and observation as data collection instruments. The methods for analysing and interpreting the data were also described. In addition, the chapter concluded with a discourse of ethical issues and the reliability and validity of the study. Chapter 4 introduces an analysis of data generated from the participants.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

In the previous chapter, the focal point was the research design and methodology used in this study. This chapter focuses on data presentation as well as the analysis and interpretation of data gathered using semi-structured interviews and observations. Thematic analysis is employed in this study and is a technique that was constructed to interpret, arrange, and narrate the themes in the data (Braun & Clarke, 2006). Themes emerged between coding and categorisation of the data. Selected participants' words and experiences are presented as precisely as possible. The researcher inserted direct quotations, in italics, from the data collected in the semi-structured interviews, to record the data gathered from participants' spoken words. The analysis presents teachers' experiences in the classroom. The interviews also revealed the influence that resources, orientations and goals had on their teaching and the decisions they made about their teaching.

The results, interpretation, and discussion follow the order of the research questions, as stated in Chapter 1, which are:

Research main question

What are Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS)?

Research sub-questions

1. How do teacher resources, orientations and goals affect teaching NS in Grade 9?
2. To what extent are Grade 9 teachers supported in developing resources, orientations, and goals for teaching NS in Grade 9?

4.2 FINDINGS

The findings of the study are presented in themes and sub-themes (see Table 4.2). The curriculum itself, teaching resources, teachers' resources and support were found to be the four main themes of the study. The demographic information is presented first followed by the thematic analysis.

4.2.1 Developing analytical tool

The researcher analysed data inductively using thematic analysis. After performing all the steps of thematic analysis that is: Familiarisation, Coding, Generating themes, reviewing themes, Defining and naming themes, and Writing up. The researcher ended up with the following themes that emerged from the data.

Table 2: Emerging themes and subthemes

QUESTIONS	THEMES	SUBTHEMES
What are the Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni?	Theme 1: Curriculum coverage	Sub-theme 1.1: The impact of COVID-19 on curriculum coverage Sub-theme 1.2: The overloaded content in the CAPS.
How do teacher resources, orientations and goals affect teaching NS in Grade 9?	Theme 2: NS Teaching resources	Sub-theme 2.1: The use of Textbooks Sub-theme 2.2: The use of laboratory and equipment (include practical work) Sub-theme 2.3: Impact of COVID-19 on practical work Sub-theme 2.4: Assessment in Grade 9 NS Sub-theme 3.1: N S Content Knowledge Sub-theme 3.2: Pedagogical Content

	Theme 3: NS Teacher resources	Knowledge 3.2.1 Lesson Plans 3.2.2 Classroom environment 3.3.3 Teacher-learner interaction
To what extent are Grade 9 teachers supported in developing resources, orientations, and goals for teaching NS in Grade 9?	Theme 4: NS planning, classroom environment and interaction	Sub-theme 4.1: The role of District subject advisors Sub-theme 4.2: School Management Sub-theme 4.3: Parental support

4.3 THEME 1: GRADE 9 NS TEACHERS' EXPERIENCES

The study set out to investigate teachers' experiences of teaching NS in Grade 9 while exploring the nature of their decision making through their resources and support structures, beliefs and goals in an endeavour to interpret and understand how and why Grade 9 Natural Sciences teachers made instructional decisions in their classrooms.

4.3.1 Sub-theme 1.1: The impact of covid-19 on curriculum coverage

The Grade 9 NS CAPS sets out the NS content to be taught during each year, and the time allocated for each knowledge area and also (DBE, 2011). The CAPS Grade 9 NS document prescribes both short-term and long-term goals. For example, the Annual Teaching Plan (ATP). The ATP sets out goals on a long-term basis and lesson plans provide the detail on a short-term basis. Teachers are expected to adapt their planning and teaching strategies to their local contexts. The process of curriculum delivery that manifests in the classroom is guided by the NS CAPS document. However, teacher resources (both knowledge and physical materials), support received, and their teaching strategies affect how the curriculum is implemented. The teacher may find it challenging to be in full command of effective

and complete curriculum delivery, especially during the disruption brought about by the COVID-19 pandemic. However, planning and curriculum delivery are imperative aspects of teaching.

When asked about the revised Annual Teaching Plan (ATP) during Term 3 for NS corresponding to the actual time or days at school, Teacher F (School 3), Teacher D (School 2) and Teacher C (School 2) respectively responded that:

“Not really, it is quite problematic with the revised ATP for all the terms; the learners have lost ten days of teaching and learning. The Minister of Education wants to cancel the October holidays and most of us feel that the learners need to catch up for the lost time. However, the unions are rejecting the call...I mean it was going to help some of us who still need to cover the ATP.”

“Not at all... I felt like the revised ATP not suitable to meet the needs of the learners, especially during this COVID-19 pandemic period. The number of days for learner attendance is not sufficient to finish the syllabus on time. The actual times do not actually reflect according to the school calendar. I still have to finish Matter and Materials in term three and I don't think I will accomplish that.”

“The learners are learning too much content. We also have to finish the ATP as per term. The learners will have to catch up with the Term 2 work. We have only ten days to prepare for this term. We are also experiencing so many gaps in our worksheets and this is due to absenteeism.”

It is evident that teacher F, D and C felt that they were not getting enough time to teach the entire content due to congestion in the work schedule. Also, the teachers felt that the learners were also overloaded in terms of the content.

In reply to a question that needed the teachers to elaborate on the adequacy of the time allocated to complete the Grade 9 NS curriculum, Teachers C (School 2) and Teacher D (School 2) respectively responded that:

“Grade 9 NS has a lot of content in a short period of time...it is a problem for learners' understanding, especially the Life and Living section. The weekly timetable for different grades is killing the learners. The Grade 9 learners only attend for a

week...you must improvise by giving hand-outs because you will only see them after three weeks.”

“Even when you give the learners the hand-outs for three weeks...they still don’t understand the concepts. There are always gaps between the worksheets. During this term, we have to do two or three practicals and we haven’t done the first one yet. Things are so hectic because everyone is focusing on Grade 12. I don’t think Grade 9 NS is given enough time it deserves...we are disadvantaging these learners.”

The above sentiment confirms that teacher C and D were not equipped to teach remotely in an emergency situation such as the pandemic, even though they were trying to give learners some form of correspondence education by giving hand-outs. This affected curriculum coverage and may have compromised teaching and learning as teachers are just thrown into an unexpected way of teaching. The response from teacher C and D revealed that there were gaps in most learners’ workbooks and this was due to the fact that teachers were not having enough time to explain the content fully, and also that the learners did their work without any of the usual explanation, activities, and supervision as a result of rotational class attendance during the pandemic.

On completion of the syllabus Teacher E (School 3) responded that:

“Because of the NS curriculum time stipulations and overburden ATP is to be dealt with in a time indicated. The COVID-19 pandemic affected us a lot... we do not get a chance to focus on the individual learners. I just continue and move to the next knowledge area...as I cannot slow down because I need to cover as much as I can. The situation is not improving to ensure full curriculum coverage.”

Teacher E (School 3) alluded to the impact of the COVID-19 pandemic that brought about school rotation. School rotation happened in a situation whereby schools divided learners into groups attending on different days to reduce the class size. Learners who attended for example on Mondays, Wednesdays, and Fridays would rotate to Tuesdays, and Thursdays the following week. In a nutshell, COVID-19 impacted planning, teaching, learning, and assessment. Teachers indicated that the pandemic made it challenging to teach and assess learners due to time constraints and also the fact that they were unable to finish the content fully within a specified

time according to the ATP. The district visits had a system of monthly reporting on curriculum coverage and this would also place significant pressure on teachers to explain why they had not reached the relevant curriculum coverage milestones.

If teachers had to deal with too many challenges; they were unable to accomplish their goals. The Department of Education expected the curriculum to be covered on time and teachers had to deliver the content within a specified period. The COVID-19 pandemic limited time for learners' attendance, and as a result, it has affected learners' performance in NS.

"...there is always no time to do corrections...", Teacher B (School 1) added that.

"I am unable to finish the content in time as time is against us. After giving the learners work they will go home and when they return there is no time for remedial work as I am hurriedly looking to finish by moving to the next topic,"

"...ensure that you complete the syllabus...and that is impossible considering that we have to adhere to the Covid-19 pandemic protocols. Practically you see some learners this week, and they will return in three weeks' time. The situation creates gaps in the syllabus." Teacher D, School 2 added.

When asked about the impact of the Covid-19 pandemic, Teacher C (School 2) responded that:

"For the past year, we did not conduct experiments like we used to...the number of activities are lacking due to the COVID-19 pandemic...learners are not allowed to group themselves for practicals and all that is required is to demonstrate and let the learners do write-up."

On the same note, Teacher A (School 1) sentiments suggested the constraints when performing the practical. This is reflected in her views:

"In Term 1 we managed to do two practicals and in Term 2 we only managed to perform one experiment. This term we are not anticipating conducting any practical due to congestion in the ATP, we are currently under Covid-19 constraints to complete the assessment on time."

With regard to practical investigation, Teacher B (School1) responded that:

“All we do is just to demonstrate the investigation but the learners never have a chance to perform the practical because we have to adhere to covid-19 rules. Besides, the FET teachers use the Laboratory as their staff-room. We never have a chance to have control over what is happening there except to look for what you want to use for the practical.”

When asked about the effect of the COVID-19 pandemic on conducting the practical activities Teacher E (School 3) responded:

“DBE prescribes that schools are not allowed to conduct practical activities because group work is not permitted due to health protocols. Teachers are only using the opportunity by demonstration before the class...and this does not encourage self-inquiry.”

Teacher F (School 3) responded that:

“Not being able to do practical practice with the group is a great disadvantage to these learners. NS as a subject requires the learners to perform practical work as they enjoy by touching and have that feeling of self-determination....demonstrating practical work does help the learners in terms of write-up quality scientific reports. The Department emphasised that investigations should be done by the teacher...and learners are not allowed due to COVID-19 pandemic health guidelines.”

The challenge posed to teachers was, they found it difficult to group learners for investigations. Adherence to COVID-19 pandemic protocols was compulsory in all schools. Non-compliance could result in serious consequences. Due to compliance, teachers could not assess large groups of learners at the same time in a single venue. This resulted in school rotation of the classes which ultimately required more time to be able to cover all the grade 9 classes. According to Nkosi (2018:23), teaching of NS involves doing experiments, which both participant Teacher E and Teacher F were not enthusiastic about, particularly engaging learners in their own exploration.

It appears that curriculum completion was the over-riding goal for these teachers and decision making did not allow teachers to apply effective strategies to encourage self-inquiry and critical thinking. Linking to Schoenfeld's (2011) teacher decision making theory, the goal of completing the curriculum overshadowed decisions about

effective teaching methods. Time was a major factor influencing teacher decision making and this affected the quality of teaching in completing the syllabus. The COVID-19 pandemic was very constraining on teacher decision making since the health and safety regulations made school attendance inconsistent. Teachers' feedback implies that the content gaps created by the COVID-19 pandemic negatively impacted developing the learners' self-inquiry and critical thinking (cf. Chapter 2, sub-section 2.4.3.2).

