Physical Science Teachers' Experiences of the Junior Secondary Revised Curriculum for Grades 8 and 9, Oshikoto Region, Namibia

Jona Pohamba Shiwomwenyo Mushelenga

Thesis presented in fulfilment of the requirements for the degree of Master of Education in the Faculty of Education at Stellenbosch University

Supervisor: Prof B van Wyk

December 2020

DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that production and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

December 2020

ABSTRACT

This study is interpretive, and it employs a hermeneutic method of inquiry that draws on the work of Gadamer's theory of understanding and interpretation. It chronicles Physical Science teachers' experiences on the implementation of the Revised Physical Science curriculum for grades eight and nine in both public and private schools in Namibia for the academic years 2017 and 2018. The study is guided by an interpretive theory, driven uniquely by a hermeneutic concept that advocates for the establishment of the understanding by interpreting written or interview texts, or otherwise from various literature, in order to obtain the meaning of the whole.

I employed a conceptual analysis a research method. It is particularly important to explain concepts to obtain a better understanding, as this could result in an acceptable analysis and a meaningful conclusion on the basis of the data. Conceptual analysis is about showing the meanings of terms and is often linked to justification. The study employed document analysis and semi-structured interviews to collect data. The old and new Physical Science curriculum for the Junior Secondary phase (grades eight and nine), the National Subject Policy guidelines for Physical Science grades eight to twelve, and documents and policies relating to Physical Science Junior Secondary phase grades eight and nine were also analysed in order to understand and develop meanings of how the revised curriculum of Physical Science in Namibia was implemented. The findings of this study reveal that teachers are positive about the new curriculum, and they appreciate advanced information. Also, if implemented thoroughly, most of the learners should be well equipped at the end of Junior Secondary level. The study further discloses factors that hampered curriculum implementation, such as a shortage of textbooks, a lack of extensive teacher training or capacity building, a lack of materials and equipment to conduct practicals, overcrowded classes, and inadequate time allocated to cover all specific objectives in the Physical Science lessons for grades eight and nine.

Based on the findings this study recommends that, the Ministry of Education consider offering extensive teacher training, order the equipment and materials needed for practical investigations, and distribute them to schools through the Chief Education Officers of the regions. Learners can only acquire scientific literacy by understanding scientific processes, their nature, and by

acquiring the ability to apply such scientific thinking and skills through experimental work, which is a prerequisite of education today.

KEY WORDS:

Physical Science, teachers' experiences, curriculum implementation, curriculum transformation/reform, conceptual analysis, hermeneutics, interpretive theory, Philosophy of Education.

OPSOMMING

Hierdie studie is interpretatief en gebruik 'n hermeneutiese metode van ondersoek wat gebruik maak van Gadamer se teorie van begrip en interpretasie. Dit vervat die ervarings van Natuur- en Skeikunde-onderwysers oor die Hersiene Natuur- en Skeikunde-kurrikulum vir Grade Agt en Nege in beide openbare en privaatskole in Namibië vir die akademiese jare 2017 en 2018. Die studie word gelei deur 'n interpretatiewe teorie wat op 'n unieke manier gedryf word deur 'n hermeneutiese konsep wat pleit vir die vestiging van die begrip deur geskrewe of onderhoudstekste, of andersins uit verskillende literatuur, te interpreteer ten einde die betekenis van die geheel te verkry.

Ek het 'n konseptuele analise as navorsingsmetode gebruik. Dit is veral belangrik om konsepte te verduidelik om 'n beter begrip te kry, want dit kan lei tot 'n aanvaarbare analise en 'n betekenisvolle gevolgtrekking aan die hand van die gegewens. Konseptuele analise gaan oor die betekenis van terme en word dikwels gekoppel aan regverdiging. Die studie het gebruik gemaak van dokumentanalise en semi-gestruktureerde onderhoude om data te versamel. Die ou en nuwe kurrikulum vir Natuur- en Skeikunde vir die Junior Sekondêre fase (Graad Agt en nNge), die Nasionale Vakbeleidsriglyne vir Natuur- en Skeikunde Grade Agt tot Twaalf, en dokumente en beleid rakende Natuur- en Skeikunde Junior Sekondêre fase Grade Agt en Nege, is ook ontleed, om die betekenis van die hersiene kurrikulum vir Natuur- en Skeikunde in Namibië te verstaan en te ontwikkel. Die bevindings van hierdie studie toon dat onderwysers positief is oor die nuwe kurrikulum, hulle voel dat dit uitstekend is en dat dit baie gevorderde inligting bevat. As dit deeglik geïmplementeer word, moet die meeste van die leerders goed toegerus en gepoleer wees aan die einde van die Junior Sekondêre vlak. Die studie openbaar verder faktore wat die implementering van die kurrikulum belemmer het, soos 'n tekort aan handboeke, 'n gebrek aan uitgebreide onderwysersopleiding of kapasiteitsbou, 'n gebrek aan materiaal en toerusting om praktika uit te voer, oorvol klasse, en onvoldoende tyd wat toegewys is om alle spesifieke doelstellings in die Natuur- en Skeikunde-lesse vir Graad Agt en Nege.

Daar word aanbeveel die Ministerie van Onderwys moet uitgebreide onderwysersopleiding aanbied, die toerusting en materiaal bestel wat nodig is vir praktiese ondersoeke en dit aan skole

versprei deur die hoofonderwysbeamptes van die streke. Leerders kan slegs wetenskaplike geletterdheid verwerf deur wetenskaplike prosesse, die aard daarvan te verstaan, en deur die vermoë te verwerf om sulke wetenskaplike denke en vaardighede toe te pas deur eksperimentele werk, wat vandag 'n voorvereiste is vir die opvoeding.

SLEUTELWOORDE:
Natuur- en Skeikunde, ervarings van onderwysers, Hersiene Kurrikulum, konseptuele analise, hermeneutika, Interpretasieteorie, Filosofie van die Opvoeding.

ACKNOWLEDGEMENTS

To my life-coach, my late sister Taimi Kamati: because I owe it all to you. Many thanks!

I am grateful to the Almighty God, for the good health and wellbeing that were necessary in the challenge and troublesome ride to complete this study.

I wish to express my sincere thanks to my supervisor, Prof Berte van Wyk, for his unwavering support, patience, motivation and immense knowledge. His advice and guidance helped me throughout the time of research for and writing of this thesis.

I would also like to acknowledge Prof Peya Sheefeni, Dr Negumbo, Mr Fred Magomu, Mr Veiyo Nangombe and Ms Teopolina Kanime, Ms Ester Sakaria, as proof-readers of this thesis or portions of it. I am grateful for their very valuable comments.

I also want to thank Dr Mutombeni, Dr Ndawula, Mr Ndangi Shipanga, Mr Martin Nakambunda and Mr Sakaria Hangula, for financial assistance that made it possible for me to complete my research.

Last but not the least, I would like to thank my wife, Sesilia, and my six children, Peya, Pawa, Pohamba, Palisha, Pombili and Pali, as well as my brothers, sisters, nephews and nieces, for supporting and encouraging me spiritually while writing this thesis and through many sleepless nights.

I would also like to place on record my sense of gratitude to one and all who directly or indirectly have lent a hand in this venture.

Thanks for all your encouragement!

Table of Contents

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

The study draws on the experiences of physical science teachers who implemented the revised physical science curriculum for grades eight and nine in both a public and a private school in Namibia in the 2017 and 2018 academic years. It is an interpretive study, as it employed a hermeneutic inquiry that drew on the work of Gadamer's theory of understanding and interpretation.

As an Education Officer of Science related subjects (Physics, Chemistry, Natural Science, Physical Science), my principal task was to nurture physical science teachers' pedagogical content knowledge and practical investigation skills through quality science education during mini workshops, under the mobile van laboratory outreach programme in the regions. This interactive exercise is referred to as "teachers' support". In the past, I have supported both science teachers at public and private schools in more than nine regions in Namibia. I was part of the implementation of the Revised Physical Science Curriculum (RPSC) (grades eight and nine) trainers of teachers (TOTs) for the Oshana region during the stakeholder's workshop that was held from 29 August 2016 to 2 September 2016.

The mere fact that I was part of the implementation of RPSC constituted the three dimensions of Philosophy of Education (personal, public, and professional). First, as a participant, I brought my lived experiences (personal) and own interpretations in this study as an attempt to create a new understanding of Philosophy of Education in terms of new RPSC implementation. Secondly, I focused on the individual participants who in this context can be viewed as public, thus their experiences can be categorised as 'public' experiences of the implementation of the revised curriculum which in turn is shared with the learners as an extended public (implicitly). Thirdly, and lastly, in this study, I have considered scholars' professional views about implementation of curriculum either in a specific discipline or general. In addition, being a trainer of teachers is a

professional responsibility as a subject expert and as an educator. I have also brought in my professional views as an educator regarding curriculum implementation.

During my research, I did not come across a document narrating or researching the implementation of RPSC. This gave rise to a quest to understand the teachers' experiences during the implementation of RPSC at both a private and a public school in the Oshigambo Circuit of Namibia. In the Namibian context, a circuit is an administrative unit that supervises a group of 40 or fewer schools in an ecological space surrounding a unit (office) with a supervisor.

The study chronicles teachers' experiences, successes and challenges in the implementation of the newly revised curricula for grades eight and nine in two selected schools (a public and a private school). In the Namibian context, a public school is a learning institution implementing the National Curriculum for basic education funded by the state (government) and offering free education, as stipulated by article 20 of the Namibian Constitution (Act 1 of 1990). A private school is that institution established and maintained by a person, body corporate, trust, church or registered welfare organisation that registered such school in terms of the Education Act, No 16 of 2001, section (2). The institution may be subsidised by the state (government) as per the Education Act No 16 of 2001, section (49).

To sum up, the study also explores how physical science teachers experienced implementation of the RPSC impact at both private and public schools. Furthermore, an effort was made to discover how physical science teachers (PSTs) articulated their experiences as they implemented the newly revised physical science curriculum. Apart from getting data from interviews, I deemed it important to analyse documents such as the old physical science curriculum and the revised one.

This chapter focuses on the rationale for, background to and discussion of the conceptual analysis and philosophy of education, the statement of the problem, the research questions, and the methodology and methods. This is followed by a clarification of the related concepts and, finally, the chapter outline is provided.

1.2 BACKGROUND TO THE STUDY

In the first place, it is necessary to look at the system of education in Namibia before and after independence. I draw from Amukugo's argument (1993:45) that the education system during the colonial period was divided by the non-democratic South African government into three categories, namely white, coloured and black. She further argues that, during apartheid, different education systems and administrations were developed based on the three categories. Different schools were administered racially, for instance whites received superior schooling while blacks received an inferior one. In the same vein, Kandumbu (2005:1) adds that, before 1990, schooling in Namibia (the former South West Africa) in general was a privilege, reserved for a minority – whites who were a 'historically advantaged society' (HAS). For instance, education in Mathematics and Science was mostly for white children, who constituted a very small percentage of the population. Furthermore, the former South West Africa/Namibia (SWA/Namibia) government's policies of apartheid and colonialism advocated education for black Namibian people, the historical disadvantaged society (HDS), as a vocational utility intended to supply semi-skilled and unskilled labour.

After Namibia gained its independence in 1990, there was a need for making education relevant to the Namibian context, and to be adaptable to the changing needs of the Namibian society. Therefore, the current democratically elected government in Namibia considered it necessary to replace the unfair colonial education system with one system that is inclusive and democratic. Since there was a need to make education relevant to independent Namibia, a transitional education system was one of the Namibian government's priorities. It is worth noting that Namibia established the National Institute for Educational Development (NIED) in 1990, a department within the Ministry of Basic Education, Arts and Culture (MBEAC). This department was given the responsibility to safeguard the education development/transformation (which includes curriculum changes) and improvements, following the latest developments in the education sector. The department also drew up the curriculum and developed all the relevant curriculum materials, such as syllabi, specimen question papers and schemes of work.

I draw from Dilthey (in Van Wyk, 2004:27), who states that we may find that our texts are not the only sources, but that historical reality is a text itself that has to be understood. In this regard, I have attempted to define a curriculum and described the historical development or changes in the educational curricula in Namibia. Muhammad (2012:88) describes a curriculum as a set of planned tasks, learning experiences and behaviours proposed by an authority to achieve predetermined goals in the form of behavioural change, academic achievements, and learning outcomes within a period. According to Aloovi (2016:6), the Department of Education in Namibia implemented three different curricula within a period of less than sixteen years. For the senior phase, these were the Cape Education system, the International General Certificate of Secondary Education (IGCSE), and the Namibia Senior Secondary Certificate (NSSC), while the focus in the primary and junior secondary phase was more on curriculum reform.

A policy document, titled "*Towards education for all*", was drafted and used as a guide for the provision of quality education for all citizens (Ministry of Education and Culture [MEC], 1993:2). This policy document can be regarded as a renaissance in the democratic education system in Namibia.

The Namibian curriculum was structured into four phases soon after independence in 1990: grades one to four (lower primary), grades five to seven (upper primary), grades eight to ten (junior secondary), and grades eleven and twelve (senior secondary). The Basic Education Programme was implemented from grades one to ten, and grades eleven and twelve completed the Senior Secondary Education Programme. It is worth noting that the first curriculum transformation cycle started in 1991, and the full curriculum transformation and implementation from grades one to twelve were completed at the end of 1999 (UNESCO, 2006). In 2000, the comprehensive review of all curricula was executed as the first reform of the decade of independence and the second one was done in 2004 (UNESCO, 2010), and the third revision came in 2005. The Physical Science curriculum for grades eight and nine was also revised every fifth year after independence. For example, grade eight implemented its curriculum for the first time in 1995, while the grade nine implementation was in 1996. Grade eight implemented its second phase in 2000, whereas grade nine was in 2001. Grades eight and nine implemented their third revised curriculum in 2006 and 2007 respectively.

In 2016, the Namibian Ministry of Basic Education, Arts and Culture (MBEAC) reviewed the curriculum for the junior secondary phase (grades eight to ten), and the New Curriculum for Junior Secondary schools now starts from grades seven to nine instead of grades eight to ten. Currently, grade ten is part of the senior secondary phase, that is, grade ten to twelve, and this was approved by the Namibian Cabinet at its 3rd meeting on 25 March 2014, referenced as 3rd /25.03.14/001.

1.3 MOTIVATION FOR THE STUDY

Ryan and Deci (2000:68) say the entire representation of humanity shows people to be snooping, vital, agentic, and inspired to learn new skills. I concur with this, in that nature is very amazing. When a person finds out that he knows nothing or is curious about a certain aspect, his intrinsic motivation rouses the eagerness to explore and learn. In some cases, we even want to find out what lies outside the prospect of what we can experience. In simple terms, curiosity and exploration are triggered by the prevailing condition. This is what happened to me, and I have discussed and expounded on how my interests in this study were triggered.

My interest in conducting this study was motivated by many things, one of which was my own experience when I took part in the teachers' support outreach programme initiated by Rossing Foundation over a period of four years (2015, 2016, 2017 and 2018), and which I still participate in. The programme is two-fold: namely to nurture physical science teachers' skills to educate compassionately for excellence and impact on the nation through quality science education, and the other one is to empower Namibian learners to develop scientific skills and become critical thinkers in a collaborative learning environment. During the outreach, I had time to co-plan and co-teach with science teachers for at least one or two lessons, especially for grades ten, eleven and twelve. I have not had the opportunity to participate in the implementation programme in the revised curriculum yet.

I have offered support to science teachers at both public and private schools in the regions of Namibia, and participated in the teachers' workshops on the revised curriculum, but I had not

found out how teachers were coping or experiencing the teaching and learning of science regarding the Revised Physical Science Curriculum (RPSC). Before travelling to the regions, teachers were requested to submit topics/themes which they felt were challenging or for which they did not have equipment/apparatus or materials for onward support.

The other aspect that aroused me was the fact that the implementation of grade eight and nine curricula was just rolled out recently, so there could be no research conducted thus far or few, if there was any, I had not come across it and this could mean that I would be the first person to do research on the topic in the Namibia context. According to Mahara (2016:372), very few studies have focused on the experiences of teachers concerning the implementation of the new curriculum. Mahara refers to the studies of teachers' experiences of the implementation of the new curriculum in general. So, there might be a few studies or none at all about the implementation of the new science curriculum for grades eight and nine in Namibia.

During my honours' studies at Stellenbosch University in 2017, in the module 'Didactics Instructional Leadership', I was exposed to an article entitled "Teacher voice and ownership of curriculum change" (Kirk & Macdonald, 2001) through an assignment. This assignment required me to argue or justify whether teachers really "took ownership" of the curriculum. I realised that involvement in curriculum development is not considered, and their participation is only in the context of implementation, and every teacher is not a developer of the curriculum and they are often not empowered to fulfil their roles. It was then that I started to ponder whether other colleagues and myself could conduct mini-research to understand teachers' perspectives in support of the system and eventually all learners? This was another factor that motivated me to explore teachers' views on the implementation of the new curriculum.

Looking back at my own experience, I was trained as a science teacher at Ongwediva College of Education, where I obtained a Basic Education Teachers Diploma (BETD). This qualification allowed me to teach Physical Science up to grade ten. On appointment, I was given grades eight to twelve instead of eight to ten. Although I could feel the weight of this, I could not resist nor complain to the principal, since I desperately needed the job. There was no orientation held on how to implement the curriculum and, as a result, I could not help but find strategies which I was

comfortable with and which could secure the learners' confidence. With no senior science teacher in the school, I decided to approach one senior teacher from my neighbouring school to mentor me and I started implementing the curriculum from the topics/themes that I knew well.

The term 'mentor' in this context refers to a senior, experienced and subject specialist who imparts pedagogical knowledge and skills to a newly appointed teacher(s) or novice teacher(s). The mentor serves as a guide to a newly appointed or novice teacher, referred to as a 'mentee', to grow professionally and ultimately become an authority in a certain field. Under normal circumstances, the mentor and mentee are in the same school and the school management appoints the mentors. However, this was not the case with me, since I adopted my mentor in a different school without informing the school authorities of either school. After two years, I enrolled in a MASTEP course, which was designed to support teachers to acquire pedagogical knowledge and skills in how to implement the grade eleven and twelve science curriculum. I was among the first group that benefited from this initiative, and at no cost to me, because the government paid for my tuition, as well as accommodation and transport.

1.4 STATEMENT OF THE PROBLEM

In the section above, I discussed the main concerns that led me to conduct this study. During the implementation of the revised curriculum for grades eight and nine physical science subjects, I became concerned when I discovered that teachers experienced various challenges in the curriculum implementation. It was these circumstances surrounding the turn of events that prompted me to seek to understand the views of grade eight and nine physical science teachers regarding what they experienced in implementing the newly revised curriculum. Besides, earlier studies done by some Namibian scholars reveal that curriculum change can be a complex issue, as outlined below. Negumbo (2016), Aloovi (2016) and Iipinge and Kasanda (2013) concur that the process of curriculum change and implementation is and still poses a challenge in the education sector in many countries. Carl (2012) adds that change cannot be successful if teachers focus only on classroom instruction, which is the receiving and delivering end of the curriculum. Unfortunately, in Namibia's case, teachers who were meant to implement the curriculum were expected to perform philosophical wonders, like formulating, articulating and defending their

views on curriculum issues and had no choice but to start implementing the curriculum immediately they received it, no matter the time of the year.

In Namibia, educational transformation happened for several reasons, based largely on the political, social and economic changes influenced by the rapid increase in global knowledge, technology and skills (MEC, 1993). However, it has been argued that such reforms may have created debate and confusion among educators implementing the changes and structural adjustments, as the staff may have shifted from the intended towards the implemented revised educational curriculum.

Immediately after Namibian independence in 1990, most of the science teachers were empowered through in-service teacher training and development to implement the newly introduced physical science curriculum successfully. One such training was the Training and Assistance for Namibian Teachers (INSTANT) programme, which was set up by Vrije Universiteit Amsterdam in the Netherlands, together with the University of Exeter in the United Kingdom. This assisted Namibian physical science teachers to implement the curriculum between 1991 and 1995. The other programme was known as the Mathematics and Science Teachers' Upgrading Programme (MASTEP), which was a one-year study offered over two years through distance education. This qualification enabled junior and senior secondary teachers to implement the revised curriculum for the year 2000 and prepared learners for the school-leaving examinations (UNAM, 2011). Following the recently revised curriculum, I have hardly heard of a programme in place to benefit and train grade eight and nine physical science teachers to implement the revised curriculum successfully.

Further to that, a study conducted by Ngololo (2012:28) reveals that advisory teachers have sought capacity-building training in workshop facilitation skills and issues in curriculum development and implementation. These are professional educators responsible for specific subjects, a group of subjects or grades placed in the regions – either at the regional offices or circuit offices in each region in Namibia. Some of their duties are to advise other teachers on the specific subject issues and to facilitate workshops on subjects of their expertise. They assist in the development of the subjects at the regional and national levels (Ngololo, 2012). Yet, the

much-desired support from these professionals remains lacking in the respective areas. The absence of extensive support from advisory teachers and NIED, the custodian of the revised curriculum, can be among the factors that have hampered the successful implementation of the curriculum. Classroom overcrowding due to the staffing norms of the Ministry of Education could also be a problem in the case of the Oshikoto region.

1.5 AIMS OF THE STUDY

This study aimed to explore science teachers' experiences during the implementation of the grade eight and nine physical science revised curriculum for the period 2017 and 2018 respectively. It was an attempt to understand and interpret the teachers' experiences during the implementation of the RPSC at both private and public schools, as well as the teachers' articulation of their experiences relating to the implementation of the RPSC.

1.6 RESEARCH QUESTIONS

Andrews (2003:2) argues that research questions are not like ordinary questions, but rather are somewhat interrogational in that they expect an answer (not necessarily a reply). A research question must be answerable; answerable in the sense that it refers to the research question's potential of being answered in the study to be undertaken. It is not helpful in research to have a question that is so all-embracing that it would be impossible to answer within the confines of a research framing. I am confident that the research question in this study and its sub-questions are manageable and answerable with the resources at my disposal within the time frame allocated to this study.

1.6.1 **Main research question**:

> How does the grade eight and nine physical science teachers at both a private and a public school in Namibia experience the implementation of the Revised Science Curriculum of Physical Science (RPSC)?

1.6.2 Sub-questions

1. What are the successes and challenges of implementing the Junior Secondary phase (grades eight and nine) physical science curriculum at a private and a public school?
2. How are the physical science teachers equipped to implement the Revised Science Curriculum?
3. How are private and public schools impacted by the implementation of the RPSC?
4. How do the physical science teachers (PSTs) articulate their experiences of the implementation of the newly Revised Physical Science curriculum?

1.7 RESEARCH METHODOLOGY AND METHODS

Without going into the details of the methodology, I first explain what it is, as well as what methods are. The details are discussed later, in Chapter 2 (Research Methodology and Methods). McGregor and Murnane (2010:420) explain that research methodology refers to logic, reality, values, and what counts as knowledge to inform the research. The methodology is defined as how one finds out about procedures, and the way knowledge is acquired. In my view, this simply means methodology is about answering the question, 'how research is done', to get the response to the asked question (research question). Harding (1987, cited in Le Grange, 2017:4) defines methodology as a theory of knowledge and the interpretive framework guiding a research project.

In this study, I used the interpretive approach as a research paradigm. I used the methodology to think about and gain a better understanding of educational research. In this regard, I employed the theory of hermeneutics, which draws attention to the importance of meanings for the social sciences – that they must be understood, not simply registered or measured. I sought to understand the teachers' situation in dealing with the implementation of the RPSC, hence I believed the hermeneutic approach would be suitable as I needed to understand and interpret the life experiences of the world of the physical science teachers (Tematie, 2004:21).

In the beginning, I thought hermeneutics was the name of one of the great philosophers. I only came to realise and gained some insight after I read “Descriptive versus hermeneutics” in Sloan and Bowe (2014:09), which made it clear that not only was I going to understand teachers’ experiences in the implementation of the newly revised curriculum, but also interpret their meanings about the newly revised curriculum at both a public and a private school.

Kabende (2015:37-38) describes hermeneutics as a textual interpretation or the finding of the meaning in a hidden word, for which one must read the texts carefully to understand the meaning behind the ideas. Laverty (2003:24) clarifies that hermeneutics is an interpretive process that pursues the bringing of understanding and disclosure of phenomena through language. In my view, we can only understand why things are appearing and happening the way they are by knowing the historical background and engaging with individual people to understand the complexity of the experience of many people through the interpretation of the participants’ views.

Gadamer (in Laverty, 2003:25) states that hermeneutics must start from a position that a person seeks to understand that something has a bond to the subject matter that comes into language, through the traditional text, and has, or acquires, a connection with the tradition from which it speaks. I concur with him, as the language used can explain different meanings, but an understanding of the matter in relation to a person’s articulation is more important. In my case, I attempted to understand experiences in their entirety, as well as the participants’ subjective experiences, acquiring insight into the participant experiences to the effect that I conducted the study in two schools, both private and public, and I analysed the data. The aim was not to compare, but instead I only highlighted the similarities or differences between the two schools.

To start the discussion on the **Research Methods**, I draw on the work of Harvey (1990:1). Methods denote the techniques and procedures followed to collect data. In this study, I used semi-structured interviews and document analysis as the research methods to get a better understanding of teachers’ experiences in implementing the newly revised curriculum. Furthermore, I employed a conceptual analysis to gain a better understanding of the teachers' experiences in the implementation of the RPSC. Conceptual analysis as an analytic tool in the

philosophy of education is discussed below. Finally, I understand methods to be about answering the question of 'what' tools will be used to get the desired feedback to the research question.

I attempt to address the question of what it is to analyse a concept in the form of "concept" and "analysis". Drawing from the British Dictionary, Cambridge Advanced Learners Dictionary, (2008), a concept is defined as a general idea or notion that corresponds to some class of entities and it consists of the characteristic or essential features of the class, while analysis is defined as a philosophical method of exhibiting complex concepts or propositions as compounds or functions of more basic ones. Deleuze and Guattari (1991:15) explain the complexities of a concept, as every concept has more than one component and is defined by them. It is particularly important to elucidate concepts to have a better understanding, which can result in an acceptable analysis and meaningful conclusion from the data. Conceptual analysis is about establishing the meanings of terms and is often linked with justification.

1.8 PHILOSOPHY OF EDUCATION

I started school during the transition period from Afrikaans to English as a medium of instruction. The transformation period was hard for me for two reasons: First, I was in the Junior Primary phase, a beginner with basic Afrikaans which I had not even mastered. The second reason was that my primary school was situated in a village where the community around the school only spoke the local language. The language problem started there, since I could not express myself in Afrikaans or English and my community could not even assist me to overcome that barricade.

I went through an education system in which memorising was the order of the day. Some questions required choosing true or false. Many of us guessed answers where provisions to choose a correct answer were given. If you memorised past question papers and their respective marking schemes for at least three simultaneous examination years, you were likely to obtain a distinction, because in most cases questions were duplicated year after year. But if the order of the questions happened to be slightly different, then the majority of us would fail that paper.

Due to the language barrier and poor pronunciation, I did not much participate actively in the class. Luckily, most of the homework or classwork, if there was any, was completed individually and questions rarely asked for clarity. If you asked me a question like explicate why to deduce, or critically discuss by then, I could not be able to provide an answer. I am of the view that critical thinking or understanding, and the interpretation of issues, were not inculcated in teaching and learning during our secondary education and, if it was, then the problem was the language barrier.

When I was a student at Ongwediva College of Education, in Oshana region in the now the republic of Namibia, my lecturer in Education Theory and Practice (ETP) mentioned the terms psychology of education, sociology of education, philosophy of education and others. I heard about "philosophy of education" for the first time that year, 1995. I cannot remember much about what was said about philosophy of education then; it could have been because it was not taught as a module or theme during our teachers' training course, or because this happened twenty-three years ago. Today, it is difficult for me to relate or frame what happened in the philosophy of education or philosophy and education – why there was tangible interaction and how I interacted and responded to educational matters in school at that time. I admit that I had no clue of philosophy or philosophy of education during and after I obtained my first and second degrees.

I came to learn more about philosophy and philosophy of education during my BEd (Hons) degree at Stellenbosch University, in the philosophy of education module in 2017. Although my first encounter happened in 2016 in the core module, philosophy of education, some branches of philosophy were taught at a "moderated level" and not in-depth. Accordingly, I now analyse the two terms in the subsequent paragraph so that my readers can obtain a better understanding of the terms, as they are equally important for this research. What then is philosophy, Education and Philosophy of Education?

1.8.1 Philosophy

The word philosophy originates from two ancient Greek words, which are: “phileo”, from “Philos” (love), and “Sophia” (wisdom), which when combined etymologically to mean ‘love of wisdom’ (Jacobs, 2012:9; Kabende; 2015:11; Shanyanana, 2014:26). In my view, philosophy is at work when someone is seeking reality and displaying love towards acquiring knowledge with understanding. Philosophy is about being in a quest for a deeper understanding of being(s).

So, for many Greeks, a philosopher was the one who desired wisdom. History teaches us that, in Western culture, philosophy was born in the sixth century before common era (BCE), and this group was referred to as pre-Socratics [BCE and Common Era (CE) are modern and neutral abbreviations replacing the traditional abbreviations Anno Domini (AD) and Before Christ (BC), which both hold religious (Christian) connotations]. While history is not the focus here, it is important to note that, a century later, another group of philosophers offered their services as teachers and claimed to teach virtue. According to Moore (2010:3), philosophy is strictly a ‘higher-order’ activity dealing with linguistic and conceptual issues. It is done with the ‘concept of mind’ or the ‘concept of purpose’, rather than with minds or purposes as such, and deals with problems that arise wholly or largely from linguistic or conceptual confusions. Philosophy, in simple terms, is a discipline (activity) that thinkers or critical thinkers engage in to understand the truth about the universe and themselves, asking, arguing and answering questions as well as analysing the existing relationship between the ecological space and themselves. It is my understanding that, in philosophy, the use of language is crucial, understanding is a priority and interpretation is a mode for unpacking views in documents or the perspectives of research participants. This study attempts to understand and interpret participants views as well as documents related to the implementation of the RPSC hence this gives credence to the assertion that it is philosophical. Indeed, philosophy of education varies from country to country, region to region, and school to school, because it depends on how individuals perceive, analyse, argue, understand and construe the educational matter within the context in which the individual lives.

Teichman and Evans (1991:1) suggest that philosophy is a study of problems, which are definitive, abstract and very universal. These problems are claimed to be a concern with the nature of being(s), wisdom, principles, motive and human purpose. In philosophy, we are not necessarily seeking to solve the problem or for the solution to the problems, but we want to

understand those problems which are peculiar to the nature of beings and human purpose. Our concern is more with understanding circumstances as a whole, and we can interpret or explain a variety of abstract things without redefining it/them and, of course, increase one's understanding of life and the potential in life.

Hirst and Peters (1998:28) regard 'philosophy' as an activity that is distinguished by its concern with certain types of **second-order questions**, of a reflective sort that arises when activities like science, painting pictures, worshipping, and making moral judgements are going concerns. According to Hirst and Peters, second-order questions are those questions that inquire reflectively, though not all reflective second-order questions are regarded as philosophical. For example, supposing one South Africa Development Community (SADC) president says, 'you should not reprimand the whole country by cutting off the whole internet service due to misuse of the "WhatsApp" service', and another one says, 'That's not certainly reprimanding them: how do you know you shouldn't do this anyway?' the last question is a second-order question, because the second president reflects on the concept "reprimand" and philosophy is concerned with questions about the analysis of concepts and the grounds of knowledge, belief, actions and activities.