4.3.2 Sub-theme 1.2: The content overload in the CAPS

The NS curriculum suggests that teachers should be regarded as constructors of learning schedules (DBE, 2011), thus allowing them significant self-sufficiency in setting up and devising activities that address learners' outcomes. According to Schoenfeld (2015), teaching is a process that involves various activities in the classroom, and teachers' decision-making depends on resources such as curriculum and policy guidelines. It is crucial for teachers to design strategies in order to meet policy demands (Mudau & Tabane, 2017). Nkosi (2018) added that curriculum plays a vital role in the teachers' decision-making in the classroom.

With regard to curriculum delivery, Teacher F (School 3) echoed that:

“The challenge with CAPS document is the packed content and we must also accommodate the dates for the examination.....the 4 weeks for examination. Learners miss out on the content.”

One significant result of the situation of the CAPS being too intense and fully packed is that teachers affirm that learners are loaded with content that they are expected to learn within a short time and such force them to memorise, which is challenges given that the content is voluminous. As a result of trying to cover all the prescribed content, teachers use fewer methods that engage learners actively in their lessons. This is evident in Teacher B (School 1) comment that:

“Due to the workload I am unable to cover all the work....I rely on one-size fits all teaching strategies in order to complete the syllabus.”

In the same way, Teacher D (School 2) responded that:

“The Department of Education sends documents time and again on syllabus completion, and you have to give reasons why, and if not, what did you do or what are you going to do to ensure that you complete the syllabus...”

Teacher E (School 3), responded that:

“NS curriculum is so packed and does not give you any way to relax. There is no enough time to do remedial work. Topics that are meant to be taught in one week overlap with three to four days. Hence, the teacher falls behind schedule most of the time. NS CAPS must be trimmed to some extent.”

Teacher F (School 3), in her response echoed the same sentiments:

“Curriculum is too packed ...one hardly do remedial work when learners come back from the recess....there is no time to do corrections and reflect on the learners performance.”

The above responses indicate that there was not enough time to complete all the work as prescribed by the CAPS. The learners were overloaded with content while not given sufficient time. Teachers felt that the curriculum needed to be revised for the Grade 9 NS learners and also had a view that the Annual Teaching Plan (ATP) is tightly packed. More time, as an effective resources for teaching, must not be underestimated.

4.4 Theme 2: NS teacher instructional resources

The nature of NS teaching requires a teacher to use resources to add value to the subject and relate the world outside to the classroom situation (DBE, 2016). Researchers and experts in the teaching of NS recognise the practical aspect of sciences and the role that resources and tools play in the process of teaching and learning NS (Heeralal, 2017). Heeralal (2017) found that one of the challenges encountered by NS teachers is the shortage of resources, insufficient use of laboratories, lack of time, and large classroom size. The current study assessed the way resources in school affected NS teachers' performance and their experience of teaching science.

In response to a question that required the participants to explain the support provided on the Grade 9 NS CAPS prescribed syllabus, when asked about the curriculum support, Teacher C (School 2) responded that:

“I feel that people in general do not give Science subject the necessary support from district advisors and the school management (SMT). We do receive material in boxes from the Department. Instead, the boxes will be packed in the Principal’s office for weeks as they need to be unpacked. I think there is a need to communicate for any stock that the school receives.”

Normally, the DBE facilitate the delivery of material for use during learning and teaching, however, teachers are of the view that teaching material should be delivered on time to allow teaching and learning. Therefore, there seem to be a need for better communication so that the delivery of such crucial material would be timely. In terms of teacher need for resources, timeous dissemination of the resources may assist teachers.

4.4.1 Sub-theme 2.1: The use of textbooks

The DBE (2011) sets out that a teacher must utilise prescribed textbooks as part of their planning. In teaching coherently, learners must be given an opportunity to make sense of the resources they use in a meaningful way (Mudau & Tabane, 2017). Teaching should start with a lesson plan with objectives and the teachers’ decision making on the learning according to acceptable assessment standards. The DBE advocates for the use of a textbook, which helps the teacher to select the relevant learning activities (DBE, 2011).

When asked about the textbook method, Teacher A (School1) and Teacher B (School 1) both responded: respectively:

“Maybe the department should look into changing their system in terms of ordering NS textbooks...they must just do away with the tender system. Each and every year we have different providers...and if you complain they will bring the same textbook.”

“The subject specialist should be given an opportunity to recommend every NS textbook that is being brought to the schools.”

The sentiments shown by Teacher D (School 2) highlighted a more serious aspect, that schools did not always have enough textbooks due to lack of management, improper care and lack of textbook retrieval.

When asked about the use of textbook Teacher C (School 2) responded that:

“Each and every year we experience shortage and end up not having enough textbooks due to the department policy which does not focus on textbook retrieval. It is stipulated by the Department of Education that schools must ensure that the collection of textbooks is 100%...The School Governing Body (SGB) seems not to be too involved in things that involve curriculum. They must ensure that the school is supplied with relevant prescribed textbooks for the subject.”

Teacher E (School 3) echoed that:

“NS is different from other subjects in the sense that most learners will return textbooks in other subjects...but with NS the return is not that good. As a result, we ended up teaching learners while others don't have textbooks...It is very difficult to teach especially when one is relying on a prescribed textbook for NS.”

When asked about the use of textbook, Teacher C (School 2) responded that:

“Teachers feel that they are not being consulted by the Head of Department (HOD) and Learning and Teaching Support Material (LTSM) committee when it comes to a choice of the prescribed textbooks.”

The response shown above confirms that the teachers felt that they were not recognised as professionals and as a result, they felt less empowered. Their view was that they were not given opportunities to make decisions, particularly with the choices of prescribed textbooks. Through experience as a teacher, the researcher observed that in some instances where textbooks are made available in a school, at times, there is a lack of a proper system that prescribed different textbooks for NS in Grade 9. Most schools order textbooks through the LTSM Committee, which is controlled by the School Governing Body (SGB) and the principals. The district does not make a follow-up for proper usage of the funds allocated for the right purpose.

From the participants' responses, Teacher B (School 1) and, Teacher F (School 3) expressed their teaching preferences towards teaching from Textbooks:

Teacher B:

“We teach the content according to theory and practical...not that I prefer...but there are instances where one must use a textbook.....”

Teacher F (School 3):

“The textbook is designed it contains most of the content for every chapter then they have that last section that shows the activities of that content for NS at the end of every chapter. In most cases, textbook is the most relevant resource for most of the activities.”

The implication of the situation set out above where teachers teach most of the topics from the textbook is that it can have a negative impact on teaching and learning NS. Different learning areas require different resource materials. The findings of this study show a reliance on textbook teaching, as affirmed by Bantwini and Feza (2017) and Mtsi and Maphosa (2016) where they declare that most South African teachers' teaching strategies are textbook reliant. Teachers still encounter problems in designing their own lessons, so most lessons are textbook reliant.

Teachers feel that they should be consulted and recognised prior to when textbooks are ordered. When teachers are not involved in selecting textbooks, it can be seen as disempowering, and it can affect morale (Bantwini & Feza, 2017). Furthermore, the decisions teachers make for their teaching require that they are fully involved in curriculum implementation. Any textbook that is used as a resource in schools affects all other decisions for example, teachers must use it to make their lesson planning and presentations.

When asked about the use of textbooks Teacher D (School) and Teacher E (School 2), and Teacher F (School 3) respectively responded that:

Teacher D (School 2)

“I don't get enough time to look at other resource materials ...most of the topics I use SASOL Textbook which is CAPS aligned. The study materials don't come quite often and even the ones you get are not aligned with the CAPS document.... it's the Subject Advisors recommendations.”

“Textbooks are very handy as you don’t even have to prepare the lesson in NS. Most of the topics in the ATP are similar to the ones in the Textbook.”

Teacher F (School 3)

“I rely on the textbook for most of the investigations...everything seems easy as all the learners do have textbooks....Practically it makes life easier with the teachers’ guide.”

According to the responses to the interview questions, the teachers mentioned learner-centred strategies, but the responses did not readily address the strategies used to promote active learning and for the development of critical thinking and self-inquiry. Passive teaching strategies do not encourage learners to be more innovative, which compromises their progress in learning science.

Teacher C (School 2) and Teacher D (School 2) had the following to say about how important the textbook is in their teaching:

Teacher C (School 2)

“It is very difficult to teach learners without the NS textbook. Most of the learners are finding it very difficult to understand the concepts....but with the aid of textbook learners get enough time to deal with some concepts on their own.”

Teacher D (School 2)

“How can one teach NS without a prescribed textbook...It is very difficult looking at different Grade 9 NS study guides which only explain the concepts partially...Information from the textbook is very handy. You don’t struggle to find any topic.”

It appears that curriculum overload as perceived by participant teachers. Teachers relied on teaching procedurally from the textbook, which may have compromised the conceptual development of NS. Furthermore, teachers being exposed to a greater variety of textbooks may assist in their own knowledge resources (Schoenfeld, 2011 for teaching NS.

4.4.2 Sub-theme 2.2: Use of laboratories

The COVID-19 pandemic affected teaching and learning in NS since learners were not allowed to perform practical investigations as a group, while not having enough laboratory spaces and resources affect teachers' decision making in NS classroom (Okonkwo, Oladejo & Alimba, 2022). The selected teachers indicated that they needed more time with learners as such would enable them to manipulate theory and practical ideas. Also, they posited that they required bigger or sufficient space in the school laboratory for effective Science teaching.

When asked about the use of laboratories, Teacher D (School 2) and Teacher E (School 3) responded:

"We don't have laboratories, but the so-called storage rooms for equipment. Laboratory classes have been turned into normal classrooms because our school accommodates more learners and NS is offered to all the learners who are doing Grade 9".Some of us are discouraged due to the fact that there are no laboratory spaces where the teacher can conduct the practical."

"We can't perform investigations within specified spaces as the laboratory space is always used for other purposes"...You can only have access from the storage room."

On the question of whether the school had a laboratory and if the laboratory had a variety of learning and teaching support materials. Teacher C (School 2) responded:

"I wouldn't say yes as the Laboratories are designed as normal classes. What we have here are laboratory classes that have been turned into classrooms due to the school trying to accommodate more learners who are in the general stream. We only have storage places for our laboratory equipment. We do have supporting teaching materials but most of the equipment is not relevant for CAPS practicals. Last month we had a delivery of various laboratory equipment, but one could hardly make use of them for relevant CAPS experiments."

The above sentiment affirms that most of the equipment in the laboratory, as brought by the DBE, was not relevant to conduct prescribed practical tasks. In cases where the school admitted learners that were more than required, specialised rooms such

as laboratories needed to be converted into classrooms. Even if teachers chose to do laboratory work in their own classrooms, not having enough laboratory equipment affected teachers' decision-making in NS. It is evident that if the equipment needed to facilitate teaching and learning is not accessible and not available in a user-friendly environment, then teachers may decide not to use the equipment (Mavuru & Ramaila, 2017:3). In addition, the safety aspect of using laboratory equipment outside the laboratory environment is also a concern.