1.8.2 Education

I now revert to the question: what is education? Education is "the process of learning and teaching the young the knowledge and skills necessary for adult life" (Hicks, 2009).

I started kindergarten at the age of four years, where I learnt some songs and some games, but before that, had been educated in some ways by my parents and older siblings. I learnt how to talk, imitate other beings, and escape from danger. It is no doubt that the system I was introduced to taught me the knowledge and skills necessary for my adult life.

According to Brook (2012:32), education is to become a fully flourishing human. It exposes us to the conundrum of the realisation of a true human being. I am who I am today because of education. My success and failure depend on the education that I received, whether formal,

informal or non-formal. Education is a universal process that is defined and interpreted by different philosophers in different ways. Therefore, its meaning depends on its contextualisation by individual people. Some people refer to it as formal schooling or lifelong learning, others refer to it as the acquisition of knowledge, skills, beliefs, values, attitudes and habits (Srivastava, 2014:3). I came across a post with Mahatma Gandhi quote, who once said: "By education, I mean an all-round drawing out of the best in child and man's body, mind and spirit." Principally, this implies that education transforms people and shapes them to be critical thinkers. Van Wyk (2004:11) echoes similar sentiments. He noted that the concept 'transform' is used in the second criterion, Thus, he concludes that transformation is inherent in the processes and goals of education, and for education to be deemed a success it has to bring about a 'transformation' in the person who is or was 'educated'.

In many cases when people talk about education, they refer to institutions like school, colleges, vocational training and university, and ignore or fail to recognise other educative processes such as the roles played by parents, community and peers. Matheson (2015:1) provides several poignant quotes attributed to Mark Twain, and one of them suggests that education is not a sanctuary, the preserve of institutions such as schools, colleges and universities and that, in fact, from many perspectives, these institutions are the very antithesis of education. I believe, from Twain's quote, that as human beings we need to understand the empowerment and importance of education and how it can build, develop or destroy society. Without a deeper understanding and universal knowledge of educational issues, one would be unable to change or challenge society.

What is the purpose of education? Do transformation and transmission have some relevance to what we mean by education? As shown in Marples (2010:103), that people interested in the purpose of education have lately been influenced by the work of Peters. A more pertinent and useful discussion is concerned with the purpose of education, as it is only through this that any definition will begin to make sense. Peters, in collaboration with Hirst (1965, 1973 in Marples, 2010), argues that one of the principal aims of education should be the development of the human mind for its own sake, through a liberal education conceived as an initiation into such forms of knowledge and understanding. Peters initially looked at education as the process of

initiation into intrinsically worthwhile activities, or those activities which one might engage in for their own sake.

Darling-Hammond (2010:5) found that nations around the world are transforming their school system to meet the new educational demands. Governments are expanding educational access to more and more of their people, they are revising curricula, instructions and assessments to support the more complex knowledge and skills needed in the 21st century. She further illustrates how some of the countries, like Finland, got way with the state-mandated rigid tracking that had allocated differential access to knowledge to its young people. This was replaced by highly trained teachers, and curriculum and assessment focused on problem-solving, creativity, independent learning, and learners' reflection. This transformation propelled the achievement of this country to the top of the international rankings. In my view, countries should get away from being captives of their policies. They should aspire to transform education policies to activities and empower educators to transform young people to be agents of educational changes and solve problems to meet global demands. A well-thought-through education transformation that is driven by creativity and tactical acumen would help the government to attain social and economic independence and make strong headway to educational achievement.

According to Carl (2012:50), the content is the most important in transmission. There is a strong alignment, and learners' participation or involvement is of lesser importance. The curriculum therefore is something that is done to learners. In my view, the teacher-centred approach illustrates transmission. The teacher talks to learners but does not necessarily make them interested in what they are talking about. They might set exercises, mark them and record the points obtained in the assessment sheets, but they might not help learners to understand and become a 'knowledge-based- society' and critical thinkers. In this case, a teacher provides learners with a designated body of knowledge in a predetermined order (Johnson, 2015).

1.8.3 Philosophy of education

The question arises: What is philosophy of education?

Having discussed the two concepts (philosophy, and education), I now link the two conceptually. Kabende (2015:15) states that there is no specific definition of philosophy of education. She further alludes to the fact that different philosophers explicate the theme, "philosophy of education", differently, which made it difficult for her to understand. She cited some philosophers' work that has explained the term under discussion, such as Curren (in Chambliss, 2009:234), who describes the philosophy of education as applying a set of philosophical beliefs to education practice. Jacobs (2012:9) articulates a philosophy of education in a better and more understandable way when she defines it as an applied field of philosophy that draws from the traditional field of philosophy, such as ethics and epistemology. It is crystal clear that one definition would not clarify philosophy of education, and I contend that the discipline of philosophy of education depends on how one views it methodologically, although it deals with pedagogical issues.

I draw from Curren (2007:1), who suggests that philosophy of education is concerned more with questions related to educational goals and how to attain them, and that it becomes a tool that philosophers use to examine education matters, including the problems concerning specific educational policies, for example the curriculum. This suggestion from Curren created a philosophical standpoint in my mind that the philosophy of education is an autonomous discipline that deals with educational matters. Importantly, philosophy of education helped me to understand how Physical Science teachers experienced the process of teaching and learning Physical Science in grades eight and nine during the implementation of RPSC. It is also important to mention that this study discussed educational philosophy issues such as implementation of RPSC, teachers' perspectives, challenges and success experienced during the RPSC under the study.

I draw from the course work of Brennen (1999:5), who states that the philosophy of education is philosophy applied to education as a specific area of human endeavour. It involves taking those critical reflections that characterise philosophy, in general, to influence and direct the assortment of experiences and possessions that are being referred to as education. Furthermore, Philosophy of Education discusses philosophical problems involving a particular issue or topic, for example education. Therefore, it does not just address those problems in general.

Philosophy of education deals with different aspects of education. We study those aspects and explicate them. The phrase “philosophy of education” is not like a drive and a follower, but it has two equal parts, which are philosophy and education. Why do I regard educational philosophy as forming a part of philosophy? It forms part of the axiology branch in philosophy, which deals with educational values. Why does it also form part of education? Because it studies the purpose, nature and ideals of education.

1.9 CLARIFICATION OF KEY CONCEPTS

My study is a hermeneutic, interpretative one that entails a clarification of concepts. Paterson and Higgs (2005:342) explain that the interpretative paradigm is grounded in the philosophy of idealism. Through hermeneutic interpretation, the clarification of concepts enables people, especially our readers, to easily understand the phenomena in this study. Therefore, I find it imperative to acquaint our readers with the key concepts of my study.

1.9.1 Physical science

In an effort to understand what physical science means, I draw from Walker and Wood (2010:xi), who explain that physical science is the study of natural processes in non-living systems. It is one way to find answers to some “why” questions about the world in which we live. Put simply, it is a study of matter and energy and their interactions. It includes the branches of natural science that involve non-living systems. To successfully study physical science, one needs to understand the process of scientific enquiry, problem-solving, critical thinking and how to apply one’s knowledge. Thus, one needs to perform experiments in physical science. In the physical science curriculum, experiments play a number of educational roles.

The physical science syllabus for grades eight and nine (MoEAC, 2015b) describes the intended learning content and assessment objectives for physical science in the Junior Secondary phase. As a subject, physical science is within the natural sciences area of learning in the curriculum,

but it has thematic links to other subjects across the curriculum. It introduces learners to many natural science aspects of the world.

The PSC provides an overview of the physical world. It also gives learners concepts to think about, such as the scientific process, matter and materials, mechanics, electricity, magnetism, and other aspects of both chemistry and physics (MoEAC, 2015b).

The subject physical science places strong emphasis on the learners' understanding of the physical and biological world around them at the local, regional and international levels. It thus includes how societies use natural resources to satisfy their needs, and how the environment may be changed in ecologically sustainable ways. In this phase and subject area, the application of scientific knowledge and attitudes to health is of special relevance for the individual, the family, and society as a whole (MoEAC, 2015b).

1.9.2 Curriculum

This concept is broader and the interpretation of it may vary. Carl (2012:27) explains that teachers need a thorough knowledge and understanding of the most important concepts to improve their understanding of the whole process of the curriculum, which includes its implementation.

Although there is no generally accepted interpretation of the concept curriculum, Carl suggests that it should always be explained in the context in which it is used. I therefore discuss curriculum as a subject curriculum. According to Carl (2012:34), a subject curriculum includes more than just the objectives and selected core content described in a syllabus. It includes all details of a specific course which the teacher may require to instruct the subject effectively. Some of the details fall under rationale; for example, in the Namibian context, the country is rich in natural resources and the exploration of these resources requires scientific knowledge and relevant skills. It is thus important for the learners to acquire knowledge and skills that will foster their understanding of the interaction of human beings and the environment to satisfy human needs.

Kelly (1999, in Tse, 2013:1) explains that, if the curriculum is negatively viewed as a syllabus, then it may limit the planning of teachers to only considering the content or the body of knowledge they wish to transmit or a list of the subjects to be taught or both. This implies that to convey subject knowledge only is insufficient for something to be an effective curriculum. Teachers need to offer much more than a statement about the knowledge-content for it to be a productive subject curriculum.

Tse (2013:1) further asserts that the curriculum undoubtedly has the possibility of restricting what in-service teachers or novice teachers would like to teach in lessons. If the school tends to stick to the curriculum suggested by the directorate of education, its negative effect will become more explicit. Therefore, as much as the curriculum is regarded as an umbrella facet that includes many components, such as the syllabus, teachers should try to be open-minded and objective to deliver curriculum appropriately.

1.10 CHAPTER OUTLINE

In **Chapter 2**, I focus on the research methodology and research methods of enquiry that were used in trying to answer the research question. I discuss the research questions and hermeneutic interpretive paradigm that guided this study. I attempt to explain the reasons for opting for the hermeneutic interpretative as an appropriate research paradigm, and why I regarded other social science research paradigms, like critical theory and positivism, as not being suitable. Conceptual analysis, the sampling and two data-collection instruments (document analysis and interviews) are discussed in detail.

Chapter 3 presents the literature review, which describes the theories of other researchers who have surveyed teachers' experiences in curriculum implementation. According to Cronin, Ryan and Coughlan (2008:38), the primary purpose of the literature review is to provide the reader with an inclusive background for understanding the current knowledge and highlighting the significance of new research. I believe that the literature review offers a backdrop for the reader to contextualise the topic at hand.

Chapter 4 presents the research findings, analysis description and interpretation of the data collected during the research study. And lastly, in **Chapter 5**, I discuss the findings from the earlier chapters. Also, a conclusion on the research findings, recommendations and suggestions for further research are provided. At the end of this research project, the references and appendices are provided to give a clear understanding of the study.

1.11 CHAPTER SUMMARY

In this chapter, I have introduced my reader to the topic of this study, which is about the implementation of the new physical science curriculum. Physical science teachers implemented the revised physical science curriculum for grades eight and nine in both public and private schools in Namibia in the 2017/2018 academic years. After Namibia gained independence in 1990, the physical science curriculum, including the one for grades eight and nine, has been revised every fifth year. For example, grade eight implemented its curriculum for the first time in 1995, while the grade nine implementation was in 1996.

The chapter proceeds with the background to the study, which attempts to elucidate the post-apartheid educational status quo, especially in the mathematics- and science-related subjects. Also, I addressed and clarified a few concepts to ease the understanding of the whole text. Although I am familiar with texts produced by other researchers on curriculum transformation and curriculum reform, my primary goal was for my readers to get a clear historicism and a better understanding of what necessitated Namibia's education reform.

Every project comes about as a result of certain interests. I have discussed the interests that motivated me to embark upon this study. Furthermore, I included a section on the statement of the problem, which pinpoints the specific problem of this study, for example teachers implementing the new curriculum experienced various challenges during the implementation process, which was characterised by a great deal of uneasiness.

This chapter also includes the focus of the study, some information on research methodology and methods, what questions the study proposes to answer and an outline of the chapters of this study. Chapter 2 focuses on the methodology and methods in detail.

CHAPTER 2

RESEARCH METHODOLOGY AND METHODS

2.1 INTRODUCTION

The previous chapter gave insight into the orientation of this study. It provided a broad overview of the topic and contextualised the research problem. It underpinned the conception of the study and justified why it was important to study the topic chosen. This chapter deals with methodology and methods employed to produce this work.

McGregor and Murnane (2010:419) point out that consumer scholars often use the terms methodology and method interchangeably. However, they are not the same. The former refers to philosophy, it outlined in Chapter 1, part 1.8.1, and the latter, to be discussed shortly, refers to technical procedures employed to conduct research. Given that evidence, there is a good probability that most scholars start their projects with limited knowledge and understanding of the terms mentioned.

I decided to read more about methodology and methods, especially from the research of other scholars who grounded their work in the philosophy of education. This study is rooted in the same term. Apart from other scholars' research, the work of McGregor and Murnane on paradigm, methodology and method helped me understand these aspects better.

I now discuss methodology a little deeper, even though it was discussed briefly in Chapter 1, part 1.7, along with methods, for my readers and on my own behalf so that I gain a better understanding of what they entail. It therefore is imperative to mention that I analyse these two aspects as the hermeneutic theory advocates as the bringing of understanding by interpreting the written texts or interview texts or other texts from various literature in order to obtain the meaning of the whole.

I discuss the research questions and different research paradigms, such as positivist theory, interpretative theory and critical theory, and the hermeneutic post-positivism (interpretative) research paradigm. I attempt to demonstrate the reasons why I decided on the hermeneutic interpretative as the appropriate research paradigm for this study. Before I discuss this set of assumptions, concepts and values that constitute ways of viewing, which are known as paradigms (McGregor & Murnane, 2010:419), I start with a discussion of educational research. Since I fall in the group of novice researchers, the discussion of educational research helps me understand my assignment better. To this end I pose this question: What is educational research?

Looking at the question above, I think I know what educational research is, but in reality, I doubt my understanding of it. To clear the confusion. I draw from one of the most widely quoted versions of Stenhouse (1975, in Wellington, 2015:13), who views educational research as "systematic enquiry made public". In the same vein, Waghid (2013:2) argues that educational research is a systematic and sustained inquiry made public. Bassey (1990, in Wellington, 2015:13) elaborates on Stenhouse by defining research as a "systematic, critical and self-critical inquiry which aims to contribute to the advancement of knowledge". By critical inquiry he implies that the data collected and the samples used in the research are closely and carefully scrutinised by the researcher, and by "self-critical" he implies that researchers are critical of their own decisions, the methods they choose to use, their own analysis and interpretation, and the presentation of their findings. Regarding "sustained inquiry", Waghid implies the constant commitment and enthusiasm, which depend entirely on the qualities of patience, seriousness and care.

In my attempt to analyse and understand Stenhouse and Waghid's arguments or theories, I realised that educational research needs orderly and well-organised approaches to acquire new knowledge, and that they should be documented and made available to society. Fan and Fielding-Wells (2016:3) support my contribution partially when they theorise that educational research encompasses a field of inquiry that is both broad and deep; that it brings together a range of research approaches to investigate questions and further knowledge; and that it also has different academic disciplines, as well as different schools of thought within each discipline. These

disciplines determine how the different schools of thought are acknowledged, represented, evidenced and reported on in projects falling under educational research.

Keiner (cited in Furlong and Lawn, 2011:163) explains that educational research aims at generating knowledge that conforms to specific requirements: that is thematic pertinence, conceptual integration, and methodological quality. He further states that it is characterised by epistemic logic, method and justification, and by theory and analysis, and that it refers to truth and consistency within a critical medium.

To summarise educational research, it can be said that different researchers have different explanations of what education research means. Nevertheless, similar words or phrases, like systematics, procedural, data collection, analysis and made public, emerge from the researchers above. In my view, educational research brings up new knowledge on the specific situation based on certain perceptions and it is done procedurally. The knowledge considered is determined by features like gathering data from participatory and designed procedures, which analyse what is being studied and eventually published for everyone to read. The main focus is to make sense of the latter for future advantage.

2.2 RESEARCH METHODOLOGY

The concept “methodology” ‘paralyses’ me sometimes. Ideally, in layman’s language, there is no distinction between the word methodology and methods. Nevertheless, reading different books and engaging in discussions with other scholars have enlightened me to understand what constitutes methodology. My impression was that holders of Master’s degrees do not have any problem with these concepts. I presumed that they had better knowledge and understanding of the concepts. Nevertheless, it came to my knowledge that some scholars I had engaged with had experienced similar misunderstandings.

In Chapter 1, part 1.7, I indicated that McGregor and Murnane (2010:420) refer to methodology as how each of logic, reality, values and what counts as knowledge inform research. By logic, reality and values they refer to a sensible and standard procedure which should be followed by a

person conducting research. A researcher must decide which procedure is appropriate to acquire the knowledge needed. Therefore, it is essential to think about how research should be done to study the chosen topic. The above sentiments led me to another ideology about methodology. I have described methodology as a yardstick leading to the way of answering the question, 'how is research done?' to get a response to the research question.

Le Grange (2017:4) defines methodology as a theory of knowledge and the interpretive framework guiding a research project. Harding's definition implies that methodology is a philosophy or an overall approach that guides a research project. Methodology maps out how knowledge is discovered and analysed in a systematic way. Thus, different issues are outlined and presented to guide the researcher and notify readers of the route taken in carrying the study.

Maree (2016:51) describes methodology as a bridge that brings out our philosophical standpoint (on ontology and epistemology) and method (perspective and tool) together. They further explain that a researcher travels on this bridge throughout the research process. Similarly, methodology can be viewed as the interface between methodic practice, substantive theory and epistemological underpinnings (Harvey, 1990:1-2, in Van Wyk, 2004:25). I believe that, under research methodology, one has to indicate how to 'travel on the bridge' to get knowledge and how to come to know new things. The researcher must also clearly show whether the reality is discovered through measurement, generalised to other situations or is context bound and not generalised. Furthermore, the tools used to obtain knowledge are also stipulated. If what I have mentioned above is what constitutes methodology, then axioms, ontology, epistemology and method are curial in the research study journey.

While different methodologies are applicable, and some researchers think that one methodology is better than the other, the correct way would be to say they are just different and both have their strengths and weaknesses and both also depend on the skills, training and experiences of the researcher (Dawson, 2009:16). Now it is understandable why some researchers strongly prefer a certain methodology over the other. It should not be a question of whether one paradigm is better than the others, but the main question should be which paradigm is more suitable for the research question in comparison to others. Therefore, the decision depends upon what methodology

should be used in relation to the topic, whereby words in the topic can suggest the suitability of the methodology to be applied.

2.2.1 Positivist theory

I now discuss the different philosophical and theoretical assumptions/paradigms. I was very fortunate to be a telematics student who received different recorded presentations from different modules, including positivism and empiricism, during my BEd Hons studies in 2016. The above-mentioned concepts took me off 'balance', although I had the opportunity to listen to them as many times as I wished. But the question remained: did I understood them? The reality was I had only a faint idea about positivism, but in actual fact I had limited knowledge and understanding of what it was.

I read different articles, theses and books as stepping stones to understand positivist theory. I selected a few documents that explicated and elucidated the concept. I now discuss it to decide whether it is more suitable for my study.

Positivism has a long history in the social sciences, and there are three known chronological variants. The first was developed by Auguste Comte in the nineteenth century (Smith *et al*., 1996:14). Comte's aim was to develop a science of society that was based on natural sciences like observation. The second variant is logical positivism, also called logical empiricism, and arose in the Vienna Circle, which was formed around 1960. In these variants, members shared ideologies like knowledge as known only through scientific processes. Furthermore, statements were just cognitively meaningful if they could be falsified or verified by experience. Finally, the third variant is the most influential, and is a contra opinion to Comte or a somewhat softer version of logical positivism. Smith *et al*. (1996:14) state that Christopher Varian Lloyd divided the third variant into four aspects, namely logicism, empirical varificationism, theory and observation distinction, and the human theory of causation.

Logicism

1) Logicism is the view that "the objective confirmation of scientific theory should conform to the canons of deductive logic" (Smith *et al*., 1999:44).

2) Empirical verificationism is when "only statements that are either empirically verifiable or falsifiable (synthetic) or true by definition (analytic) are scientific" (Smith *et al*., 1999:44).

3) The distinction between theory and observation tells us that there is a "strict separation between observation and theories, with observations being seen as theoretically neutral" (Smith *et al*., 1999:44).

4) The human theory of causation is an idea based on "establishing a causal relationship which is a matter of discovering the invariant temporal relationship between observed events" (Smith *et al*., 1999:44).

From what Smith means by positivism, it is clear that the positivistic approach does not count feelings, expressions, views or emotions as knowledge. Therefore, it is not suitable for this study since I explore science teachers' experiences during the implementation of the grades eight and nine revised curriculum. Positivism is pinned only to the verification of data or statements by scientific approaches. In addition, Thahn and Thahn (2015:26) argue that describing the world in numbers and measures instead of words is not likely to be productive. By positivism basing more on natural and social sciences is regarded as not being in principle of scientific verification of feelings, views or emotions as knowledge. The ideas and views of participants could be regarded as meaningless if they do not adhere to scientific principles.

According to McGregor and Murnane (2010:421), the positivistic research paradigm was assumed to be the only way people can be positive that knowledge is true if it is created using the scientific method. This data for this methodology is derived from experiment and observation. Punch (2009, in Thahn and Thahn, 2015:26) argues that it is unlikely that one can gather depth and insight via the statistics that are frequently used in the quantitative approach, which is connected to positivism. In this study, I had to interpret the teachers' perspectives and their experiences on the implementation of the new science curriculum. This simply meant my study fitted well with approaches that were more subjective than objective.

2.2.2 Critical theory

In an attempt to justify why the critical theory was not more suitable for my study. I draw from the course work of Kabende (2015:33), who lectured me through a telematics programme on critical theory and hermeneutics. She explained that critical theory is associated with the Frankfurt School, as part of which major philosophers such as Herbert Marcuse, Theodor Adorno, Marx Horkheimer and Jürgen Habermas wrote about it. Furthermore, Van Wyk (2004:48) also wrote that 'Critical theory' is ineluctably connected with the Frankfurt School (principally the social theorists Horkheimer, Marcuse, Adorno and Habermas). Kabende adds that, for Marcuse, critical theory presents a different way of thinking about education and is concerned primarily with solving particular social problems. She articulates that critical theory is not only concerned with thinking critically about problems in education, but also wants to suggest ways to solve such problems. Similarly, Burgoyne and Reynolds (1997:4) point out that the intention behind critical theory is to strengthen other theories, such as descriptive and interpretative, by searching for their weak points and what it would take to overcome them. This study focused on teachers' experience while implementing the physical science curriculum. I did not have the mandate to empower teachers to change situations or solve problems arising, but I merely analysed the situation from the teachers' perspectives. Hopefully some authority or power will proceed to implement the outcome of this study.

Burgoyne and Reynolds (1997:4) reason that critical theory examines questions such as the following in depth: What assumptions are we making in analysing things as we do? What aspects are we leaving out? What value judgements are built into positions taken? What larger social processes are our theory and practice part of? What contradictions and paradoxes are there between values, assumptions, agendas, omissions? And lastly, what would it take to resolve them? For me, critical theory in research needs in-depth skills of dealing with questions and mental processes such as analysis and processing of participants' ideas or situations to unshackle people from their problems in education. It also requires one to have a skill to review a piece of text for the assumptions that are made in it. In addition, I agree with Van Wyk (2004:48), who says critical theory is a special term that is self-conscious about its historicity, its place in dialogue and among cultures, its irreducibility to facts, and its engagement in the practical world.

Gibson (1986, in Nxawe 2002:14) claims that critical theorists of education have three things in common. First,

> they begin from a concern to map the inequalities and injustices of education; furthermore, they claim to trace those inequalities and injustices to their source, showing the educational processes and structures by which, they are maintained; and finally, they seek or propose remedies to those injustices.

Kabende (2015:33), on the other hand, contends that the main concern of critical theory is the idea of emancipation. For critical theory to solve social problems, it must change the world in the direction of freedom, justice and democracy, with the practical intent to transform and empower. This translates into one perceiving that there is something wrong with the implementation of the subject curriculum in schools. One needs to find ways for how to square the situation and why that situation need to be resolved. These are the types of questions asked by critical theorists in education because they consider it their duty to question, which will enable them to produce the required remedies.

Naukushu (2016:29) suggests that critical theory can also be interpreted to imply that empowered agents are able to effectively question, challenge and contribute toward the progressive transformation of the prevailing status quo within the communities, societies and cultures in which they function. For me, the empowered agents in this context were physical science teachers who possessed the necessary skills for teaching, learning and implementing curriculum and can defend their own views on curriculum issues freely in contributing to science development in schools, regions, and the country at large.

Another, vital characteristic of critical theory holds that it is deceptive to divorce “real-life testing” from scientific theory. This suggests that scientists do not exist in a vacuum but are rather part and parcel of the society and are bound by social reality and norms as much as anyone else in that society (Naukushu, 2016:22). But the central point is the critical theorists who identify the shortcoming of science in certain areas of science, such as political science and philosophy, which cannot be studied as a whole, like mathematics, physics and chemistry, which

exclude the former. Such an exclusion of certain areas of science defeats the primary purpose of critical theory, namely protecting humankind against all forms of oppression other than massive human life snubbed (Naukushu, 2016:22). Although critical theory is remarkably interesting and wants to solve problems, this study does not entail a problem but wanted to discover what experiences physical science teachers had while implementing the new curriculum. I therefore did not believe that this paradigm was appropriate for this study.

2.2.3 Interpretive theory

In this section, interpretive theory is discussed and it is justified why it was suitable for this study. I found this concept very interesting. After Namibian independence in 1990, I learnt that the then President addressed all communities in English during his state visits to various regions of the country. The master of ceremonies, on many occasions, informed the meeting attendants to wait for the speech to be interpreted. Likewise, in the courts of law, non-English speakers normally convey their statements to the magistrates or judges through an interpreter. If you ask people what the interpreter does, the answer can be, he/she interprets what was said? The question is: are the words interpretation and translation the same?

To analyse the two terms does not mean I am doing comparative analysis, but rather attempting to clarify the talk more often done, especially by my ethnic group, the 'Oshiwambo speaking', who use the terms to interpret and to translate interchangeably. I draw on the work of Burgoyne and Reynolds (1997:3), who say interpretive theory attempts to answer the question 'why is this happening?' For example, the way people behave towards each other and the effects they have on each other.

Furthermore, for any given phenomenon that may be described, there is usually a whole range of available interpretative theories. The interpretative theories attempt to be descriptive of a deeper level of reality – that which is presumed to generate phenomena. It is my understanding that interpretative theory attempts to answer the question, 'why do things happen the way they do?' The translation is about 'reproducing the message' in the receptor's language. I suggest that the interpreter is the one who attempts to answer the question, 'why do things happen the way they

do?', while the one who reproduces the message can be called the translator. So, a translator is not an interpreter. A translator does not intend to answer any question, but rather just reproduces the message and possibly makes some grammatical changes.

Bevir and Rhodes (2002:7) explain that interpretive approaches often begin from the insight of understanding actions, practices and institutions, and we need to grasp the meanings, the beliefs and preferences of the people involved. He indicates that this approach emphasises social interaction as the basis for knowledge, where the participants and the researcher negotiate and the researcher communicates the meaning through a written document. The researcher uses his or her skills as a social being to try to understand how others understand their world. It is my understanding that a person can interpret something if he has knowledge of it from the right people. By 'right people' I refer to the people involved, whether they present their knowledge instantly or in the written setting.

Thahn and Thahn (2015:24) argue that the interpretive paradigm allows researchers to view the world through the perceptions and experiences of the participants. In seeking for answers for a study, the researcher who follows the interpretive paradigm uses those experiences to construct and interpret his understanding from the gathered data. This study sought to gain reality from teachers who are implementers of the new physical science curriculum. They presented their own views and experiences, and their understanding as individuals is interpreted. Knowledge is constructed by mutual negotiation and it is specific to the situation being investigated.

Further to this, Fay (1975:71) alludes to the fact that an interpretive analysis deals with the concept of "action", which describes doings as opposed to happenings. The action concept requires understanding and interpretation, as it involves reference to either the subjects' intentions and plans or desires. Correspondingly, Fay (1975, in Kabende, 2015:36) indicates that an interpretive analysis is to reach the self-understanding of the person acting in the situation, by analysing, clarifying and understanding the reasons for and intentions of the actions of the actor. Similarly, Bevir and Rhodes (2002:2) articulate interpretive theory as to understand expressions of, for example: reasons, intentions, beliefs, the unconscious or a system of signs. Equally, Waghid (2002, in Kabende, 2015:36) says that the vital subject within interpretive theory is the

self-understanding of the individual. In addition, Kabende (2015:36) suggests that we can only make sense of our research when we are able to explain it using our own understanding. In my view, what is needed is to understand "action" concepts such as implementing or assessing or interpreting teachers' perceptions and articulations. The researcher needs to understand those concepts to be able to explain meanings and interpret teachers' ideas or discourses using his own explanation.

2.3 HERMENEUTICS

When I read more literature, I came across the work of Paterson and Higgs (2005) on 'Using hermeneutics as a qualitative research approach', which indicates that hermeneutics is one of the many theories that are rooted in interpretive theory and can be used to understand the situation. Therefore, I embark on a discussion of hermeneutics as an appropriate research approach to interpret how teachers understand the implementation of the physical science curriculum.

Although, at first, I thought hermeneutics was a name of one of the great philosophers, the views I advance tend to be far from realism and the complex history of hermeneutics might confuse one when one thinks of the origin of it. Porter and Robinson (2011:2) wrote that the term has a historical association with the Greek god Hermes. The history tells us that Hermes is regarded as one of the earliest and most primitive gods of the Greeks. Hermes, a character in the Greek poems the *Iliad* and *Odyssey*, played the role of an interpreter of the gods. He interpreted the gods' messages to his listeners. He was responsible for fostering genuine understanding. Hoy (1978:1) writes that Hermes was known as the messenger of the gods; he certainly did not always carry an explicit message, but his appearance could be the message. He further explains that Socrates said Hermes was the god who inverted language and speech, and could be called an interpreter or messenger, but also a thief, liar or contriver. Hermes was not just simply a messenger; he was also a swindler. Therefore, it was not always easy to determine which role he was playing (Phillips, 2014:375). Now I turn to the question, "what is hermeneutics?"

Hermeneutics existed for centuries and it can be traced back as far as the ancient Greeks. According to Porter and Robinson (2011:2), the term hermeneutics originates from the Greek

verb *hermeneuein*, which literally means to "interpret" or "translate". Danner (1995, in Kabende, 2015:37) indicates that hermeneutics has three meanings, namely to make something explicit (to express), to unfold something (to explain), and to translate. The hermeneutics literature tells us that today it refers to the science, theory and practice of human interpretation. This implies that it can be employed to interpret human understanding in many disciplines, including education.

Hermeneutics is the theory and methodology of text interpretation. Paterson and Higgs (2005:342) explain that different theologians' and philosophers' arguments and elaborations (Dilthey, 1988; Gadamer, 1975; Heidegger, 1962; Ricoeur, 1976; Schleiermacher, 19977) lead to the development of variations in hermeneutic philosophy and in the eventual methodologies. In the absence of Hermes, the modern age needs hermeneutics. In a more limited sense, hermeneutics is anxiety with speech and writing, and hence with the methodology of interpretation of texts (Hoy, 1978:1). In my view, from the argument of the past centuries' hermeneutists, a better understanding and broader hermeneutical approach emerged that I contend is a universal one. My statement is supported by how the hermeneutic approach in the work methodology of past centuries still holds true.