With regard to the question about the use of laboratories, Teacher B (School 2) responded:

“The school does have a laboratory but not specifically for NS as a subject. We share the equipment with both Life Sciences and Physical Sciences respectively. If you need to do an experiment, you need a booking for such equipment ...you have to look for the ones you are going to use from the storage space and then we can all share what the other person is using. I would say that we are not having a properly well-run laboratory...I think a better word will be like a storage facility.”

The above comment was echoed by Teacher A (School 1):

“I would rather say yes we do receive equipment, but some of the apparatus are not stored properly. There are no fixed laboratory spaces to accommodate all the equipment.”

In all the schools visited, teachers concurred that the laboratories were not properly utilised. Teachers expressed the concern that this affected them when conducting investigations and teaching practical skills. From the responses, it is evident that three main themes are prevalent. Firstly, the laboratory spaces were shared and meant for exclusive use for NS; secondly, the equipment in the laboratories was not enough for use by all learners; and thirdly, COVID-19 protocols made it very difficult for teachers to facilitate any form of group work so limited laboratory equipment could be shared.

Teachers A (School 1), Teacher E (School 3), and Teacher F (School 3), respectively, stated that they did not have enough apparatus to do experiments for all the learners:

“We have 355 learners in grade 9 and they are all doing NS....when do you get an opportunity for all the learners to do a practical....if As far as I can remember we do not have enough apparatus for the entire group It is not possible to accommodate every learner during practicals.”

“Mostly we use Life Sciences Toolkit, and it does not cover fully when doing NS practical investigations. I wish we could get NS mobile tools which will assist NS grade 9 practical work and assessment as well.”

The learners have to share the equipment as a group...yes equipment we do have but it does not cover all the Grade 9 learners...what you use in one class will be used in all the Grade 9 classes. Grade 9 teachers will have to share the same equipment, and this disrupts teaching and learning.”

The response from the participants showed that laboratory equipment was available but did not cover all the learners in NS. This was due to the equipment not being utilised by all Grade 9 learners. As such, the situation may have negative impact on the delivery of the curriculum. Dhurumraj (2020) further argues that learners should be inspired to conduct practical investigations even during classroom lessons because NS concepts are explained and emphasised through experimental learning. Dhurumraj (2020) further highlighted that learners can learn better when using practical equipment to conduct investigations, and this can be achieved by not only the teacher doing a demonstration, however, through all the activities, the teacher should engage learners. Teachers find it very challenging to use laboratory spaces, especially when learners perform practical. This is partly due to a lack of sufficient spacing, lack of suitable equipment, and the fact that some laboratories are converted into normal classrooms. Resources, such as laboratories and laboratory equipment is critical to teaching NS concepts effectively, and as such compromise effective teacher decision making (Schoenfeld, 2011).

Data collected from the teachers show that laboratories were not utilized for their purpose. As a result, teachers demonstrated the practical in the classroom. In this regard, learners were not given an opportunity to perform the investigations, and this tend to limit learners in self-inquiry and critical thinking in learning NS. Maphosa (2016) acknowledges that in NS, when projects and investigations are performed

correctly, can inspire and build the learners' investigation and the capability to innovate.

4.4.3 Sub-theme 2.4 Assessment in Grade 9 NS

Assessment gives learners and chance to reflect on their performance by being assessed in the subject (DBE, 2011). Curriculum policies advise that assessment ought to be supervised so that a teacher would be able to mitigate and alleviate misconceptions. Assessment is administered in different ways in order to allow learners to demonstrate their level of understanding, both formally and informally. According to CAPS, this can be carried through presentations, projects, practical assessment tasks, investigations, and summatively during examinations.

Teacher B (School 1) explained the assessment at the end of the term, as follows:

“Teaching and learning took place until exam time. It is very challenging to do assessment ...and be able to give feedback on the written test...and as a result the term work overlaps.”

When asked about the role of assessment in learner performance Teacher D (School 2) responded:

“Learners' absenteeism proved a greater problem that undermines learners' ability to perform well in assessments. Some learners have a tendency of staying away from school at the time when assessments are administered. In other cases, some learners are not able to engage in assessments due to the school rotational timetable. A majority of learners are affected and perform poorly during tests and examinations.”

The assessment of practical work was also a concern for teachers. For example, when asked about the role of assessment teacher, A (School 1) responded:

“This term we haven't done any practical assessment due to time constraints. According to the ATP, we were supposed to have given the learners a task to build a model of the Earth and Other Planets...I still haven't received any practical tasks from the learners.”

The participants at all the participant three schools indicated that conducting an assessment was challenging as they could not assess all the learners due to content gaps created by the school's rotational system. Based on Teacher D's response, there had been challenges in terms of assessing all the learners at the same time. This is reflected in her comments:

“NS assessment is not simple to implement, there are some drawbacks during the assessment. Not all learners are assessed at the same time. The challenge is that there are learners who miss assessments and ended up not having marks during submission.”

Data obtained during the interviews revealed that all the teachers agreed that assessment was crucial in determining learner progress. Most of the teachers interviewed attest that it was a challenge to administer any form of assessment due to a lack of time and poor learner attendance.

When asked about the role of assessment, Teacher E (School 3) responded:

“According to DBE, the teacher must assess the learners to validate that they really master and understand the concepts...so that one is able to know those that need to be progressed and to use different teaching strategies to improve the learner's competency in the subject. Yes, assessment is vital in NS teaching, now lately you give them a test and ask them to go home to study for the test...but they still fail the test. What is the purpose of assessing?”

The Teachers stated that they did follow assessment in Grade 9 NS as prescribed by CAPS curriculum, but their main challenge was the difficulty in implementation. The response from teachers regarding assessment showed that all teachers valued assessment. However, they experienced challenges in terms of conducting assessment activities due to schools' rotational timetable. Mavuru and Ramaila (2017) argued that assessment in NS can encourage sensible expertise in learners while building up their inquiry skills and the comprehension of the correlation between NS, technology, society and natural habitat. Assessment can develop in acquiring knowledge and concepts especially in NS (Mavuru & Ramaila, 2017). In addition, if teachers were more resourced in alternative or different assessment strategies for NS, they may have been able to make different decisions regarding

assessment. However, teachers were facing multiple changes to their usual teaching patterns.

4.4.4 Sub-theme 2.5 NS content knowledge

This is the knowledge of facts, theories, principles, ideas, and vocabulary that teachers must master in order to teach effectively. Teachers should have the knowledge of the subject in correlation with the curriculum (subject content knowledge). Teachers' content knowledge is a vital resource in teaching NS.

When asked about the areas of content preference in NS teaching, Teacher A (School 1) responded:

"I do have some of my favourite topics like life and living. I do not like the physical sciences section that much, especially the Chemistry part. I always ask my colleague to assist me regarding problematic areas in NS, due to knowledge area preferences."

The response from Teacher A (School 1) was echoed by Teacher C (School 2) and responded:

"I spend little time on Life and Living as a knowledge area in NS as opposed to other areas like Electricity and Magnetism because I enjoy teaching the content, with Energy and Change is more dealt with, in terms of syllabus content, so as a result, more time goes to electricity during NS lessons."

From the responses shown above, both Teacher A (School 1) and Teacher C (School 2) had their personal preference when selecting NS content. Apart from having a personal preference to select content for NS, the general experience of both teachers was that they focused on the part that they were comfortable teaching.

According to Schoenfeld (2015), the teachers' subject knowledge can have an effect on their decision-making in the classroom. Schoenfeld (2015) gives insight to the fact that a teacher not only repossesses knowledge constantly but depends directly on the pedagogy for teaching the subject. In general, most teachers begin by planning through considering content, but their personal preferences alter their goals which affect their decision making in the classroom (Chapter 2, subsection 2.5.1.2). Personal preference to content may be understandable, but neglecting topics due to

insufficient content knowledge, resulting in learners' poor holistic understanding of the subject.

4.4.5 Sub-theme 2.6: Pedagogical content knowledge

Schoenfeld (2015) theory indicates that a teacher's pedagogical knowledge (PCK) is vital, to making informed decisions in the learning process. The teacher must be able to connect the contextual and situational factors in his/her decision making in order to lead to effective teaching actions. Applied to the teaching of NS, PCK can provide a meta-analytical explanation of why it is important for teachers of NS to master the content of the subject and to use appropriate pedagogical processes in ensuring successful teaching and learning of the subject (Ball, Hill, & Schilling, 2004).

When asked about the teaching in the classroom, participants gave varied responses.

Teacher C (School 2) responded:

"What is not prescribed I don't teach. I normally plan my work weekly and give small tests on Fridays. But because of the learners coming on different weeks which is most challenging...I hardly adhere to my schedule."

Reflecting a cognitivist approach is that she presented content in small sections and tested the sections regularly. Her pedagogy relied on scaffolding and regular repetition of content.

The response by Teacher F (School 3) revealed a more practical orientation to teaching:

"Practically we rely mostly on textbooks by following the work schedule. What the work schedule prescribes you locate that section in the textbook. I use different models to reach my learners. With the NS science toolkit (Models) the learners will have to read the instructions from the textbook."

Using the prescribed textbook was the main form of pedagogy used by Teacher D (School 3) in this response:

“I always rely on the prescribed textbook and the activities during and at the end of the chapter.....alternatively I ask my colleagues to assist me with the topics that I find difficult to teach. I rely mostly on the textbook content.”

During classroom observation of Teacher D (School 2), some learners displayed misunderstanding in her lesson and misconceptions were due to irrelevant content being taught in the class. The Composition of the atmosphere was not properly articulated during classroom observation. The teacher could not demonstrate how the spheres interacted with one another, as prescribed (DBE, 2011). However, the teacher only relied on the general knowledge of the composition of the atmosphere, rather than following the content as specified by CAPS. As such, the teacher appeared to generally lack knowledge or an understanding of the content for the topic spheres of earth. The teacher also used limited curriculum materials.

Teacher D failed to utilise teaching suggestions in the new curriculum and relied on the previous curriculum that promoted rote learning. In addition, even though the educator revisited the names of planets in his teaching, the knowledge was irrelevant because it was done in earlier grades. There is nothing wrong with re-capping if it is necessary to build new knowledge, however, the teacher did not use the prior knowledge to build new ideas.

When asked about how content was delivered in the classroom, Teacher F (School 3) responded:

“I encourage the learners to be more participative in the class by giving them the opportunity to ask questions and give feedback after every activity. I also relate every topic related to their daily routine. The focus is given to the low performing learners by giving them extra work. I sometimes group them ...but now because of the COVID-19 pandemic... It becomes a challenge.”

During the observation, Teacher F (School 2) did not display this participative learning. For example, in the learning of how the Earth rotates (The Earth and Beyond) and revolves around the sun, the teacher did not use role play after she has explained the process. This leaves the question of why Teacher F was not using strategies mentioned during the interview on a topic that provided ample opportunity for active learning.

At the beginning of the lesson, Teacher D (School 2) did not elicit students' prior knowledge as suggested during the interview. The teacher worked hurriedly to finish the lesson due to curriculum pressure which did not give learners time to understand the concepts.

Data collected from the lesson observation did not concur with that collected from the teacher interviews. Most of the teachers, whose lessons were observed by the researcher in this study, used teacher-centred strategies such as telling and following the textbook in their lesson. Six lessons were observed in the classroom and due to the nature of the knowledge area, no practical work was required for the knowledge area, but the teacher could still have used role-play or models to differentiate the layers of the Earth. Furthermore, no practical work was observed during classroom observations either. It is possible that the effect of the pandemic made it difficult for teachers to perform. The knowledge of teachers as learning experts engages in understanding of how PCK functions in the teaching and learning process and how the teacher applies his/her knowledge in lesson design and decision making (Schoenfeld, 2015).

When asked specifically about the teaching strategies, Teacher E (School 3) responded:

"I feel like as a teacher I am just doing my job...which is to teach NS, I think I am also not being patient with my learners and not being able to use my full potential to ensure that the learners understand the concepts. There are times when I don't feel like repeating the lesson or feel like doing corrections is a waste of time. Maybe get somebody else from outside because maybe the learners do not understand my teaching methods."

Teacher E appears to be demotivated and disempowered through extensive repetition of the lesson during teaching. Teachers need to be supported in developing effective teaching strategies and need development with regard to PCK. It is possible that this may affect teachers' goal setting and their finding effective resources and strategies for teaching.

When asked about creating a good environment for learning, Teacher A (School 1) responded:

“I always give my learners an opportunity to express themselves in any way they can. The learners are able to ask questions and I am always willing to give them feedback, and most importantly I strive to give positive feedback pertaining to any given task. The learners must feel that they are part of the learning process and must be able to have a say in what they are about to learn.”

The above sentiment confirms learners’ participation in the form of asking questions. The teacher acknowledged that giving feedback and learners’ participation were important in teaching and learning.

4.5 THEME 3: SUPPORT PROVIDED TO TEACHERS

The teachers in this study seemed to need support for teaching NS while teaching and training in order to achieve their goals. When asked about the support teachers received or required to teach NS effectively, three levels of support were identified: district support, school management support, and parental support.

4.5.1 Sub-theme 3.1: The role of district subject advisors

Regarding the support that the teachers got in teaching Natural Sciences from subject advisors, the participants’ responses were as follows:

Teacher D (School 2):

“When the subject advisor visited the school, they will not spend time to show you how practical is done and experience you are having in the classroom; I don’t feel revived and excited. Okay, regarding the workshop, you still get the same issues like every workshop. You still come back from the workshop very disappointed. Teachers must be trained properly so they are able to deliver the content as required...They don’t expect us to teach by just attending one workshop. Lately it’s even worse with the virtual meetings. It just doesn’t do justice to the teacher and learners.”

There is an expectation from teachers regarding support from the district. The teacher felt despondent as her needs were not met. The teacher further alluded that workshops should address classroom challenges in conducting practical investigations. More face-to-face workshops should be conducted.

These views were echoed by Teacher C (School 2), in his response:

“We are not having school visits like we used to. I think it’s because of the current situation (Covid-19 pandemic) that we are facing in our education system. For both term one and term two, the facilitator only came once...and all they are conducting is Virtual meetings and training. None of them will come to demonstrate even a single experiment or practical investigation.”

In the same way, Teacher E’s (School 3) sentiments suggested that facilitators should be supportive in assisting with documentation in the NS CAPS curriculum to make it possible to fulfil the curriculum implementation.

“We do get support from the NS facilitators...But I think they are not doing enough...? The Subject Advisor only focuses on making NS file and what needs to be in the file.... sometimes it’s very difficult to put everything together....I feel that there is just too much paperwork and we have to focus on teaching.”

This opinion was shared with Teacher F (School 3), who added that subject advisors should give guidelines in the Grade 9 NS practical settings, as affirmed by his remarks:

“To perform a single practical demonstration is a challenge from the subject advisors. I think that would help us to guide the learners in performing NS practical investigations... Honestly...I don’t see any value from their visits as well as the online meetings.”

Teachers who partook in this study revealed that they were not receiving enough support from the district subject advisors. All of the teachers acknowledged that subject advisors only visited the school to look at the learners’ files and the syllabus coverage, but did not help with the challenges in the classroom especially in performing NS practical investigations.

When asked about the support from District Advisors, Teacher D (School 2) responded:

“They decided to choose schools that are experiencing serious problems in the subject. Mostly subject Advisors only concentrate and focus on the schools that are producing poor results. If the subject advisors could visit all the schools regularly ...this can have positive results at the end of the year.”

From the responses of teacher F (School 3), it appears that the support needed from the subject advisors and the circuit officials does not meet their requirements in the form of teacher resources. Teacher D (School 2) indicated that in reality, the NS subject advisors did not visit the schools regularly and if the practice was done on regular basis that could have a positive impact. The teacher's portfolio file check can be coupled with the classroom visit and assist with practical investigations. However, Teacher E (School 3) was positive that the presence of facilitators in the classroom could minimise the challenges they were experiencing in teaching NS. A teacher's decision regarding the teaching process is shaped by his/her resources. The teacher needs resources to achieve his/her goals. Support from the district plays a pivotal role as it informs the teachers with important information regarding the subject. Subject information meetings inform the teacher for any amendment pertaining to the ATP and assessment.

The Department of Education (DBE) emphasises that teachers should be guided by subject advisors, who are based in the district, and this ensures the NS curriculum implementation is achieved. Mtsi and Maphosa (2016) stress the role of subject advisors in creating opportunities for teachers to review and explore their implicit beliefs and to observe how it affects their goals in decision making in the classroom.

4.5.2 Sub-theme 3.2: School management

Successful school management is generally accepted as being the most important part of school success in education (DBE, 2010). Many public schools in South Africa are grappling to meet their own, community and Departmental criteria for better achievement (Umalusi, 2016). This is typically related to the ability, competence and characteristics of the school's management team and in particular the principal.

The data collected affirmed the problems with the administration and enactment of the NS curriculum. When asked about the support from school management, Teacher B (School 1) responded:

"The school Management Team is supportive in terms of giving the learners extra – classes to attend however the challenge is always the space as we don't have enough classes for extra classes. We can't cater for all the learners in Grade 9."

With regard to the question regarding management support, Teacher C (School 2) and Teacher F (School 3) responded:

“As a school, we do make use of what we have at our disposal. The principal is very supportive in terms of the sponsorship and ensuring that we get equipment for conducting the broadcast live lesson, but in most cases, the timing is not right as we have to share with grades 8 and 10 lessons. We do use GDE internet Wi-Fi. The problems with the online lesson are the availability of learners coupled with load shedding.”

“The principal is really trying hard to get the mobile classes just to improve on the situation we are facing regarding NS spaces and classrooms....but we are being told about the SGB approval....I wish it could be done sooner than expected.”

Teacher E (School 3) remarked:

“The school management team (SMT) including the principal will forever look to get better results...but do not have a clue on how these results came about...All we need is for them to make proper decisions in terms of how the curriculum is carried out. We should all be able to carry the burden in teaching and learning.”

Data collected from teachers regarding school management support gives a clear indication that the support is there in terms of provisioning of extra classes, or sponsorship. However, teachers want support that they can feel in the classroom from the school management. Insufficient support from the school management could have an adverse condition in the teaching and learning of NS in Grade 9. Support from management becomes a resource that teachers can use to influence their decision making and classroom goals.

4.5.3 Sub-theme 3.3: Parental support

It is very important that parents engage themselves in their children’s school work which could be essential to the learners’ performance (Mavuru and Ramaila, 2017). The feedbacks from the participating teachers confirm that parents rarely engage themselves in their children’s schoolwork which hinders their progress.

In response to parental support, Teacher F (School 3) responded:

“That’s a tough one because most parents do not follow up on their children’s progress. The only time they come to school is when the child is not promoted at the end of the year...but during terms one, two and three they are never bothered. If parents could help us with extra support the teachers’ work could be easy and that can yield better results.”

In responding to the question about parental support, both Teacher D (School 2) and Teacher E (School 3) respectively added:

“Parents rarely attend their children’s meetings. Only 10% will attend. The situation is different unlike in private schools where you get parental support...or maybe it’s because parents in former Model C schools pay school fees...with us here parents don’t pay school fees...they only contribute towards stationery like printing paper. How do you address their children’s concerns with regard to their progress? It has been proved that parental involvement improves the learner’s performance results.”

“Our main concern is parental involvement in their children’s school attendance. When you call the parent all you hear is that the child is supposed to be at school...because the child left home with the view that he/she is attending school...I guess this has got to do with disciplining the child and making a follow-up that the child is attending school on the set dates...since the rotation things have been quite tough for parents and even to us as teachers.”

The outcome of the research advocates that parental involvement is an element to consider in improving learners’ performance in NS (source). This advocates that learners whose parents are highly engaged in their education are more likely to achieve better results than children whose parents are less interested in their children’s schoolwork. The responses from teachers also indicated that some parents may themselves not be interested in their children’s progress and would not even collect their progress reports as per term. Parents rarely attended meetings during the course of the year, including their children’s conduct. This means that teachers could not rely on parents as a resource to help learners.

4.6 THEME 4: NS PLANNING, CLASSROOM ENVIRONMENT AND INTERACTION

Teaching and learning start with the implementation of the most effective strategies to enhance the learners' performance in the classroom. These strategies involve activities as well as classroom arrangement which affect learner interaction (DBE, 2011). All the activities should be aligned to the CAPS requirements include the contextual factors. According to the DBE, learners must be afforded to participate actively in the classroom to foster their self-inquiry and critical thinking (CAPS). The following sub-themes emerged from the data as teaching strategies used by the teachers:

4.6.1 Sub-theme 4.1: Lesson plans

Lesson plans play a significant role in classroom teaching and have real consequences. This is guided by a teacher's orientation and belief systems, which influence their plans, actions and goals. Lesson planning is an important aspect of a teacher's strategy that directly have an bearing on what and how learners learn to use the necessary material, and importantly how teachers plan.

When asked about the lesson preparation, Teacher C (School 2) responded:

"In most cases, I rely on the textbook....and also check the Annual Teaching Plan every week. I don't plan to my strength due to the NS curriculum which must be taught according to CAPS. I usually use workbooks from other resource material which I give to my learners. There are lesson plans from the districts which are out-dated and not CAPS aligned...with regard to lesson plans it is quite time-consuming as I have to prepare for other subjects."

Teacher E (School 3) Commented:

"I usually plan my lessons weekly but due to a lot of content to cover I need more time to conduct all the activities....but the challenge is that I don't accomplish that. The work schedule is too congested, and I hardly finish all the activities in a week."

When asked about how the lesson plan benefited the learners, Teacher D (School 2) responded:

“Most of the activities I give to my learners are hands-on and sometimes I do get a positive outcome and it shows that the learners do understand a little bit...I guess it is very important to plan the lesson before. Planning for lessons is time consuming.”

When asked about how to plan NS lessons. How often are they planning and what material is considered when planning the lesson, Teacher A (School 1) responded:

“I usually plan my lesson plans through the ATP and for most of the topics I use a Textbook. Learners do have textbooks, so I normally use activities that are in the learners’ prescribed textbooks. I normally plan my lessons weekly. The department supply designed document in a form of lesson plans, but most of the topics are not CAPS aligned. I do have an educator’s file where all the resource materials are documented.”