In this study, I seek to understand teachers' views of dealing with the implementation of the RPSC. Hence, I believed the hermeneutic approach would be suitable as I needed to understand and interpret the life experiences of the world of physical science teachers (Tematie, 2004:21). The hermeneutic approach would assist me to gain a better understanding of my task in this research.

Hermeneutics has its origin in branches of intersubjectivity. It comprises situations where researchers and readers cannot immediately understand their meanings but require an interpretive effort (Linge, 1976:xii). Indeed, there is a need to understand and interpret things to get the proper meaning. Even when we are reading a text, understanding is necessary. Some books narrate that one of the main objectives of hermeneutics is human understanding, whereby one needs to understand what others say and why they do so. According to Porter and Robinson (2011:1), hermeneutics and interpretive theory drive us to a complete definition of a difficult

question: what does it mean to understand? For Gadamer, understanding is made possible by historically conditioned ways of thinking and one in which language plays a crucial role.

Porter and Robinson (2011:7) mention about six distinct hermeneutical trends: romantic, philosophical, critical, structural, post-structural, phenomenological and existential. I will not discuss them in detail; however, I pick philosophical hermeneutics and elaborate on it to indicate how it has a stronger linked to this study.

2.3.1 Hans-Georg Gadamer's philosophical hermeneutics

Philosophical hermeneutics was initially developed by a German philosopher, Hans-Georg Gadamer (Porter & Robinson, 2011:10). He was the first hermeneutist to bring together philosophical and hermeneutical interests to address definitions of meaning and understanding, so he championed its development (Porter & Robinson 2011:10, 75). According to Porter and Robinson (2011:10), one of the most important virtues of Gadamer's philosophical hermeneutics is that it pursues the finding of willing dialogue partners who play "give and take" as mutual partners in an ongoing interpretive arena, unlike other interpretive methodologies. For Gadamer, understanding is mediated through language and tradition. Understanding is more than a matter of taking a good look to see what is there. It is produced from asking questions. From Gadamer, I truly believe, to understand and make sense of an object of study we need acts of interpretation to clarify an unclear subject. Therefore, we must risk our beliefs, assumptions and desires, and allow ourselves to be caught up in the event of interpretation (Porter & Robinson, 2011:10).

According to Hoy (1978:41), Gadamer's hermeneutic philosophy determines the approach to the question regarding the nature of historical knowledge. Gadamer insists that the effect, or *Wirkung*, of a test is an important constituent of its meaning. The *Wirkung differs for different ages.* For me, "meaning" can be distorted due to different circumstances and time. Therefore, understanding is crucial.

Gadamer has been disturbed by modern forms of thinking, especially by some philosophers who claim and mistakenly accept the scientific ethos in an attempt to foster objectivity and methods

as all-important ways to achieving the most reliable insight. He reacted to the hegemony of positivism by saying to natural scientists, as well as their philosophical defenders, “hands off the human sciences” (Crease, 1997:260). With the above sentiment of Gadamer, I believe that natural science cedes.

Gadamer focuses on understanding and language. According to Hoy (1987:61), Gadamer analyses the immediate phenomenon of the very communication of meanings through texts. Put in my context, I need to analyse the grade eight and nine physical science texts in the new curriculum, although it is equally worthy understanding the text in the past curriculum. A routine of checking texts to get the relevant meaning through the language used will help me gain a better understanding of the newly implemented physical science curriculum. For Gadamer, tradition is not simply an occurrence that one recognises through experience and learns to control, but rather language.

Daher *et al*. (2017:4) state that Gadamer links personal meaning-making processes to the overall phenomenon of language, which encounters the world and intersubjective communion. We need to understand that the world is changing, and new things are emerging, including language, so the construction of meaning occurs when a common interpretation of the world emerges from an intersubjective encounter. Hermeneutics proposes the emergence of interpretations from the participants, rather than by an external observer (Daher *et al*., 2017:4).

According to Porter and Robinson (2011:78), Gadamer suggests that understanding occurs as something far from radical in terms of questioning and working through our experience of estrangement and alienation, and the sense of “others” we encounter in new things, people, texts etc. Tan, Wilson and Olver (2009:4) observe that, from Gadamer’s (1989) perspective, the interaction between a researcher and a participant, or between a reader and a text, is a constant discourse, and hence interpretation is a collaborative process. I notice that understanding, according to Gadamer, is not a straightforward occurrence, but an incidence whereby one deduces from information and meanings made and grasped from participants or texts by way of thinking and analysing the language used. Interpretation is therefore central to understanding something.

Kabende (2015:37-38) describes hermeneutics as a textual interpretation or the finding of the meaning in a hidden word, whereby one must read the text carefully to understand the meanings behind the ideas. She further explains that texts are not fixed to a specific meaning; they are instead subjected to many understandings and interpretations. In other words, texts have different meanings for different people, even in the contexts from which they come. Phillips (2014:375) elucidates that, in some instances, learners struggle to understand the meaning of texts on a certain educational matter. They ask questions which teachers try to understand and may wonder about the meaning of teaching for their own lives. This implies that different people have different thoughts about the understanding and meaning of the texts, even in the same context. Laverty (2003:24) adds that hermeneutics is an interpretive process that pursues the understanding and disclosure of phenomena through language. Hoy (1978:99) explains that "language" means the way: the situation is encountered; problems are phrased; and the future is anticipated. So, language is tied to a historical setting. Historical differences can be seen as different from languages. This is why, in Chapter 1, I observed that we can only understand why things are appearing and happening the way they are by knowing the historical background and engaging with individual people so as to understand the complexity experienced by many people through the interpretation of the participants' views.

Gadamer (in Laverty, 2003:25) states that hermeneutics must start from a position that a person seeking to understand something has a bond to the subject matter that comes into language through the text and has, or acquires, a connection with the original text from which it speaks. I agree with him that the language used can explicate different meanings, but an understanding of the matter in relation to a person's articulation is more important. In this case, I have tried to understand experiences in their entirety, as well as their subjective experience, acquiring insights into participants' experiences. Learning from experience leads to increased knowledge and self-consciousness (Hoy, 1978:60), and understanding happens through a gradual and perpetual interplay between the subject matter and the interpreter's initial position (Porter & Robinson, 2011:86).

Gadamer views interpretation as a fusion of horizons, a dialect between the excitation of the interpreter and the meaning of the text (Laverty, 2003:25). Porter and Robinson (2011:86), on the other hand, see the hermeneutic event or fusion of horizons as something that happens without our making or doing. The fusion of horizons is the event of opening ourselves to others (other lives, questions, ideas). Laverty (2003:25) explains that a "horizon" is a range of visions that includes everything seen from a vantage point. For Gadamer, if one lacks limit, he does not see far enough and overvalues what is nearest at hand, whereas to have a horizon means being able to see beyond what is nearby. Asking questions is a vital aspect of the interpretive process and makes new horizons and understanding possible. In undertaking this study, I agree with Gadamer that my interaction with participants or texts will emerge into a better understanding. It was my objective to attempt to gain and expand my experience in understanding the implementation of the new grade 8 and 9 physical science curriculum.

2.4 RESEARCH METHODS

Drawing on the work of Harvey (1990:1), methods denote the techniques and procedures followed to collect data. In the same vein, he states that methods are the tools that one uses to collect data.

In social science, there are different methods that can be used to collect data. Some literature is concerned with those that advocate the use of one method, which may not be necessary. Dawson (2009:34) supports the use of a combination of methods as this enables a researcher to overcome the weaknesses inherent in one method or another method. I concur with Dawson that one method may not really give enough information, more especially in relation to this study. Therefore, I chose to use more than one method, which I mention in the following paragraph.

According to Maree (2016:4), research methods are tools; they are used to gather data about social reality from individuals, groups, artefacts, and texts in any medium. A research study may employ interviewing, observation, or the collection of textual or visual data. As opposed to Maree, I add a section on conceptual analysis as another method that fits my study, although not all of the methods mentioned by him were used.

In this study, I employed semi-structured interviews and document analysis as research methods to get a better understanding of teachers' experiences of the implementation of the new revised curriculum. Furthermore, I employ conceptual analysis to gain a better understanding of the teachers' experiences of the implementation of the RPSC. Conceptual analysis as an analytical tool in the philosophy of education is discussed below. Finally, I understand methods are about answering the question: 'what' tools will be used to get the desired feedback on a research question? Maree (2016:4) notes that it is essential to ensure a tight fit between the purpose, the research question and the method. I agreed with Maree's approach and have employed his method in articulating my views in this study.

2.4.1 Conceptual analysis

In the first draft of my proposal, I omitted conceptual analysis deliberately because I did not understand the idea behind it. Although my supervisor advised me to read Hirst and Peters' work for a better understanding, as well as other scholars, and provided me with handouts of Hirst and Peters' work, I could not understand what conceptual analysis was in spite of the fact that I had all the ammunition I needed.

Here, I have attempted to address the question of what it is to analyse a concept. I look at the words "concept" and "analysis". Drawing from the British Dictionary, a concept is defined as a general idea or notion that corresponds to some class of entities that consist of the characteristic or essential features of the class, while analysis is defined as a philosophical method of exhibiting complex concepts or propositions as compounds or functions of more basic ones. Deleuze and Guattari (1991:15) describe the complexities of a concept as not being simple, and that each one has more than one component and is defined by them.

It is particularly important to explain concepts to gain a better understanding of them. This could result in an acceptable analysis and a meaningful conclusion from the data. Conceptual analysis is about establishing the meanings of terms and is often linked with justification. It is imperative to mention that I employed conceptual analysis throughout in this study since I have identified

the concept of curriculum implementation and related concepts. Thus, I have conducted literature review search and analysed theories, findings or conclusions of other scholars who wrote about curriculum implementation. Similarly, in terms of conceptual analysis in practice. I have conducted document analysis, interviews or data analysis in this study were part of concept analysis and lead me to a better understanding and interpretation of the RPSC implementation in Oshigambo Circuit in Oshikoto region, Namibia.

Hirst and Peters (1998:30) suggest that having a concept covers both the experience of grasping a principle and the ability to use words appropriately. As researchers, we need to examine the use of the word to see what principle or principles govern its use. To put it differently, but similar to Van Wyk (2004:5), we can claim that a concept is attained when a person has the aptitude to apply the words appropriately and another person is able to examine the use of words and identify the principle governing their use without describing/redefining the words.

According to Van Wyk (2004:8), conceptual analysis attempts to establish the logically necessary conditions for the use of a word. Hirst and Peters (1998:29) argue that it does not refer to an image, but to the word – a word that can be related to other words. For me, one can have a concept of analysis without necessarily having a picture in mind. Thus, it means being able to relate the word without an image. This means that we analyse a concept so that we can use it correctly and apply it in our own specific situations. I thus came to understand what a concept was and how it should be analysed in philosophy of education. In my study, this goes with questions such as, how do the grades eight to nine physical science teachers at a private school and a public school in Namibia experience the implementation of the Revised Physical Science Curriculum (RPSC)?

In my view, a concept does not occur in isolation, but relates to a variety of other concepts. In the context of this study, I claimed to have a concept of teachers' experiences when I was able to relate them to others, such as the Junior Secondary School revised curriculum. Having gained a deep insight into the word concept, I now take a closer look at the term analysis. Schroeter (2004:426) describes 'analysis' as a method of explaining our current, implicit understanding of what it is our concepts represent. Van Wyk (2004:3) argues that analysis is not merely concerned

with the meaning of beliefs, but also with their justification and truth. Therefore, we should not clarify the concepts only because we need to understand them, but we also must provide reasons for what they mean in the context of our study. Conceptual analysis allows me to have a clear understanding of the teachers' experiences, and to justify what they mean in my study and why there is a need to study them.

In the chapter regarding methods, I used semi-structured interview questions and document analysis. Their meanings and justifications in the context of this study are clarified in the following sections.

2.4.2 Semi-structured interviews

I draw from the observation of Vandermause and Fleming (2011:369), who refer to the hermeneutic interview as a source of gathering data for qualitative research that is grounded in the philosophical hermeneutic tradition. That is, the interviewer seeks to uncover what it means *to be* as it shows up or reveals itself through stories. As stories are elicited, the interpretation begins, and the practically interconnected experience of the world is also revealed. In my view, an interview is a door that opens communication between a researcher and a participant. The participant tells the story, which contributes to the quality data needed.

Dawson (2009:28) explains that semi-structured interviews have mostly been used in qualitative social research. He further notes that a researcher should remain flexible and generate open questions so that other valuable information can arise. My focus in this type of interview is to get specific information that can be compared and contrasted with information gained from other interviews. I asked the same questions of all the participants and assessed their information by comparing them.

For a semi-structured interview, a researcher prepares a list of specific questions or a list of topics to be discussed. The literature suggest that it is vital for a researcher to produce an interview schedule to ensure continuity. Maree (2016:93) states that semi-structured interviews are developed in advance and consist of open questions that are followed by probing questions

for clarification. A researcher listens carefully to identify new emerging lines of inquiry related to the phenomena under study. In this study, I ensured that participants involved in this dialogue stated the idea and clarified their views and understanding to the phenomena under study. Enough time was given for the participants to respond.

According to Le Grange (2000:5, cited in Aloovi, 2016), a method is distinguished by a methodology, hence the semi-structured interview method is essential for the hermeneutic methodology, since one of my goals was to understand teachers' experiences of the RPSC and to make sense of their experiences (interpreted or unstructured). It also allows the researcher to get into the minds of people to understand and gather data about their views on different matters, and therefore is used as a magnifying glass to depict the respondent's experience. The semi-structured interview helped me set the tone of the research through an introduction, and the participants articulated their new understandings. Through this method, rich data was generated.

Whiting (2008:35) explains that one of the advantages of semi-structured interviews is when participants experience speech or language impairments. Since the questions are already formulated, it is always possible to elicit detailed stories form the participants. Whiting provides a framework that she terms 'key features of semi-structured interviews', as follows:

- Scheduled in advance at a designated time
- Location normally outside everyday events
- Organised around a set of predetermined questions
- Other questions emerge from dialogue
- Usually lasts from 30 minutes to several hours (Whiting, 2008:36).

I regard the above framework as a summary of various authors views' about interviews, particularly semi-structured interviews (Harrel & Bradley, 2009:67-70; Maree, 2016:100; Schlebusch & Thobedi, 2004:39). Whiting (2008:36) recommends to the novice researcher to learn from experienced researchers and to draw up a checklist that identifies practical preparations and areas to be clarified. She lists nine points, as set out below:

- Purpose of the interview
- Clarification of topic under discussion
- Format of the interview
- Approximate length of interview
- Assurance of confidentiality
- Purpose of digital recorder – ask permission to use it. Explain who will listen to the recording
- Assure participant that he or she may seek clarification of questions
- Assure participant that he or she may prefer not to answer a question
- Assure participant that there will be an opportunity during the interview to ask questions (Whiting, 2008:37).

I adopted Whiting's advice in collecting information on the main research question, viz. How do grade eight to nine physical science teachers at both private and public schools in Namibia experience the implementation of the Revised Physical Science Curriculum (RPSC)? as well as the subsequent sub-questions.

2.4.3 Document analysis

What is document analysis and whose document is to be analysed? are some of the philosophical questions one needs to understand. For Bowen (2009:27), document analysis is a systematic procedure for reviewing or evaluating documents, both printed and electronic (computer-based and Internet-transmitted) material. It requires that data be examined and interpreted to elicit meaning, and more importantly to gain understanding and develop empirical knowledge.

Furthermore, as Merriam (1988, in Bowen, 2009:29) points out, documents of all types can help the researcher uncover meaning, develop understanding, and discover insights relevant to the research problem. This method enabled me to understand how the curriculum was being implemented, what policies were guiding the implementation, and what strategies had been used in the implementation of the previous physical science curriculum. According to Pershing

(2002:36), documents as primary sources can serve as either a stand-alone data-collection procedure or as a precursor to collecting new data using other methodologies. Noting the above, I adopted it as my second research method in this study.