When asked about following the lesson plan in NS, how closely the lesson plan is followed and on factors that may cause a teacher not to follow the lesson plan. Teacher B (School 1) commented:

“Very closely, factors that cause me not to follow the lesson plans well, is that at times the learners may need me to teach (or re-teach) a topic that is a pre-requisite or prior knowledge to the one being taught. This resulted in me not following the lesson plan. I also don’t follow the DBE lesson plans as most of the topics are out dated, especially now that the ATP was revised due to Covid-19.”

It appears that the teachers did not see lesson plans as a valuable resource. Their previous experiences with lesson plans may have resulted in an orientation that lesson plans were not useful. Data collected from the study suggests that teachers did not feel the value in the ready-made lesson plans from the Department. In addition, teachers were still textbook reliant in lesson planning. Even though Teacher E (School 3) had planned for a week, she needed more time to manage all the activities, which was a challenge.

Schoenfeld’s theory of teacher decision, provided a valuable theoretical background to this study, which was based on the assumption that effective teaching of NS depends largely on the knowledge the teacher possesses regarding the content of the relevant subject such as NS, the goals to be achieved by the whole teaching

process, and the beliefs that guide the teacher's decisions. (see Chapter 2, sub-section 2.6.4).

4.6.2 Sub-theme 4.2 Classroom environment

By definition, a classroom environment involve seating arrangements, how the learners interact with the teacher, and how they interact with each other using different accessible materials to strengthen their knowledge in the classroom (Bantwini & Feza, 2017: 314). The classroom environment affects teachers' ability to teach effectively and in turn, the performances of learners.

When asked about a good NS environment in the classroom, Teacher E (School 3) responded:

"I do try to put posters, but the classroom is just congested on the dirty wall...the other time we try to do some wall painting. But some learners like to put graffiti on the walls and would try to remove the posters...I mean those posters are very important part of learning NS."

These sentiments were echoed by Teacher F's (School 3) response:

"Our classrooms don't look appealing hey...they don't look to be NS classes. How do you create a good environment with all the vandalism...besides the community around here don't really care about their school."

Most of the classrooms that were observed by the researcher did have adequate furniture for both the teacher and learners in spite of the Covid-19 protocol. Of the 3 schools visited, one was neatly tiled (School 1) while School 2 and School 3 had cracked cement floors. The physical environment was challenging for science learning and there were rarely NS posters such as the Periodic Table on the walls (Chapter 2, sub-section 2.6.7).

Teacher F (School 3) responded when asked about the classroom environment:

"There's always the removal of furniture from class to class due to lack of resources and the fact that COVID-19 pandemic requires social distancing...this could help if the tables and chairs were permanently suited in every classroom."

Data collected from the teachers showed that teachers were not happy with the settings of the classrooms and felt that it was not conducive to teaching under such conditions. Teachers indicated that some of the reasons were based on the physical aspect such as broken windows, which is a challenge during the winter months.

Normally, an NS classroom should encourage learners and make the subject interesting, especially learners from poor communities (Mavuru & Ramaila, 2017). These researchers further added that a positive classroom environment is a good space for learners to learn, be productive and make good progress. A positive NS environment stimulates a learner's progress and enhances good academic achievement. When the NS teachers formulate or plan the aims of the subject, they must consider contextual factors which differ from school to school, and from class to class.

4.6.3 Sub-theme 4.3 NS Teacher-learner interactions

According to the CAPS document, teaching and learning should be learner centered. Consequently, the teacher should be able to create a positive environment where learners are presented with an opportunity using their own enquiry and critical thinking. Classroom interaction is vital between the teacher and learner, and learner to learner type of relationship.

When asked about creating a positive NS environment:

Teacher F (School 3) responded:

“Some learners are very difficult to deal with in the class...it has to do with their social background ...in a township school, this is as a result of crime and violence within their community...I am not a social worker...but sometimes one has to deal with very problematic learners in the class.”

Teacher C (School 2) responded:

“I'm always of the opinion that learners will respond on how you treat them in the class...I guess one has to know their background and be able to teach with compassion. That level of openness does help the learners to learn better...with a subject like NS you need to allow the learners to be innovative in their thinking.”

The teachers were aware that learner background and context influence learning. Teachers argue that learners' performance gets affected by socio-economic factors. Learners must be allowed to be innovative in critical thinking as required by CAPS.

Teacher F (School 3) lesson was negatively affected by the noise in the classroom, and some learners arrived late. The teacher must deal with classroom management first in order to be able to deliver the content. In this regard, there is little time left for the NS period which will prompt the teacher to finish the lesson quickly which overrides that science is learned through interaction.

4.7 REVISITING SCHOENFELD'S THEORY OF TEACHER DECISION MAKING

The objectives of the case study were to explore the Grade 9 NS teachers' experiences of teaching NS. Schoenfeld's theory of teacher decision making was brought in by assimilating the perspective of the Grade 9 natural sciences teachers. These allowed the researcher to investigate teacher's experiences in the teaching and learning of NS. The theory is therefore based on the assumption that a teacher's decision regarding the teaching process is predicted by his/her knowledge of the content of the subject to be taught, the goals to be achieved, and his/her beliefs (Schoenfeld, 2016).

According to Schoenfeld (2016), the concept of planning plays a crucial role in the process of thinking ahead, and goal setting. Schoenfeld's theory supports the notion that teaching is a goal-directed activity because the teacher enters the classroom with a lesson plan and certain goals that he /she intends to achieve. During a lesson, a teacher may deviate from the plan due to factors that make themselves evidently - so the teacher makes certain decisions during the lesson. When teachers' driving goal is to complete the content, then other aspects such as their orientations (for example, valuing practical work) and resources (collaborative lessons) are put aside.

Schoenfeld's (2016:49) main theoretical idea is that what a teacher decides to do while engaged in teaching is a prerogative of a teacher's goals, beliefs, and orientations serve to configure goals as some goals are attained and new goals emerge. Schoenfeld (2016) further argues that the fact that a teacher's beliefs, goals, and knowledge play such an important role in the teacher's decision making has important implications for professional development. Additionally, teachers have to

reflect on their decision-making in the classroom; reflect on why they make the choices, and what resulted in the type of decisions as well as whether they correlate with their beliefs, goals and knowledge which serve as a catalyst in their professional development growth and learner development (Schoenfeld, 2016:82). This theory emphasise reflective teaching which enable teachers to explore effective teaching methods.

Table 3: Research findings

Resources factors	Orientations	Goals
CAPS guides teaching	Teachers understand the need for practical work in NS	Cover the curriculum as specified by CAPS Integrate practical work where possible Use laboratories and apparatus
CAPS is overloaded in content	Teachers want learners to have more time to learn NS concepts	Learners need more understanding than content.
Limited time severely constrains teaching	Teachers teach hurriedly when constrained for time	Teachers need support to complete the syllabus on time
Teacher need resources (laboratories, equipment and skills) to teach practical work	Teachers want the resources available to conduct practical work effectively	To encourage self-enquiry and critical thinking to learners

Summary of findings based on Schoenfeld (2011)

4.8 CHAPTER SUMMARY

The analysis show that teachers acknowledged the need for practical work. However, due to curriculum overload, the teachers were unable to cover the curriculum as specified by CAPS and find possible way to integrate theory and practical work. Teachers felt that learners needed more time to understand NS content. This resulted in teachers' teaching procedurally when constrained for time. Teachers wanted a situation where resources were readily available to so that they

would be able to conduct practical work effectively. Laboratory spaces, equipment skills, and time needed to be utilised properly to facilitate teaching and learning. Teachers needed support in order to encourage self-inquiry and critical thinking to learners. This study shows in reality that when teachers teach such that they do all the talking, the learners become passive recipients of NS concepts and content as compared to constructing their knowledge and skill understanding the subject. Chapter five presents the conclusions and recommendations of this study.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The aim of this study was to explore the Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni. Therefore, teachers' experiences and revelations about their resources, support, orientations, goals, and teaching strategies were very important in this study for the enhancement of NS teaching and learning. This chapter summarises the main findings of the study, provides recommendations, and suggestions for further research.

The findings of this study are summarised by revisiting the research questions. These research questions were given specific answers according to the findings.

Main research question:

- What are Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS)?

The sub-questions:

- How do teacher resources, orientations and goals affect teaching NS in Grade 9?
- To what extent are Grade 9 teachers supported in developing resources, orientations, and goals for teaching NS in Grade 9?

Furthermore, this chapter presents the research conclusions, the study's contributions, limitations, recommendations, suggestions for future research and concluding remarks on the study.

Chapter 1 presented an overview of the study consisting of the introduction, background, theoretical framework, problem statement and research questions as well as aims and objectives. The research methodology, measures of trustworthiness, and ethical consideration, were discussed briefly.

Chapter 2 introduced analytical reports of previous studies on a related topic. The chapter deliberated on the teaching of NS in international countries, in accordance with South African context. Schoenfeld's decision-making theory is the theoretical framework that supports this study and was examined in this chapter. Policies that are in line with CAPS were also discussed. The chapter elaborated on literature derived from teachers' experiences in teaching NS.

Chapter 3 presented the study's methodology in more detail. This chapter covered participants' biographical information and elaborated on the rationale for empirical research, research design and the interpretive qualitative methods through interviews and participants observation selected to answer the research questions. Measures of trustworthiness and ethical consideration were explicitly explained.

Chapter 4 presented meticulous analysis of the findings and presented a discussion and interpretation of the findings. This chapter covered participants' responses through interviews, classroom observation and interpretation of data. Lastly, the chapter ended with concluding remarks.

Data presentation, analysis and interpretation that were discussed in Chapter 4 provided the responses to the three research questions.

5.2 SUMMARY OF RESEARCH FINDINGS

This study yielded findings subscribed by the participants to manifest their phenomenal truth (Billups, 2021). The research objectives were set out in order to answer the research questions.

5.2.1 *What are Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS)?*

The focus was therefore on theories underlying teachers' experiences in the teaching of NS, the resources and tools used in the process and the support needed (Schoenfeld, 2015) (*cf.* Chapter 2, subsection 2.5). The teachers experienced a congested curriculum that affected their time management and teaching methods. The overloaded curriculum affected the decisions teachers could make in their classrooms. Learners were overloaded with content and that limited their level of understanding. This also meant that teachers could not demonstrate sound decision making processes to achieve learning goals (*cf.* Chapter 4, subsection 4.3.1). Learners were largely passive recipients of knowledge in the classrooms due to teachers enacting traditional teaching approaches because they were rushed to complete work. This shows that their goals affected their decisions. Teachers had rotational classes, and adjusted ATPs, but were still feeling the curriculum was crowded and all these changes made matters worse. Time was not sufficient. As a result, they did not achieve their goals in teaching NS, especially in completing the syllabus (*cf.* Chapter 4, subsection 4.3.2).

Since teacher decision making is affected by their resources (both knowledge and physical resources; orientations (beliefs and values) and teaching goals (Schoenfeld, 2011) – it is evident that the interplay of these three influence NS teaching. In exploring teacher experiences of NS teaching, these three elements were foundational to teaching Gr 9 NS. It may be useful to share this theory with teachers to reflect on their own teaching experiences so that they may be able to improve their teaching.

5.2.2 How do teacher resources, orientations and goals affect teaching NS in Grade 9?

Prescribed textbooks were relied on and because of this; teachers did not plan lessons in detail. They used ready-made lesson plans. Teachers interacted with their learners with the aid of textbooks. The pressure to present the required content forced them to use textbooks and ask questions was their main teaching method (*cf.* Chapter 4, subsection 4.6.1). The teachers therefore did not use the resources that were available to them (e.g. knowledge of other teaching methods and other physical resources) to attain their goals. Laboratories, which are essential to science teaching and learning, were turned into classrooms for teaching purposes not used for

practical work because schools admitted more learners than the buildings could accommodate. Also, there was not enough laboratory equipment for each learner, and the learners had little time to use laboratory equipment effectively (*cf.* Chapter 4, subsection 4.4.2). Teacher knowledge resources (e.g. lesson planning, teaching methods, pedagogical content knowledge) did not always support effective teaching and learning, while teacher goals and pressure to achieve set goals also affected teacher decision making.

5.2.3 To what extent are Grade 9 teachers supported in developing resources, orientations, and goals for teaching NS in Grade 9?

Teachers should be guided by the *Subject Advisors* from the district. Data from the teachers suggested that Subject Advisors and district workshops did not add value (i.e. they were not used as resources) to achieving their goals for NS. The teachers required support from the Department of Education District subject advisors in curriculum implementation. The teachers were of the view that the department was not supportive of their schools. Lack of support has resulted in conflicting objectives of what the teachers' goals were, in ensuring that the learners were getting instruction as required by the CAPS (*cf.* Chapter 4, subsection 4.5.1).

The role of School Management Team in support of teachers was verified by the response from the participants. Data collected from this study's participants affirmed that the supportive role of the Principal and School Management Team (SMT) was evident, however, it was primarily focused on the results rather than supporting the teachers to conduct NS practical investigation in the classroom as specified by CAPS.

Teachers highlighted that the lack of support in the classroom, for example, demonstration of practical investigation influenced their teaching and learning of NS. The response from participants showed that Principals were largely interested in imposing the curriculum, and do not understand the needs of teachers to teach the NS curriculum was concerning. However, the teachers' profiles revealed that some teachers were not trained in teaching the subject; the school management assigned un-qualified teachers to teach the subject (*cf.* Chapter 4, subsection 4.5.2). Teachers also need management and district support as a resource that can enhance their decision making and improve their teaching.

The teachers appeared not to be eager to change entirely from their traditional teaching strategies. The consequence was that teachers were not able to use relevant strategies for various topics. Some teachers were not introduced to the knowledge strand (for example “Planet Earth and Beyond”) during their teacher training. School management has been highlighted as one of the crucial aspects that can enhance learners’ performance according to the National Development Plan 2030. According to the Goal 21 in the Action Plan for 2019, the realisation of schooling 2025 underlines that the foundation of annual management operations transpires across all schools in the country to contribute toward a functional school environment. School management should be part of the resources that teachers can turn to when teaching NS. The type of support received from the school managements affects the decisions teachers will make in their teaching.

Parental involvement was little and affected learners’ performance in teaching NS. The teachers’ responses from all the three schools visited confirmed that there was a lack of parental involvement. Teachers affirmed Parental involvement was essential in children’s education as it stimulates the child performance. The Centre for Child Well-being (2017:1) advocate that parental involvement in the learner’s learning builds a great number of opportunities for developing a child’s drive, attitude and educational achievement in and brings up improved behaviour and social interaction (cf. Chapter 4, subsection 4.5.3). As a resource, parental involvement was insufficient and as a consequence, teachers made decisions where they could not rely on parental assistance.

A summary of the findings (cf. Chapter 4, subsection 4.7) has shown how this enhancement could be attained.

Table 5.1: Research presumptions

Research Findings			Enhancement of Grade 9 NS teaching and learning
Resources factors	Orientations	Goals	
CAPS practical work requirements	Teachers understand the need for practical work	Cover the curriculum as specified by CAPS.	CAPS needs to be revised (to pre-plan for disasters and achieve learning goals).

	in NS.	Integrate practical work where possible. Use laboratories and apparatus.	
CAPS is overloaded in content.	Teachers want learners to have more time to teach NS concepts.	Learners need more time to understand the content.	CAPS needs to be revised (to reduce excessive content and maximize time for learning,
Time severely constrains teaching.	Teachers tend to teach procedurally when constrained for time.	Teachers need support from Subject Advisors, School Management and Parents.	<ul style="list-style-type: none"> • Time should allow use of a variety of teaching strategies. • Subject advisors must have strategies to enhance teaching, not only for monitoring. • School management should have a way to involve teachers in decision making • Parents must be involved in their children's work.
Teachers need resources (laboratories, equipment, skills, time) to teach practical work	Teachers want the resources available to conduct practical work effectively	To encourage self-enquiry and critical thinking to learners	<ul style="list-style-type: none"> • Equipment and resources should be readily available. • Learners to do practical work to enhance their skills in problem solving.

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5.3 RESEARCH CONCLUSIONS

The research findings emphasise the aspects that affected teachers' experiences in teaching Grade 9 NS in the Senior Phase. It is also concluded that teachers needed sufficient support from District subject advisors, School Management, and parents needed to play a role in their children's schoolwork.

The main research question was: *What are Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS)?* Three questions were constructed to respond to the main question. Research conclusions came out from the participants' responses to the research questions.

5.3.1 What are Grade 9 teachers' experiences in teaching Natural Sciences according to Curriculum and Assessment Policy Statement (CAPS)?

Regarding the main question, the empirical investigation confirmed that teachers indicated that the time allocated for NS was not corresponding to the Annual Teaching Plan. Consequently, teachers could not teach all the strands and that it has affected curriculum coverage. From the data collected, teachers indicated that there was not enough time to complete the syllabus. Teachers showed a tendency to narrate the content to the learners, with learners acting submissively to instruction. (cf. Chapter 4, subsection 4.3.1).

5.3.2 How do teacher resources, orientations and goals affect teaching NS in Grade 9?

Regarding this question, the empirical investigation according to teachers from interviews and observation from the classroom most of the activities were extracted from the textbook. Teachers were textbook-reliant and not opting for other resources. Data collected from the study suggested that schools were not utilising laboratory spaces as required. Laboratories were turned into normal classrooms due to the

large number of learners enrolled at the schools and the rooms were used as storage places. The teachers' responses indicated that lack of accessible resources affected teachers' goals for the teaching and learning of NS. Teachers acknowledged that their beliefs were not appropriate for interpreting their NS teaching experiences; and concurrently they had to provide guidance oriented with their personal goals (*cf.* Chapter 4, subsection 4.5.1).

5.3.3 To what extent are Grade 9 teachers supported in developing resources, orientations, and goals for teaching NS in Grade 9?

It was confirmed during investigations that teachers did get support from the District Advisors' and School Management. However, the support was not enough in helping teachers to achieve their goals in conducting investigations as well as practical work in NS. Teachers stressed that the support from the District and SMT could be vital in achieving their goals in decision-making in the classroom. Furthermore, the findings of the study showed that parents rarely participated in their children's schoolwork and hindered learners' progress (*cf.* Chapter 4, subsection 4.5.3).

5.4 RECOMMENDATIONS

The recommendations of the study are based on the resources, orientations, and goals of the NS teachers in the study and the data presented in the previous chapter.

5.4.1 Recommendations for the department of basic education

The Department of Education must empower teachers by designing developmental programmes that are aimed at capacitating teachers in the content aligned with the teaching programmes. Data collected from teachers who partook in this study confirmed that content knowledge in of essence in teaching and learning. The involvement of Subject Advisors, School Management, and Parental support need to be emphasized as they all play a vital role in teachers support. Training workshops should be sufficient to give guidance for teachers teaching the subject, particularly teachers that have not been trained in some knowledge areas like "Planet Earth and Beyond" during their teaching training. This would narrow the gap if it is done during in-service training and included prior curriculum implementation at schools. Conceivably, this can lead to improved teaching strategies than content focus. This

implies that teachers need support from the Department of Education in the field having Natural Sciences as a major subject from the training institutions/colleges.

5.4.2 Recommendations for the district subject advisors

Strategies that enhance teaching and learning should be encouraged to promote self-inquiry and critical thinking in the teaching of Natural Sciences. Professional Learning Communities (PLC) should be supported in form of clusters groups. The National Curriculum Statement (2011) advocates that the Subject Advisors should encourage teachers to help learners to identify, solve problems and apply critical knowledge in making decision to solve problems. It is the researchers' view that self-enquiry and critical thinking is vital in effective teaching and learners need to be supported adequately to work interdependently and not in isolation. Additionally, the teachers' content knowledge is of paramount importance in helping the learners to grasp the concepts. It is the responsibility of the districts to ensure that teachers' knowledge is emphasized to enhance teaching.

5.4.3 Recommendations for the school management team

It is recommended that SMT should encourage parents to engage actively in their children schoolwork. The SMT including the principal must profile learners with difficulty in learning by having regular meeting with the parents concerned. As a result, this would encourage learners to master the subject and improved results. This would stimulate learners to do what is required of them. Parents should not only give financial support to their children, but emotional support and monitoring their children's educational activities (i.e. regular school meetings).

5.4.4 Recommendations for the NS teachers

Teachers are curriculum drivers. Consequently, this implies that teachers need to develop themselves academically. Teachers must develop their skills to be competent with the content. The teaching strategies should promote active learning and critical thinking to learners. The teaching of Natural Science must be taught by teachers with a background in the subject. Teacher PCK is a vital resource in teaching NS. Teachers must be able to integrate both theory and practical activities in the teaching of Natural Science, and learners should be taught as prescribed by CAPS. Teaching strategies must enhance learners' conceptual understanding of

science in various fields. The researcher suggests that Natural Science teachers must practice reflective teaching in the decision making. Eventually, this would enable a teacher to explore teaching strategies which are more effective in the teaching of Natural Science.

The suggestions of the research findings in this study are that teachers need to be supported and have the necessary resources to enhance performance of the Grade 9 NS learners in Township schools to address the raised concerns.

5.5 AVENUES FOR FURTHER RESEARCH

The aim of this study intended to explore the Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni. The study could be broadened to other spheres to compare the findings, and could also be extended to more township schools within the Gauteng region in comparison to the findings in urban and township schools. Further research could also be extended to other curricula in South African schools.

Further studies could explore the most effective teaching strategies for teachers to enhance the teaching and learning in the Natural Science curriculum.

5.6 LIMITATIONS OF THE STUDY

Like in every research, there are common limitations within the study. This study presented limitations as suggested by Abbadia (2022) that the participants do not always respond truthfully to the research interviews. Their responses do not always give a true perception of the population. Okonkwo (2022) argue that there are aspects in data collection that may influence the results of the study. This study was conducted in the Ekurhuleni District schools where only three schools were selected within this district. The findings could have been dissimilar if other circuits participated in the study significantly if a much greater number of teachers were included in the study.

5.7 CONCLUDING REMARKS

Gathering data from the participants the researcher met with challenges as data collection was conducted during COVID-19 pandemic. The researcher had to adhere to the DBE health protocols. Teachers acknowledged effective teaching strategies. However, the difficulty was to group learners in conducting practical investigation.