2.4.4 Sampling

According to Maree (2016:192, 197), there are two major classes of sampling, namely probability and non-probability. The probability method is based on randomness and probability theory, while non-probability methods are not. I applied purposive sampling, which falls under non-probability. Before I explain what purposive sampling is, first let me analyse the word sampling as applied in this research.

In the article titled "Sampling in research", Mugo (2002:1) defines sampling as the act or technique of selecting a suitable representative part of a population for the purpose of determining parameters or characteristics of the entire population. Sampling is also seen as a finite part of a statistical population whose properties are studied to gain information about the full population. A population is a group of individual persons, objects or items from which samples are taken for measurement. For example: a population of schools, books, teachers or learners, (Mugo, 2002:1). It is worth noting what is meant by sampling, along with reasons why researchers are likely to select a sample. Taking a subset from a chosen sampling frame or entire population is called sampling.

Sampling can be used to make inferences about a population or to make generalisations in relation to existing theory. This depends on the choice of sampling technique (Hamed, 2016:18-20). In this study, when dealing with people, I define sampling as a set of participants (a certain number of people from a school) selected from a circuit for the purpose of this survey. The entire establishment of entities from which a research sample is drawn in called the population. In addition, sampling is chosen to draw inferences about a population, but not to draw general conclusions. In other words, the purpose of sampling is to draw conclusions from the experiences of selected physical science teachers who participated in the research.

There are many types of sampling methods and I chose to use the purposive sampling technique because it involves the selection of certain units or cases "based on a specific purpose rather than randomly" (Tashakkori & Teddlie, 2003:713). According to Mugo (2002:8-9), there are about 16 types of purposeful sampling. She further notes that the details can be found in Patton (1990:169 -186, in Mugo, 2002). She briefly describes them as follows:

- Extreme and deviant case sampling – this involves learning from highly unusual manifestations of the phenomenon of interest, like outstanding successes, dropouts, notable failures, crises.
- Intensity sampling – this relates to information-rich cases that manifest the phenomenon intensely, but not extremely, for example good students, poor students, above or below averages.
- Maximum variation sampling – this involves purposefully picking a diverse variation of dimensions of interest. It identifies important common patterns that cut across variations.
- Homogeneous sampling – this reduces difference, simplifies analysis, and facilitates group interviewing.
- Typical case sampling – involves taking a sample of what one would call typical, normal or average for a particular phenomenon.
- Stratified purposeful sampling – this illustrates characteristics of particular subgroups of interest and facilitates comparisons between the different groups.
- Critical case sampling – this permits logical generalisation and maximum application of information to other cases, e.g. "If it is true for this one case, it is likely to be true of all other cases."
- Snowball or chain sampling – this identifies cases of interest from people who know of information-rich cases, e.g. good examples for study or good interview subjects.
- Criterion sampling – to set and pick all cases that meet the criteria, for example all ladies who are six feet tall, all white cars, all farmers who have planted onions.
- Theory-based or operational construct sampling – to find manifestations of the theoretical construct of interest so as to elaborate and examine the construct.
- Confirming and disconfirming case sampling – to elaborate and deepen the initial analysis, for example, if you had already started some study, you are seeking further

information or confirming some emerging issues that are not clear, thus seeking exceptions and testing variation.

- Opportunistic sampling – to follow new leads during fieldwork, taking advantage of the unexpected flexibility.
- Random purposeful sampling – adds credibility when the purposeful sample is larger than one can handle.
- Sampling politically significant cases – this type of sampling attracts or avoids attracting attention or undesired attention by purposefully eliminating from the sample political cases. These may be individuals or localities.
- Convenience sampling – this is useful in getting general ideas on a phenomenon of interest. For example, you decide you will interview the first ten people you meet tomorrow morning. It saves time, money and effort.
- Combination or mixed purposeful sampling – this combines sampling strategies to achieve the desired sample. This helps in triangulation, allows for flexibility, and meets multiple interests and needs (Mugo, 2002:8-10).

From the sampling method framework of Mugo (2002:8), I employed the purposeful sampling method, which gave rich information for this study. For example, the teachers that I interviewed met some criteria, such as current subject teachers of physical science for either grade eight or nine and who had taught the old physical science curriculum. I also used purposive sampling to select two schools for this study. These schools had grades eight and nine with teachers knowledgeable about the implementation of the new physical science curriculum.

This study focuses on the lived experiences of six physical science teachers of grades eight and nine, of which two were heads of department – one from each of the selected schools – and two teachers were selected from each chosen school in Oshigambo Circuit. I derived what their experience was in the implementation of the new curriculum and interpreted their views on the implementation of the new curriculum. I requested the school principal of each school to identify two willing and able teachers who communicated their experiences and feelings in an articulate, expressive and philosophical manner. They completed consent forms before they attended the interview session.

2.5 DATA ANALYSIS

The analysis of data occurs with explicit analytical strategies to transform the raw data into a new and coherent depiction of the thing being studied (Thorne, 2000:68). What is data analysis? Data analysis is the process of making data more manageable by organising the information obtained from the data that were generated (Negumbo, 2016:72). Yin (2009:126) expounds on data analysis as a process of examining, sorting, charting, testing or otherwise recommending evidence to draw an empirically based conclusion. This shows that data analysis is a process of breaking up data into manageable themes, patterns, trends and relationship so that the researcher and others can meaningfully understand various aspects of the data (Mouton, in Schurink, 2003:134). I therefore organised categories and generated thematic areas and patterns from the data. This was done every day soon after the process of transcribing the interviews started.

2.6 ETHICAL CONSIDERATIONS

Ethical considerations are one of the imperative parts of research. Ethics approval is sought to ensure that the researcher will conduct a research project in an appropriate and reverential manner towards the participants and other players who might be influenced by the research process. This can be a standard yardstick which will help me to stay true to good research conduct and to promote the search for knowledge and truth. I covered most of ethical codes, like legality, confidentiality, honesty and integrity, carefulness, objectivity, and responsible publication.

The participants were science teachers who are implementers of the RPSC. They were from selected schools in Oshikoto Region, close to the researcher's duty station. This means that the participants knew the researcher as a professional colleague. Therefore, the researcher predicted that the situation would be stress-free and would lead to honesty, integrity, and meaningful engagement.

Regarding legality, I sought consent to enter the selected schools from the Oshikoto Directorate of Education. The participants also signed letters of consent, which I had sent to the Research

Ethics Committee at Stellenbosch University to receive ethical clearance before starting with the interviews. Precautionary measures were considered to ensure that the participants' confidentiality, autonomy and identity are secured, more especially when photographs and an audio-recorder were used. The participants were informed of the purpose of the research project and the researcher ensured that their identities would not be divulged under any circumstances.

2.7 CHAPTER SUMMARY

In this chapter I discussed the methodology and methods employed to produce this work. Paradigm, methodology and methods are some of the words that I first encountered when I registered for an Advanced Diploma in Education Management through the Central Africa Correspondence College Namibia (CACC) in 2010.

I observed how methodology and methods are used interchangeably and attempted to clarify what they are. I discussed the latter to gain a better understanding of what they entail. I analysed the two aspects as advocated by hermeneutic theory to bring about understanding by interpreting written texts or interview texts or other texts from various literature in order to obtain meaning of the whole study.

Methodology is defined as a theory of knowledge and the interpretive framework guiding a research project. Harding's (1987, in Le Grange, 2017) definition implies that methodology is a philosophy or an overall approach that guides a research project and maps out how knowledge is discovered and analysed in a systematic way. Hesse-Biber and Leavy (2011, in Maree, 2016) describes methodology as a bridge that brings our philosophical standpoint (on ontology and epistemology) and method (perspective and tool) together. Furthermore, Harvey (1990) states that methods denote the techniques and procedures, also known as tools, used to collect data.

I have discussed different paradigms, such as critical theory, positivity theory and interpretive theory. This is an indication that different methodologies are available and applicable. Dawson (2009:16) discourages researchers from thinking that one methodology is better than the other, but rather to realise that the correct way would be to say they are just different and both have

their strengths and weaknesses and both also depend on the individual skills, training and experience of the researcher. It should not be the question of whether one paradigm is better than the others, but the main question should be which paradigm is more suitable for the research question in comparison to the others. Therefore, the decision depends upon what methodology should be used in relation to the topic, in which case words in the topic can suggest the suitability of the methodology to be applied.

I also employed another research approach, namely hermeneutics. This is the theory and methodology of text interpretation. Paterson and Higgs (2005) explain that different theologians' and philosophers' arguments and elaborations led to the development of variations in hermeneutic philosophy and eventual in the methodologies. I indicated that the father of philosophical hermeneutics is a German philosopher, Hans-Georg Gadamer (Porter & Robinson, 2011). He was the first hermeneutist to bring together philosophical and hermeneutical interests to address definitions of meaning and understanding.

Also, I proceeded with clarifying and justifying why conceptual analysis, semi-structured interviews and document analysis were chosen as suitable tools. It is a known fact that a method is distinguished by a methodology. I indicate how the methods selected fit nicely under the hermeneutic methodology, since one of my goals was to understand teachers' experiences of the RPSC and make sense of them.

The discussion of the sampling and data analysis methods conclude the discussion of the chapter. Different sampling methods were discussed, and I explained why purposeful sampling was chosen. The next chapter focuses on the literature review.

CHAPTER 3

LITERATURE REVIEW

3.1 INTRODUCTION

This chapter provides information about the 'foundation' of this project, which is a literature review. As stated in Oliver (2012:1), the literature review is the most important part of any piece of academic writing and serves "an essential base where all academic writing can focus on". This study is not exceptional, therefore, especially when I discovered that I needed it as a foundation to base on. Though I completed the methodology and methods chapter, which I regarded as most challenging, I hoped that this chapter would be less troublesome. As it appeared, my hopes were far-fetched, as I observed that more studies were needed to be able to select suitable materials for this topic. I found myself in a dilemma of not knowing where to start and what a literature review was?

While Stellenbosch University has a postgraduate support programme, which assists distance scholars to develop their research study ideas, I had not been a beneficiary and had not even attended one due to my nature of work. To worsen matters, the support available on the weekends overlaps with my traveling schedule from Namibia to South Africa, since it is a two-day trip. Despite that, I was able to benefit from a module on SUNLearn, which is designed to support postgraduate education students. I wholeheartedly believe that the idea of introducing a SUNLearn module is to assist scholars to write a well-researched literature review, and besides my supervisor regularly supported me during my campus visits.

As indicated earlier, I had a limited understanding of the concept of literature review, and therefore deemed it necessary to expand my knowledge and understanding further. Ridley (2012:1) made me realise where to start in tackling a successful literature review. She suggests a few questions that I had to consider in the context of my discipline, such as: what is a literature review and what purpose~~s~~ does it serve in relation to my research? Why is it such a vital

component of research? What are the various ways it can be realised in this thesis? And, what does the process of completing a literature review involve?

According to Mouton (2001:87), the preliminary literature review helps the researcher to see how other scholars have investigated or theorised about and conceptualised issues like the research problem that the researcher is interested in. Jesson, Lacey and Matheson (2011:10) regard a literature review as a place where a researcher shows and interprets what is known already, and it is also where a researcher underpins the contradictions or gaps in the existing knowledge. The researchers above indicate that one of the objectives is to ensure being original and making an original contribution to the topic. This simply means creating a new dimension that makes a distinctive contribution.

Borrowing a leaf from the above, I demarcated my field of study by showing how other scholars approached the study without mere duplication of previous studies. I explore the various theories of other researchers who previously examined the phenomenon regarding teachers' experiences of the implementation of a RPSC.

Before I embarked on my task, I firstly will attempt to answer what a literature review is. That will be followed by a description of physical science in the school curriculum. Then, in the context of my study, I will move to the literature review section. This I discuss under the following subheadings: Literature review disclosure and curriculum transformation; Assistance or support rendered to teachers for successful implementation of new curriculum; Difference in the implementation of a new a curriculum between private schools and public schools; Successes and challenges in implementing a new curriculum at private and public schools; and Views of teachers on the implementation of a new curriculum.

3.2 WHAT IS A LITERATURE REVIEW?

When I look back and try to recall what I wrote in my BEd Honours research document, as well as in my MEd proposal, I find myself in the same 'pool' as Kabende (2015). When Kabende reviewed the literature in her proposal, she realised that she had summarised what other authors

wrote. I noticed that I had done the same. I also could not see any new dimension nor place myself in both the literature reviews of my BEd Honours and my MEd proposal. I realised that if I did not pay more attention in this literature review, I would most likely receive comments from my supervisor such as: “Your draft review is little more than a list of previous research papers in the field. While it is clear that the topic is professionally researched, it does not give me a sense of what is less significant. It is hard to know where you stand” (adapted from Feak & Swales, 2009:10-11). To sum up, it therefore was vital that I got to understand better in this study what a literature review is.

Hart (1998:13) defines a literature review as the selection of available documents (both published and unpublished) on the topic that contain information, ideas, data and evidence written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed. For Aveyard (2010:1), a literature review is a comprehensive study, with a brief interpretation of the literature that addresses a specific topic. Further, she argues that it is not an essay of one's personal views and opinions, and neither is it a series of quotes nor lengthy descriptions of other people’s work. But it gives insight into the topic of interest, while pointing out similarities and inconsistencies in the existing relevant literature. Rhoades (2011:61) describes a literature review as a mechanism that assists readers in understanding the whole body of available research topics and points out the strengths and weaknesses of studies within that body. A literature review done from entirely one source or study is condemned by the group. It must be constructed from different resources; this prevents reliance on a single study which may not be in accordance with the findings of other studies. From these definitions and arguments, it is quite clear that a literature review serves different purposes and activities and it is hence no surprise that I had limited knowledge about it. This requires us (novice researchers) to be prepared more than before for the task ahead.

Furthermore, the suggestions above offered me insight to look at different primary sources of information with themes related to my topic, which is physical science teachers’ experience of the revised junior secondary curriculum for grades eight and nine based in the Oshikoto region of Namibia. This implies that I needed to review and document past examples of research,

especially how they are connected or related to my topic. It is thus a matter of selection of the appropriate materials to fulfil the objectives of the research, such as to obtain teachers' perspectives on the implementation of a new curriculum. Oliver (2012:5) contends that a topic should be fairly narrow and focused. It is thus difficult to understand how this research can connect to related areas – hence the need to review the related literature to enable my readers to understand how this study fits into a broader context.

Ridley (2012:3) reminds us that it is imperative to define a complex phenomenon such as literature review by approaching it from two angles: one, its finished product and second, its process. For her, a literature review belongs to the part of a thesis where extensive references to research and theory in the field under study are being unpacked. She further makes it clear that a literature review is a process that begins the moment a researcher opens a book, an article, a thesis, or a dissertation – whether a hard or soft copy – related to the research. This process is an ongoing effort until one finishes the final draft. This is where the connection is made between the source texts that one draws on, and where a researcher positions himself and his research among those sources.

As alluded to earlier, in the introduction to this chapter, Ridley offers a few questions for consideration as necessary for a successful literature review. Let me now turn to the question: Why is a literature review such a vital component of research? To answer this question, I have to say that I agree with Feak and Swales (2009:2), who argue that there are several reasons to justify the importance of a literature review in a study. This is to ensure that you are not replicating a research project, and second to tell a relevant previous story to demonstrate how your study fits in, builds on or differs from existing documents. A third reason is something of a subtle rationale. It comes from the fact that what I write shows others that I belong to the chosen field. In the same vein, Randolph (2009:2) observes that there are several scientific reasons for conducting a literature review, viz. a literature review assists you in distinguishing what has been attempted and not attempted, in discovering variables important to the topic, in synthesising information and gaining a new perspective, to name but a few. Aveyard (2010:3) also states reasons why a literature review is crucial. One is to provide a comprehensive picture of the

knowledge relating to a specific topic. The second is to position a specific project in its relevant context or background by drawing on previous work, ideas and information.