For all the three schools visited, no practical investigation was conducted. The knowledge area did not require practical, but the researcher felt that teachers could have demonstrated in enhancing learners' self-inquiry. The research added value as it empowered the researcher to get actively involved in the research process. It also helped the researcher to understand the context of his research. Assist in developing innovative ideas and approaches. Also allows the researcher identifying potential problems and mistakes, helps the researcher to think more globally and objectively, and assists the researcher in producing high quality work. A teacher is a lifelong learner, therefore, can adapt to fit the individual needs of his/her own pupils. As teachers are accountable, the public must have faith in the profession and attitude to education vary across many social groups, so the performance of teachers can be demonstrated through publication of research findings.

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APPENDICES

Appendix A: Proof of Registration



0743 86121

SCRIPTS & SET
P O BOX 3444
SOUTHBOTE ROAD
1000

STUDENT NUMBER : 4428-889-0

REGISTRAR NAME : G MAFICHA
REGISTRAR TEL : (011) 441-8700

DATE : 2023-03-23

Dear student

I wish to inform you that your registration has been accepted for the academic year indicated below. kindly activate your unisa mylife (<https://myunisa.ac.za/portal>) account for future communication purposes and access to research resources.

DEGREE : BEd (CURRICULUM STUDIES) (88424)
TITLE : grade 8 natural sciences teachers' experiences of curriculum implementation in selected secondary schools in starbuiseni
SUPERVISOR : Prof M MATA (maja@unisa.ac.za)
CO-SUPERVISOR : Prof P MOCHEM (pico@unisa.ac.za)
ACADEMIC YEAR : 2023
TYPE : DISSERTATION
SUBJECT REGISTERED: PEDAGOGY AND PEDAGOGICAL

A statement of account will be sent to you shortly.

You must re-register online and pay every academic year until such time that you can submit your dissertation/thesis for examination.

Students registering for the first time for a dissertation or thesis must complete a research proposal in their first year of study. Guidelines will be provided by your supervisor/contact person.

If you intend submitting your dissertation/thesis for examination you have to submit an intention to submit form (available on the website www.unisa.ac.za) at least two months before the date of submission. If submission takes place after 15 November, but before the end of January of the following year, you do need not to re-register and pay registration fees for the next academic year. Should you submit after the end of January, you must formally re-register online and pay the full fees.

Please access the information with regard to your personal librarian on the following link:
<https://bit.ly/shoexpr>

Yours faithfully,

Prof M C MATHA
Registrar



University of South Africa
Pretter Street, Muckleneuk Ridge, City of Tshwane
PO Box 3192 UNISA 0003 South Africa
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Appendix B: Ethical Clearance Certificate



UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2021/05/12

Ref: **2021/05/12/44256892/25/AM**

Name: Mr SA Mosifa

Student No.:44256892

Dear Mr SA Mosifa

Decision: Ethics Approval from
2021/05/12 to 2024/05/12

Researcher(s): Name: Mr SA Mosifa
E-mail address: 44256892@mylife.unisa.ac.za
Telephone: 0849460786

Supervisor(s): Name: Dr MM Maja
E-mail address: majam@unisa.ac.za
Telephone: +27 12 429 6201

Name: Dr P Biccard
E-mail address: biccap@unisa.ac.za
Telephone: +27 012 429 6634

Title of research:

**TEACHING EXPERIENCES OF GRADE 9 NATURAL SCIENCES TEACHERS AT
SELECTED SECONDARY SCHOOLS IN EKURHULENI DISTRICT**

Qualification: MEd Curriculum Studies

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2021/05/12 to 2024/05/12.

*The **medium risk** application was reviewed by the Ethics Review Committee on 2021/05/12 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.



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Appendix C: Request Permission from the GDE



PO Box 3464

Southgate Mall

2082

The Director

Strategic Planning Policy and Research

Gauteng Department of Education

Johannesburg

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT:

PHUMULA SENIOR SECONDARY SCHOOL

LEONDALE SENIOR SECONDARY SCHOOL

RONDEBULT SENIOR SECONDARY SCHOOL

I, Seele Austin Mosifa am doing research under supervision of Professor Margaret Malewaneng Maja and Professor Piera Biccard, lecturers in Curriculum and Instructional Studies (UNISA College of Education) towards M.Ed. at the University of South Africa. I request two Natural Sciences from each school who give instruction in Grade 9 to participate in a study entitled "GRADE 9 NATURAL SCIENCES TEACHERS' EXPERIENCES OF CURRICULUM IMPLEMENTATION IN SELECTED SECONDARY SCHOOLS IN EKURHULENI

" in Ekurhuleni South District, Although my request is to have teachers participating in the research, participation is voluntary. Participants have the right to withdraw at any time and without giving a reason as they are under no obligation to participate.

The aim of this study is to explore the teaching experiences of grade 9 NS teachers at selected secondary schools in Ekurhuleni district.

The schools have been selected because they offer Natural Sciences which are the main focus of this study. The study will entail direct lesson observations in which there will be no interaction with participants. There will also be one-on-one, face-to-face interviews. Field notes of each classroom setting will be taken, and a voice-recorder will be used to capture interview responses. After data collection, all data will be used and kept confidentially for the purpose of study- and personal information will not be shared with unauthorized persons.

There will be no reimbursement or any incentives for participation in the research. The benefits of this study are knowledge and appropriate skills will be generated to teach Natural Sciences. The research report will be given to participating schools in completion of the study. This will be part of - Natural Sciences teachers' professional development.

The potential risk is of inconvenience as observations will be done while participants are teaching, and interviews will take place during break or free time and after school. No other risks are expected as the research sites (schools) and participants will not be identifiable in report writing. Pseudonyms will be used. Covid-19 protocol will be followed to mitigate the risk.

Feedback procedure will entail data analysis to confirm that transcribed data reflects the exact words of participants. On completion of the study, a meeting with participants will be requested. Feedback on important findings and recommendations will be presented in the meeting and a hard copy of the research report will be given to each school that participated in the research.

Yours sincerely



Seele Mosifa

M Ed student-researcher (UNISA)

Appendix D: GDE approval research letter



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	06 July 2021
Validity of Research Approval:	08 February 2021– 30 September 2021 2021/176
Name of Researcher:	Mosifa S A
Address of Researcher:	57 Murray Avenue 29 Palm Spring Meredale
Telephone Number:	0820702549 / 0849460786
Email address:	smosifa@gmail.com
Research Topic:	Teaching experiences of Grade 9 Natural Sciences Teachers selected Secondary Schools in Ekurhuleni Districts
Type of qualification	Master of Education (Curriculum Studies)
Number and type of schools:	6 Secondary Schools
District/s/HO	Ekurhuleni South

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1. Letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management

7th Floor, 17 Simmonds Street, Johannesburg, 2001

Tel: (011) 365 0488

Email: Falih.Tshabelaia@gauteng.gov.za

Website: www.education.gpg.gov.za

Appendix E: Request Permission Letter to Schools



PO Box 3464

Southgate Mall

2082

Dear Principal

REQUEST FOR PERMISSION TO CONDUCT M.Ed. RESEARCH AT YOUR SCHOOL

TITLE: GRADE 9 NATURAL SCIENCES TEACHERS' EXPERIENCES OF CURRICULUM IMPLEMENTATION IN SELECTED SECONDARY SCHOOLS IN EKURHULENI

My name is Seele Austin Mosifa, and I am doing research under the supervision of Professor M.M Maja and Professor P Biccard, senior lectures in the Department of Curriculum Studies towards an M.Ed. degree at University of South Africa. I hereby request your permission to conduct a study entitled, "grade 9 natural sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni" at your school.

The study will entail interviewing the teachers conducting their teaching natural science in the selected primary schools within Ekurhuleni South District. Interviews will be in a form of individual face to face interview. The expected duration of interview is approximately 40-45 minutes in length. Data will be collected over a period of two weeks depending on the availability of teachers. The aim of this study is to explore the teachers' experiences in teaching natural science in selected secondary schools in Ekurhuleni District. Your school has been selected because it is one of the schools within the Ekurhuleni South District and therefore the presence

of teachers in this school will be of great value. I also undertake to ensure that confidentiality and anonymity during the study will be maintained, and that data obtained will be kept in a safe place upon completion of the study. Participants' participation will always remain voluntary, and they can withdraw from the study at any time without penalty.

Should you have any questions regarding this study, would like additional information to assist you in reaching a decision about participation, please contact me at 0849460786 or by email at 44256892@mylife.unisa.ac.za or you can alternatively contact my supervisor on 012 729 6201 or by email at majam@unisa.ac.za.

Yours sincerely

A handwritten signature in black ink, appearing to be 'M. Majam', written in a cursive style.

Appendix F: Participation information sheet

P O Box 3464
Southgate Mall
Meredale
2082

Dear prospective participant

My name is Seele Mosifa. I am studying towards a Master's degree in education. Currently I am doing research under the supervision of Dr Margaret Malewaneng Maja and Dr Piera Biccard, lecturers in Curriculum and Instructional Studies at UNISA College of Education. We are inviting you to participate in a study entitled: **GRADE 9 NATURAL SCIENCES TEACHERS' EXPERIENCES OF CURRICULUM IMPLEMENTATION IN SELECTED SECONDARY SCHOOLS IN EKURHULENI.**

This study is expected to collect important information that could generate knowledge and appropriate skills to teach Natural Sciences effectively and to develop NS teachers professionally.

You are invited because you teach NS and your school offers the subject; therefore, you are one of the relevant participants in this study. I believe you will be able to answer the research questions as outlined in this information sheet. As I believe that people have different experiences due to contextual factors in their workplace, you will not be the only participant in this research. The research will be conducted in three different schools in Ekurhuleni District including your school. There will be two participants from each school- who teach NS in Grade 9.

The purpose of this study is to explore the teaching experiences of grade 9 NS teachers at selected secondary schools in Ekurhuleni district. The study involves a direct lesson observation in which there will be no interaction between the researcher and participant. After the lesson observation, your lesson plan will be requested for document analysis which will enhance validity of data collected through observation. A face-to-face semi-structured interview that is intended not to exceed 40 minutes will be conducted after the lesson observation. Field notes and a voice-recorder will be used to record your responses to the research questions. A

voice-recorder will only be used to ensure that your exact words are captured accurately for data analysis purpose.

There will be low level of inconvenience to you as the lesson observation will take place while you teach NS and the semi-structured interview will be conducted during free periods or breaks and after school, after the lesson observation. There are no expected risks due to participation in this study. All data will only be used for the study and pseudonyms will be used in report writing. No personal information will be shared with unauthorized persons. The supervisor of this research and members of the Research Ethics Committee will be the only authorized persons to access data to validate that the research is done properly. All raw data will be kept safely in a personal computer that uses a password to restrict access to unauthorized persons. Hard copies of your answers will be stored safely for a period of five years until it is used for future research or academic purposes and conference proceedings. After five years when data is no longer needed, hard copies will be burned, and the computerized data will be deleted permanently from the drive. Your school will be given a copy of the final report as an indication that data is treated confidentially.

Although my request is to have teachers participating in the research, participation is voluntary. Participants have the right to withdraw at any time and without giving a reason as they are under no obligation to participate. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form.

You will not be reimbursed or receive incentives for participating in this research. To ensure that you and your school benefit from participating in this study, on completion of the final report, a feedback meeting in which important findings and recommendations will be presented will be requested and your school will be given a copy of the final report.

This study has received written approval from the Research Ethics Review Committee of the College of Education, UNISA. A copy of the approval letter can be obtained from the researcher if you so wish. If you require any further information please contact Seele Mosifa on 0849460786 or email smosifa@gmail.com. Should you have concerns about the way in which the research has been conducted, you

may contact the supervisor of this study, Professor Margaret Malewaneng Maja at +27 12 429 62 01 or majam@unisa.ac.za.

Thank you for taking time to read this information sheet and for participating in this study.

Yours faithfully

A handwritten signature in black ink, appearing to read 'Seele Mosifa', with a stylized, cursive script.

Seele Mosifa

Appendix G: Consent form to participate in research



I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified. I agree to the recording of the interview responses on a voice-recorder. I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print) :

Participant Signature _____ Date _____

Researcher's Name & Surname: Seele Mosifa

Researcher's signature:  Date: _____

Appendix H: Interview Schedule

TITLE: GRADE 9 NATURAL SCIENCES TEACHERS' EXPERIENCES OF CURRICULUM IMPLEMENTATION IN SELECTED SECONDARY SCHOOLS IN EKURHULENI

AIM: The aim of this study was to explore the Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni.

Interview Questions

INTERVIEW QUESTIONS FOR TEACHERS

1. Explain your role as a Natural Sciences teacher.

To instil NS discipline in terms on mastering the concepts to the learners

2. What is your understanding of content knowledge in Natural Sciences?

Which sections do you feel that you have good content knowledge? Which sections do you feel you can improve your content knowledge? What is your favourite section to teach? And your least favourite? (Why?)

My favourite sections are Matter and Materials, Energy and Change and Life and Living because I have a passion for them, and I studied them at tertiary level. Least favourite is Earth and Beyond because I have no real passion for the section

3. Do you feel NS is the right subject for you? Have you always taught NS?

Having trained at tertiary, I enjoy NS and feel very passionate

4. Are you qualified specifically as a NS teacher? Did you take any NS subjects in your teaching qualification? How many years of experience do you have?

Yes, I am qualified in teaching the subjects and took NS in my teaching qualifications, I have 12 years of experience in teaching the subject

5. What successes have you had in Natural science teaching?

Yes, some of my learners are qualified in Science subjects including Physical Sciences and Geography as well as Life Sciences

6. What challenges do you have in teaching Natural science - in Grade 9?

Because of the NS curriculum time stipulations and overburden ATP to be dealt with in a time indicated... we do not get a chance to focus on the individual learners. I just continue and move to the next knowledge area...as I cannot slow down because I need to cover as much as I can. The situation is not improving to ensure full curriculum coverage.

7. Which aspects of the curriculum are most problematic for you? Why?

If you look at it (curriculum), it is just packed. It does not give a breather, it does not have that day when you come back from holiday when you say, today it is remedial work, because that's what we do when we come back from holiday, you give back their (learners) scripts and do remedial work is not accommodated for, which is normally two days after the beginning of the term,

8. What kind of support do you get in teaching Natural Sciences? From the Department in the form of:

- **District Advisors**
- **School Management**
- **Parental Support**

Subject Advisors do not come to visit as they should so as to keep up with the challenges we are experiencing in the classroom...especially in conducting practicals. At school level information is only shared through meetings on ATP and discusses the resources. Parents do attend meeting, but for learners that are performing well but majority come as an when you have to send the invite one on one

9. What resources are available to you to teach NS? (e.g. textbooks, posters, equipment etc.) In your opinion, are the resources useful in helping learners in learning NS? Which resources do you feel you still need to teach NS effectively?

When we (teachers) teach it as science, it was much focused. You know that you are teaching the content and you are doing the practical. It was very focused and the kids (learners) could grasp that knowledge very easily...It's not because there's a personal preference that there's a leaning...it's simply because err..., there's more content in the science part, so you have to teach that content before you apply it, and we are following and relying heavily on the textbooks

10. What do you see as the role of assessment in Natural Sciences?

According to DBE, the teacher must assess the learners to validate that they really master and understand the concepts...so that one is able to know those that need to be progressed and to use different teaching strategies to improve the learner's competency in the subject. Yet assessment is vital in NS teaching, now of lately you give them a test and ask them to go home to study for the test...but they still fail the test. What is the purpose for assessing?

11. What do you understand by the term "a competent NS teacher" and what constitutes competence?

Must teach the NS with no difficulty, by showing competence in the lesson preparation and execution

12. Does the school have a laboratory and does the laboratory have a variety of learning and teaching support materials?

Mostly we use Life Sciences Toolkit, and it does not cover fully when doing NS practical investigations. I wish we could get NS mobile tools which will cater NS Grade 9 practical work and assessment as well.....The learners have to share the equipment as a group...yes equipment we do have but it does not cater for all the learners...what you use in one class will be used in all the Grade 9 classes. And teachers will have to share the equipment

13. How do you make the NS learning environment conducive to learning, please give examples?

I group learners according to their level of understanding and discusses the NS concepts .I also give feedback and focus on the level 1 learners.

14. How do you plan your NS lessons? How often do you plan your lessons? Do you plan to your strengths? How do you consider resources when doing your planning?

I plan my lesson plans around prescribed textbook, It is merely very convenient as it entails theory and all activities with solutions from the teacher's guide. I plan my lesson weekly, but since the COVID-19 pandemic I hardly plan my lessons timeously.

15. How closely do you follow the lesson plan? What factors cause you not to follow the plan?

I hardly follow my lesson plans closely due to congestion in the curriculum...I feel that the curriculum needs to be trimmed a little bit to allow the learners to understand the concepts

16. What do you do to support learners to learn NS concepts effectively?

How can one teaches NS without a prescribed textbook...It is very difficult looking at different Grade 9 NS study guides which only explain the concepts partially...Information from the textbook is very handy. You don't struggle to find any topic

17. Which strategies/methods do you use when teaching NS?

Participative and collaborative learning. I always encourage my learners to ask questions related to any topic in NS. Most of the knowledge areas are textbook-reliant...because all the learners have textbooks" ...I also check the learners prior-Knowledge.

18. Does the revised ATP for NS correspond to the actual time or days at your school?

The syllabus should be trimmed to allow the teacher to teach all the topics. Due to time constraints and the school rotational time-table. Some topics do overlap to the next term. I would say that we don't get enough time to complete the curriculum as prescribed by the department of education.

Appendix I: Observational Schedule

School: 1

Participants: Teacher A and Teacher B

Date: 09/2021 (Teacher A), 09/2021 (Teacher B) Time: 10:00 (Teacher A), 10:45 (Teacher B)

What to observe	Reflective notes/ detailed notes of what you see during observation		Themes	
	Teacher A	Teacher B	Teacher A	Teacher B
	Teacher's content knowledge during the lesson	The teacher was familiar with the topic, but could not explain the concepts clearly to the learners. The teacher was teaching general scientific concepts.	The teacher was very knowledgeable about the NS content. Prior learning was established. However the teacher did not allow the Learners to grasp the scientific concepts in context.	<u>NS teacher resources</u> CK (limited- was teaching general concepts only)
Teacher's use of lesson plan	No lesson plans was used during the lesson in the classroom Mostly extracted from the textbook	No specific lesson plans were used to highlight the lesson objectives, aims. Only written notes from the Textbook were used. The teacher could not make connections between the learners level of understanding and the new concepts.	<u>NS teacher resources</u> PCK (lesson plan- lessons not properly planned, example; no lesson plans or at time just extracted ready-made lesson plans from the textbook)	<u>NS teacher resources</u> PCK (lesson plan- lessons not planned; teacher could not make connections between the learners level of understanding and the new concepts)
Teachers use of physical resources	Teaching materials or equipment were used, but not shared with the rest of the class. Smart board available but not utilised. No technological tools used during the lesson. Textbooks used.	Smart-board available, but not user friendly. No use of Technological equipment used during the lesson. Teaching materials or equipment were used for illustrations but could not be shared by all the learners.	<u>NS teaching resources</u> Use of laboratory equipment (not adequately used, not enough for every learner). No technology used, example; Smart boards available but never used.	<u>NS teaching resources</u> Use of laboratory equipment (not adequately used, not enough for every learner). No technology used, example; Smart boards available but never used.

Teacher's use of textbook	Learning material extracted from the textbook. Photocopies were shared to the class in a form of Illustrations and summary. All the activities were textbook based.	Content mostly textbook reliant. The prescribed textbook (SASOL) from DBE was evident on classroom activities. However, the activities were not similar to teacher A even though they come from the same school.	<u>NS teaching resources</u> Use of textbooks (adequately used).	<u>NS teaching resources</u> Use of textbooks (adequately used).
Teacher's methods and strategies during the lesson	Question and answer methods. Narrative /telling teaching strategies. Demonstration strategies.	Question and answer teaching strategies. Narrative/telling method. No productive feedback was evident due to time and method of teaching for one period which lasted 50 minutes.	<u>NS teacher resources</u> CK (enough content knowledge-example, ability to narrate and demonstrate the content) PCK (teacher-learner interaction-limited interaction, only happens when teacher dominates by posing questions and expecting answers from learners)	<u>NS teacher resources</u> CK (enough content knowledge-example, ability to narrate and demonstrate the content) PCK (teacher-learner interaction-limited interaction, only happens when teacher dominates by posing questions and expecting answers from learners)
Classroom environment	Classroom sitting arrangement in rows well ventilated for the conditions. Smart-board available. Teacher – learner environment not intensive as the teacher could not create a positive atmosphere. The positive aspects were charts and the periodic table on the wall to indicate science classroom.	Evidence of teacher-learner interaction but not interactive to create a positive learning environment. The learners were not allowed enough time to ask questions as the teacher was very hurried to finish the content.	<u>NS teacher resources</u> PCK (classroom environment-shows a science class; charts and the periodic table displayed. Conditions unfavourable, examples; sitting arrangement, not well ventilated)	<u>NS teacher resources</u> PCK (interaction evident)

Appendix J: Turnitin Report

GRADE 9 NATURAL SCIENCES TEACHERS' EXPERIENCES OF CURRICULUM IMPLEMENTATION IN SELECTED SECONDARY SCHOOLS IN EKURHULENI

ORIGINALITY REPORT

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Appendix K: Proof of Editing



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148 Aramburg (Mpumalanga) Cell: 060 346 7091 email: mhlekaziet@gmail.com

Proof of editing

STMBondvo editing services
148 Aramburg
Mpumalanga
South Africa
Cell.: 0603467091

Date: December 2023

This is to certify that I have edited the Master of Education of the following candidate:

Names and Surname: S.A. Mosifa

Title: Grade 9 Natural Sciences teachers' experiences of curriculum implementation in selected secondary schools in Ekurhuleni.

Dr ST Maseko
Director
STMBondvo editing services

Confidentiality: In editing academic documents, I understand that I have access to confidential data, that information contained in documents is confidential and for that, I agree not to divulge, publish, make known to unauthorized persons or to the public the data in documents.