Having observed what a literature review entails, the question is: What are the many ways it can be realised in my thesis? I wish to align myself with Oliver (2012:6), who claims that, when readers go through previous research on a chosen study, they may be able to identify areas that have not yet been investigated. As a result, they can suggest topics for future research projects or suggest a particular focus or train of thought for the present thesis. She further argues that, as you investigate what has been written previously, you can start to justify the choice of subject for your research.

3.2.1 Physical science in a school curriculum

On attaining independence in 1990, the Namibian government unified different educational authorities in the country into one ministry (MEC, 1993). Physical Science was made compulsory from grade 8 to 10. The Junior Primary phase which started from grade 4-7 by then taught Natural Science and Health Education (NSHE) which are science subjects at the lower grades. This was a greater move though, the sector was faced by under and non-qualified teachers, overcrowded classrooms, poorly or non-existence of laboratory equipment (Nghishongwa, 2017:12). It is a known fact that before independence few blacks' schools offered science subjects and very few black learners excelled in science-related fields, as such the government got committed to close the gap and implemented compulsory science-related subjects through grade 10.

Ministry of Education documents and syllabi indicate that science plays a significant role and for that reason occupies a key place in the education system. This sentiment is supported by Kasanda and Uugwanga (2018:65) who explain that the nature of science influences society in terms of making sense of science and managing technological objects and processes in everyday life. Informed decision-making on socio-scientific issues, strengthen the value of science as part of contemporary culture, developing an understanding of the norms of the scientific community that express moral commitments and enhancing the learning of science subject matter.

Furthermore, the group observes that the National Curriculum for Basic Education in Namibia, which is broad informs us that Natural Sciences are part of the main drivers of the transformation of society and the world. It is imperative, therefore, to mention that Natural science is the name used at the lower grades up to grade 7 and Physical Science is moderately covered. Hence, there is a need to develop learners into scientific literate citizens (Ministry of Education, 2010b). In addition, the group cites the National Curriculum for Basic Education, which indicates that scientific literacy which is the understanding of scientific processes, the nature of scientific knowledge, and the ability to apply scientific thinking and skills, is indispensable today. Therefore, the Natural Sciences area of learning contributes to the groundwork of a knowledge-based society. It empowers learners with the scientific knowledge, skills, and attitudes to formulate hypotheses, to investigate, observe, make deductions and understand the physical world in a rational scientific and sustainable way.

Another important aspect of science subjects in a school curriculum is that science education predominantly focuses on teaching the subject-matter content in preparation for high stakes examinations. Other aspects of scientific literacy such as inquiry skills and the understanding of the nature of scientific knowledge ought to develop in students indirectly. The implicit approach assumes that 'students' participation in authentic scientific investigations would help learners develop more accurate understandings of the nature of scientific inquiry and knowledge. However, the literature shows that this approach has not been effective in facilitating learners and teachers' understanding of the nature of Science.

In conclusion, some of the aims of the broad curriculum are manifested in specific Natural Sciences and Physical Science curricula (syllabi). One of the syllabi states that Science in schools provides basic scientific background for learners with the expectation of producing the much-needed scientists for the country as the main aim of science education in Namibia. It further states that the Namibian society needs to be scientifically literate if it is to cope with the challenges of appropriate global technology requirements (Kasanda & Uugwanga, 2018:65).

3.2.2 Literature review disclosure and curriculum transformation

Kliebard (2002:1) indicates that pessimism about reform and change in the American schools' curriculum is nothing new. It happened many years ago, though the surrogate for educational reform seems to be taking hold now. He observes that the kinds of curriculum transformation prevalent during most of the twentieth century are becoming the subject of not only political but scholarly criticism. The politicians are the lawmakers while scholars do research that aim at informing lawmakers to do the right things.

In addition, Kliebard (2002:1) observes that the re-examination of earlier school reform arrived at two different paths. One takes the form of great rejection of the educational reforms and consider that reform having undesirable consequences. Two recent educational reforms have imparted a caustic view of the course that curriculum reform has taken in the twentieth century. The titles of David Angus and Jeffrey Mirel's *The Failed Promise of the American High School*, 1890–1954 and Diane Ravitch's *Left Back: A Century of Failed School Reforms* convey the sense that the concentrated efforts to reform the curriculum for many years somehow have gone awry. Such accounts show that it is not simply that many of these reforms failed to accomplish their purposes, but that they were ill-conceived to begin with and affected school practice. However, the analytic of research above is less focused on curriculum transformation itself. It focuses on reasons why some reforms succeeded while others failed to make much of an impact on school reform practice.

When curriculum reform is implemented, so many things happen at the same time, it is not easy to establish a strict sequence of changes that are likely to take place but one can observe some logical connections like; grading cannot really function effectively without a curriculum that expresses common achievements or expectations for groups of learners. Collaborative teaching is supported with recent and appropriate materials and decline the use of textbooks, in other words the grasp of textbooks as curriculum is undone; teachers require an intensive training on curriculum implementation as well as longer-term contracts, so that continuity in the curriculum can be fostered from one term to the next. Teachers also are obligated to keep records of student progress in the event of a change of teachers (Kliebard, 2002:20).

Gray, Scott and Mehisto (2018:2) articulate how curriculum changes in European schools are affected by internal and external structures or relations. They refer to capacity within the education system or set of reforms as structures in particular ways. In other words, things that have high or least potential to influence curriculum transformation i.e. physical or human resources are the structures in particular ways and they can be referred to as change-catalysts. Teachers who are at the forefront of curriculum implementation act as "curriculum change-agents/ transformation-agents". Some curriculum transformation agents have a high capacity to induce a desired curriculum transformation and implement it effectively or with fewer challenges while other transformation agents' influence might not be realised.

Fullan (1993:63) explains the difficulties faced by two primary and secondary schools in the United Kingdom in the implementation of the National curriculum in fulfilling their responsibility for staff development and training. He observed that a change from one curriculum to another on a national scale is extremely difficult. It cannot be achieved without the significant integration of teachers in the process. This implies that teachers play a vital role in the implementation of any curriculum and to achieve its goals one needs to count on teachers' involvement.

In his book titled *Curriculum in a New Key* Aoki (2005:112) explains how a successful curriculum implementation in the classroom depends on teachers' damnedest to make sense of the new curriculum in Canadian schools. He suggests some conundrums which teachers are likely to observe like: wondering if the implementation is relevant to the learners, or whether there is a distinction between what they have been doing and what they are expected to do. I observe that what Aoki sees as a problem in the transformation of the curriculum especially the implementation stage is a curriculum does not detail what happens in the classroom and the curriculum transformation is a complex exercise (Aloovi, 2016:21). Therefore, it stays one of the teacher's task to interpret and implement the curriculum as planned.

In addition, successful curriculum implementation lies directly in the hands of the classroom teachers. Teachers need to outline the curriculum into schemes of work which eventually

fragmented into subject periods. Some subject specialists tend to be more critique about the time allocated to each subject in the school timetable which they termed as insufficient, as indeed it is' (Goodson, 1993:28). Furthermore, teachers may interpret the new curriculum differently which can lead to different experiences of that curriculum. Carl (2005:223), suggests that the process of curriculum reform, becomes a major feature of education in Africa, which involves various role players and interested parties, with teachers being effectively the principal role players.

Although, Mahara claims that changing from one curriculum to another on a national scale can be extremely difficult, the Namibia Cabinet at its 3rd/25.03.14/001 meeting approved the curriculum reform for Basic Education and its eight-year implementation. The Ministry of Education requested school managers, teachers, parents, and the public at large to support the implementation of the revised curriculum for Basic Education. This study will not be a panacea to the problems of the new curricula implementation, rather it will attempt to explore what has been experienced so far by various stakeholders. My principal duty will be to gain an insight into their involvement in the Physical Science grades Eight and Nine curriculum rollout, the gains or losses as per teachers' perspectives and their contributions to the existing knowledge as it is unfolded by scholars and other researchers with similar objectives in the education fraternity.

In addition, I align myself with Reed (1999:199) who acknowledges that there is an opportunity for research to play a more explicit role in curriculum reform. He says this about Mathematics Education. A research is crucial when it comes to curriculum reform as it uncovers many things that other stakeholders may not be aware of. Considering this, research is a necessary tool for curriculum developers who in this context is NIED. I strongly suggest that as Namibia rolls out its revised school curriculum research could be a necessary aid for its success.

3.2.2.1 Assistance or support rendered to teachers for successful implementation of new curriculum

A study by Ottevanger *et al*. (2007:55) on Developing Science, Mathematics, and ICT Education in Sub-Saharan Africa (SSA) based on studies from 10 SSA countries (Botswana, Burkina Faso,

Ghana, Namibia, Nigeria, Senegal, South Africa, Uganda, Tanzania, and Zimbabwe) reveals that there are many examples of professional development programs for science and mathematics teachers from these countries which try to influence teaching in the schools. These programs may be associated with the implementation of specific curriculum reforms or with general efforts to improve practice in schools. Most of these programmes are rolled out by donor-funded projects. Furthermore, in most countries, upgrading courses for teachers exist to tackle the shortage of qualified teachers, and as a stimulus to make the teaching profession more attractive, thus drawing better-qualified individuals into the profession (Ottevanger *et al.*, 2007:xiii).

The above study reveals that most of the programmes supporting teachers in implementing curriculum effectiveness or to support and develop teachers professionally rely on donor-funded projects. It provides me with no definitive answers as to why countries do not execute teacher support and development programmes by themselves or how programmes are sustained after the end of the funding period. Nevertheless, one of the basic questions under examination in this study is how are the Physical Science teachers equipped to implement the Revised Science Curriculum?

Teachers need development programmes to implement a set of planned tasks, learning experiences and behaviours proposed by an authority effectively. As I mentioned in Chapter 1, recent studies done by Namibian scholars listed below, indicate that curriculum change can be a complex issue. Negumbo, (2016), Aloovi (2016) and Iipinge and Kasanda (2013) concurred that the process of curriculum change and implementation is and still posed a challenge in the educational sector in many countries. In Namibia, teachers do experience numerous challenges in the implementation of the NSSC curriculum. Their training seemed not aligned with the needs of the classroom. Accordingly, Mulkeen (2010:174) reveals that teachers' development training offered in pedagogical methods is often theoretical as a result its impact on classroom practices could be minimal. Again, the teaching of the pedagogical content knowledge is often not thoroughly aligned to the curriculum being implemented in schools (Mulkeen, 2010:174). In the same vein, Mahara (2016:372) argues that teachers often lack the theoretical knowledge and the familiarity with principles informing the implementation change.

Furthermore, while the new change emphasises learner-centred approach, teachers are ill-equipped to carry out the tasks. Thus, insufficient training of teachers may result in mediocre performance of learners both nationally and globally. Correspondingly, Mahara (2016:379) argues that the challenges experienced by most South African teachers on the implementation of the Curriculum Assessment Policy Statements (CAPS) originate from lack of material resources and poor teacher training as teachers need to be trained how to develop their materials. Equally, Aloovi (2016:46) reasons that although consultation with teachers and their proper training on how to implement relevant teaching approaches are important; factors to take into account for the successful implementation of any curriculum and the training and support provided to them did not adequately address their needs. He concludes that most teachers were not empowered to handle the new curriculum successfully. Mulkeen (2010:174) observes that for effective implementation of a curriculum, teachers who are principal implementers need adequate knowledge, skills, and competences.

In a case study of the Namibian schools, the implementation of the H/IGCSE curriculum led to a complex curriculum reform process largely due to insufficient preparation and support for already apprehensive teachers, who were pivotal in its implementation Aloovi, (2016: 46). These challenges in the implementation of the new curriculum lead to the introduction of large-scale professional development projects focusing on junior and senior secondary school teachers. One such training was In-service Training and Assistance for Namibian Teachers (INSTANT) programme, which was set up by Vrije Universiteit Amsterdam in the Netherlands, together with the University of Exeter in the United Kingdom, which assisted the Namibian life science, biology and physical science teachers to implement the curriculum between 1991 and 1995.

During my personal experience, I have observed that during our mobile laboratory visits in the regions known as “outreach teachers support programme” as earlier mentioned in Chapter 1, teachers submitted their needs regarding topics or themes they were experiencing difficulties in. In many cases, they asked support on different approaches and strategies on how to introduce a certain topic or deal with a theme. In this regard, I agree with Mahara (2016) and Mulkeen (2010) who concluded that teachers lacked proper training on both pedagogical methods and pedagogical content knowledge, and skills.

Many in-service training programmes employ a cascade model for their training activities. For example, a group of national trainers is trained first on the implementation of a revised curriculum. Then in turn, train regional trainers, there might be even another cascade model at the circuit or cluster levels. There are large numbers of teachers involved in such programs, but only few staff are available for the organisation and execution of activities. The cascade model is observed to be a helpful model in that it provides the opportunity to reach many teachers with few trainers, but it also presents the danger that the training gets diluted to undesirable levels with every step down the cascade (Ottevanger *et al.*, 2007:57).

After Namibian independence, Science and mathematics teachers received in-service training which supported them to implement the curriculum reform of the time. According to Kasanda (2004:5) teachers trained for two years through Mathematics and Science extension Programme (MASTEP) were able to implement a curriculum for the International General Certificate of Secondary Education level (IGCSE). The programme was offered in two modes: distance and face to face. During the face to face period teachers underwent intensive content and methods instructions for two consecutive weeks which translated to 6 weeks a year. Furthermore, teachers were given textbooks and other materials which have made their preparation and implementation of the subjects' curriculum easier.

In addition, MASTEP teachers were also supported by a trained host teacher in the schools assigned the task of overseeing them during the time they are back in the schools. In his paper Kasanda (2004:7) submits that lack of professional support for teachers may lead to a sense of isolation in teachers and hopelessness to solve some of the problems they faced at school on their own. However, the support provided by the host teachers in the MASTEP programme gave these teachers the assurance that they were not alone, and that help was always available to them.

In the previous studies, discussions were mainly based on how teachers were assisted at the national or regional level to implement newly revised curricula in different African countries. It is imperative to mention here therefore that, though some studies about teachers' experiences in implementing curricula were conducted, they were not about the Physical Science curriculum. Although teachers' training offered in different countries were similar, they mostly focused on

implementation or handling of new curriculum in schools which were under principals' and Heads of Departments' care. However, these prior studies have failed to identify how teachers were supported in these schools headed by principals and Heads of Departments. I observe that Principals and Heads of Departments played a substantial role in the implementation of the new curricula. They need to have an understanding and knowledge of curriculum development to give the desired support to teachers without ascendancy.

In my personal experience, when I completed a Basic Education Teachers Diploma (BETD) at Ongwediva College of Education, this qualified me to teach Physical Science up to grade 10. But on assuming work, I was instead given grades 8 to 12. There was no orientation held on how to implement the curriculum and as a result, I could not help but comprehend finding my strategies which I was comfortable with and which could secure learners' confidence. This enabled me to implement the curriculum from the topics/ themes that I knew well with barely any experience. With that in mind, I agree. Hence, I with Mulkeen (2010) when he guided that teachers needed adequate knowledge, skills, and competences from proper training. A teacher should be seen as a novice and diverse support is required in the form of regular workshops, subject conferences, and teaching aids.

3.2.2.2 Difference in the implementation of a new curriculum between Private School and Public School

I thoroughly searched for relevant studies until July 2019 with words into internet search engines. The keywords were private school, public school, curriculum implementation and physical science curriculum. I came across work of Fox (1985), Madsen (1996), Alabi (2014), Aloovi (2016), Koinzer, Nikolai and Waldow (2017), and Chakrabarti and Peterson (2009) which were not really studies of implementation of a new curriculum in a private or a public school, the above cited studies talked about curriculum from different perspective. For examples, Fox (1985) talks about parents' views on the private and public school issues, Madsen deliberated on private and public school partnerships while Alabi (2014) and Aloovi (2016) wrote about curriculum implementations in other fields but not Physical Science and other authors or studies were focused either on private school or school choice or curriculum in

general. However, these studies did not specify whether the curriculum implementation **was** in the public or private school, hence they did not outline differences between a public and private school. My failure to find appropriate studies as regards the implementing of a new curriculum at a private or a public-school cast doubt about adequate research on this area.

According to Chakrabarti and Peterson (2009:47) private schools enjoy so many advantages ranging from pedagogical approach to resource management and positive peer effects i.e. skimming the cream of learners. The pedagogical approach might be interpreted as a curriculum implementation. Private schools capitalise on their greater resources to translate dollars into sound outcomes in the form of value education. Subsequently, the particular subsets (cream of learners) of families excel after the curriculum is implemented well. In the same vein, Madsen (1996:iii) mentions that parents choose a private school for their children and connected to it is an affirmation of their choice. Teachers execute their tasks as regards curriculum implementation and achieve reliable Findings. In return, parents support teachers after they realise how private schools meet their children's needs. The outcome is that teachers' goals for learners replicate parents' goals and consequently this mutual support improves academic achievement and commitment to educational success.

Furthermore, Madsen (1996:7) explains that some African American parents choose private schools as they perceive that these schools would support learners to achieve their educational goals while public schools in their ecological space were of substandard quality. They feel that the academic push is more vigorous at private schools than public ones. Private schools also foster greater accountability for academic achievement for minority children due to their organisational characteristics and value structure. This study did not come out clearly to indicate whether the curriculum implementation in a private and a public school was the same, but I speculate that they implemented the same curriculum because in most cases public and private schools fall under the same regulatory regime.

Generally, parents' involvement as well as the support or push from the schools' community added a more pivotal role to the private schools' curriculum implementation than the public schools. However, my personal experience is that parents tend to choose schools on the bases of

academic excellence. In other words, schools with specific educational missions i.e. taking curriculum implementation seriously. This means if a school excels (whether public or private) parents will choose them. Should it happen to be a private school, even poor parents could make financial sacrifices towards their children's education because they believe that such a school is a panacea to their children's success.

Although most studies praise private schools' educational excellence, this is not a case in all countries or states. On the contrary, Koinzer, Nikolai and Waldow (2017:125) reveal that educational researchers and public opinion agree that Chinese public schools usually perform better than their private counterparts. Their assessment grade Findings have consistently been found to be lower among private school learners compared to public ones. The trio observe that the majority of private school learners do not have local residency near their schools or the parents' income is low. As a result, learners' performance is negatively affected. In addition, a report published by the Chinese Ministry of Education newspaper indicated that grades were lower at private schools, as more state supervision is deemed necessary to ensure good quality at private schools (Koinzer, *et al.* 2017:125). My understanding is that the state minimally supervised learners' progress while it ensured that private schools demonstrated best for better outcomes. The state blames private schools' achievement of unsatisfactory grades on poor management. Should its involvement and more supervision especially been super-standard and then implemented well the curriculum, this would yield the desired Findings. It appears greater attention and energy has been shifted to public schools; hence delivering the desired educational outcomes.

A study conducted by Alabi (2014:269) in Ondo State in Nigeria found that there was a significant difference in the Perception of Teachers in the implementation of a New Senior Secondary School Curriculum between Public and Private senior secondary schools. It was revealed that variation existed in the perception of teachers in the implementation of the New Senior Secondary School Curriculum since training on teachers' empowerment was done differently. It was revealed that ineffective implementation of the new curriculum was caused by a shortage of relevant textbooks, lack of tools and equipment and ineffective monitoring of the implementation phase. The study also underscores the need for continual and effective teaching.

Ultimately teachers play a vital role in the implementation and as such; they can be a key barrier to curriculum transformation if they are not empowered and remain being clear about what needs to be done in such circumstances.

The level of implementation is perceived as significantly higher in public than in private secondary schools. Most private schools used in Alabi's (2014) study have no functional trade workshops, hence, learners are not exposed to regular workshop practice, and this could be attributable to the high cost of building and ineffective monitoring of the curriculum implementation in the private by the Government as revealed in the study. There is a need to clarify these significant differences. This research would designate the comparisons and differences if there were any.

According to Aloovi (2016:46) appropriate implementation of a new curriculum requires time, continuous professional development, In-service training, interpersonal relations, and other relevant forms of teachers-based support. My view is that effective curriculum implementation needs proper induction program, teachers' workshops on curriculum interpretation, and one on one interview with teachers. Trained teachers can use a variety of teaching methods, be conversant and understand the curriculum as well as best use of time to ensure the national standards are achieved. Aloovi (2016:47) further suggests that pedagogical content knowledge and attitudes of teachers regarding curriculum reform need to be reported by curriculum designers, education policy makers, and the teaching community. Foregoing the above, the resources mentioned are key in the implementation of a new curriculum.

3.2.2.3 Successes and challenges in implementing a new curriculum at Private and Public schools

The output and outcome of the implementation of curriculum imaginations depended on what teachers 'do and think with regards to these creativities. Specifically, with regards to putting in practice the intended curriculum initiatives were determined by the challenges teachers encountered during the implementation process as well as the meanings teachers attributed to the initiatives (Lim & Pyvis, 2012:129). In the same vein, Haimbangu (2018:9) states that teachers

need to manage their classroom that is, learners' different abilities or class size and be in control and innovate best practices at schools. This meant that if teachers are not watching what they "do and think", the implementation of physical science curriculum could be affected at a private or public school.

In a study carried out by Lim and Pyvis (2012:129), they observe how Singapore junior college science teachers addressed curriculum reform; underpinning three areas of professional knowledge which teachers need to be expert in for the successful implementation of curriculum initiatives that advocate 'progressive' pedagogies. These areas are subject matter content knowledge; pedagogical knowledge; and pedagogical content knowledge. They are intertwined, as a good pedagogical content knowledge requires teachers to be strong in their content knowledge to be able to understand the subject-related learning difficulties students are likely to encounter. Science teachers, strong in their subject matter content knowledge are considered to be more effective in promoting higher-order critical thinking skills in their students as they can "ask cognitive challenging questions" and "pick up students' misconceptions" (Lim & Pyvis, 2012:129). However, there could be some teachers faced by the challenge of acquiring new professional knowledge. On the contrary, teachers lacking in content knowledge, pedagogical knowledge and pedagogical content knowledge will not be able to promote active learning in classrooms as these teachers are likely to teach misinterpreted curriculum. So, as a result, the curriculum is likely to be wrongly implemented. It has been argued that acquiring new knowledge for innovative science teaching is dependent on personal and institutional factors (Lim & Pyvis, 2012:129). Therefore, the attainment of knowledge for effective implementation of educational initiatives may not be a forthright process.

My own experience with regard to challenges experienced by teachers is that some of them were trained at former colleges of education whose main focus was on teaching methodologies, as a result, they lacked content knowledge and pedagogical content knowledge. These teachers may find it difficult to implement curriculum reform once they find content above their knowledge. Another challenge, could be some teachers were admitted at the institutions of higher learning with relatively low points from grade 12 (Standard 10), unlike in Singapore as alluded to in the study of Bautista, Wong and Gopinathan (2015) where candidates accepted into teacher

preparation programmes are selected from the highest achieving students of each cohort of graduating students or the university degree holders. They then go through a comprehensive application process which includes a penal interview focusing on both intellectual capacities and personal qualities such as past contributions to their alma mater and community.

Makunja (2016:32) conducted a study on challenges facing teachers in implementing Curriculum Assessment Policy Statements (CAPS) in South African schools and concluded that a lack of in-service training, unpreparedness and skills of teachers to implement, insufficient teaching and learning resources, overcrowded classrooms and low ability of learners joining secondary schools were among the challenges hindering the successful implementation of the curriculum.

Additionally, he states that the curriculum is always political which includes teacher unions on the one side, and the government on the other. The task of improving education affairs at national and regional levels lies with both the state (government) and the teacher unions. It is my understandings that if two sides differ on a certain point and each one wants to protect his or her interest then a gap will occur. In the implementation context, teachers who are at the coal face of implementation will be encircled by many challenges and eventually end-up frustrated.

Furthermore, some of the findings from Makunja's (2016) study show that when implementation is politically orientated then the effectiveness of the curriculum may indeed get lost. It had been projected that a revised curriculum would have the knock-on effect of improved implementation. This did not happen; teachers became tired of change which caused a flaw to the curriculum implementation. The policymakers consulted with teachers' unions' representatives, and not with supervisors of teachers. It had been observed that teachers' unions are ineffective in involving their members in policy-making activities within their unions despite them being at the coal face of the union. Hence, a gap being created between policy formulation, unions, and policy implementation, which left teachers not fulfilling their contractual obligations.

Other challenges observed by Makunja (2016), in the curriculum implementation included teachers not forthcoming to seek out training and support on their own or using information technology i.e. internet services. To put it differently, collaboration or liaison with other teachers

or relevant structures on the curriculum was not realised. They needed to promote a culture of cooperation, collaboration, and consultation among colleagues on matters relating to their teaching tasks as a whole. This is evidence that there is a need for sensitisation, continuous training to support teachers whenever a new curriculum is rolled out. Again, teachers seemed not encouraged to understand the ownership of the curriculum. This situation shows how imperative intensive teachers' training is, which means inadequate training of teachers can hamper implementation. Teachers would find it difficult to sufficiently implement the curriculum. My opinion is that teachers do not open up or visit relevant offices which can support them. They seem not to be active in the Associations or clubs created in their subject areas which leads to "natural death" of those associations or clubs as they become dormant.

While it is valid that lack of new textbooks or available textbooks fits only the old curriculum, it is a serious challenge that teachers use insufficient textbooks as an explanation for inadequate implementation, and that they have not found creative ways to overcome such shortages. Most of the schools are equipped with duplication machines, overhead and power-point projectors, so teachers can plan and present outstanding lessons without textbooks. It seems to appear they exclude or shift the responsibility of curriculum implementation and just teach because it is part of their job description. Haimbangu (2018: 9) explains that technology and mass media are some of the solutions to challenges experienced by teachers. Audio-visual materials can improve the implementation of curriculum and bring about permanent and meaningful experience to learners.

Aloovi (2015:48) points out that teachers scramble to include current and lively topics in their teaching and learning. They thus, face challenges in teaching their subjects. Haimbangu (2018:15) cautions teachers to be professional by integrating current global and national issues such as innovative technology, diverse cultures, religions, languages, just to mention but a few. Pedagogical consideration, therefore, should also be included by providing opportunities for 'active learning' and humour to encourage learners' engagement, bringing their models and innovated projects to make learning interesting and explaining things clearly.

According to Lim and Pyvis (2012:129) teachers are primarily concerned with how the intended educational initiatives improve teaching and learning in the classrooms. Educational initiatives

that are perceived to be able to help students to reach better Findings in the examinations are implemented with much enthusiasm by teachers.

Furthermore, Lim and Pyvis (2012:129) argue that fear and anxiety in the learning of science may also result in students showing reluctance and resistance towards the use of learners- centred teaching method, and as an alternative depend heavily on teachers to transmit conceptual knowledge. It has been proven that students tend to prefer teachers to provide them with facts and knowledge and solutions to problems as they believe that knowledge acquired directly from teachers is ‘more trustworthy’ vice-visa the knowledge learned through ‘collaboration' with their classmates (Lim & Pyvis, 2012:129).

Research done by scholars revealed that learners regard science as one of the difficult subjects to study (Lim & Pyvis, 2012:129). Therefore, the implementation problems include multiple interpretations of the curriculum and workload, such interpretations often might become a challenge that teachers face in the implementation of any new curriculum. Another challenge in the new curriculum is assessment. Njabili (2004:38) reason that “the most sensitive part of curriculum change is change in the assessment and examination system”. He concludes that lacking performance in public examinations is an indicator of poor teaching and learning.

3.3 CHAPTER SUMMARY

In this chapter, I provided information about the numerous writers who made an account of the importance of literature review. For example, Oliver (2012) indicated that a literature review was the most important part of any piece of academic writing and it is an essential base where all academic writing can focus on.

I have reviewed numerous types of literature on the phrases and concepts on my topic which is the Physical Science Teachers’ Experiences during the implementation of the Revised Junior Secondary Curriculum for Grades 8 and 9 in Oshikoto region. The chapter was more challenging than the one for methodology and methods. I did not have the knowledge and strategies that one needed to do the literature review.

I have posed vital questions like: what is literature review and what purpose does it serve concerning my research? Why is it such a vital component of research? What are the numerous ways it can be realised in this thesis? And, what does the process of completing a literature review involve?

I also reviewed how other scholars have investigated, theorised, and conceptualised the Physical Science teachers' experience on the implementation of the new curriculum. I have indicated what is known already especially, the successes and challenges of science curriculum implementation. I attempted to reinforce some of the contradictions or gaps in the existing knowledge. For instance, some studies or discussions in the chapter were mainly based on how teachers were assisted at the national or regional level to implement newly revised curricula in different African countries. It is imperative to mention here, therefore, that though some studies about teachers' experiences in implementing curricula were conducted, they were not about the Physical Science curriculum. Although teachers' training offered in different countries were similar, they mostly focused on implementation or handling of new curriculum in schools which were under principals' and Heads of Departments' care. However, prior studies have failed to identify how teachers in these schools headed by principals and Heads of Departments were supported. I observe that Principals and Heads of Departments played a substantial role in the implementation of the new curricula.

Furthermore, most of the programmes supporting teachers in implementing curriculum effectiveness and developing teachers professionally relied on donor-funded projects. Definitive answers as to why countries do not execute teachers' support and development programmes by themselves and also on how programmes are sustained after the end of the funding period are not provided. Nevertheless, one of the basic questions under examination in this study is how are the Physical Science teachers equipped to implement the Revised Science Curriculum?

I observed that Makunja and other scholars (Lim & Pyvis, 2012: Makunja, 2016; Aloovi, 2016) made good contributions towards curriculum reform and equally (Chakrabarti & Peterson, 2009;

Alabi, 2014; Koinzer, Nikolai & Waldow, 2017) in their team made various recommendations towards the implementation of curriculum at public and private schools. Most of the above writers observed the lack of textbooks and available textbooks fitted only the old curriculum. This is a valid and serious challenge. However, the reason that teachers use insufficient textbooks is not an explanation for inadequate implementation of the curriculum. Does this mean teachers did not find creative ways to overcome such shortages? Haimbangu (2018:9) explains that technology and mass media were some of the solutions to the challenges experienced by teachers. Audio-visual materials improve the implementation of a curriculum and bring about permanent and meaningful experience to learners it was observed.

CHAPTER 4

ANALYSIS OF TEACHERS' EXPERIENCES AND DOCUMENTS ABOUT NEWLY REVISED CURRICULUM

4.1 INTRODUCTION

The previous chapter deliberated on literature as presented by other scholars on the teachers' experiences in the implementation of the previously revised curricula with a focus on physical science. Different scholars investigated, theorised, and conceptualised on different curriculum implementation issues which I found related to my study. As I indicated in Chapter 1, I must mention that, it was the concern for the condition of support offered to Science teachers at both Public and Private Schools; and following their participation in the workshops on the revised curriculum that I attended, and failure to find any information on how teachers copied with or experienced such; that I undertook this study.

Equally, I was interested in finding out how Physical Science teachers (PSTs) articulated their experiences as they implemented the newly Revised Physical Science curriculum? In addition to that, I wanted to know how private and public schools are impacted by the implementation of the RPSC. The idea was not to compare the curriculum documents in the eyes of the two institutions per see, but simply to perceive both as implementers of the same document. I deemed it necessary also to scrutinise and analyse some policy documents and circulars such as: Curriculum and Learning Support Materials Review Cycle Policy, Physical Science Syllabus for Junior Secondary Phase (Old curriculum for grades Eight and Nine), National Curriculum for Basic Education (grades one to twelve), Physical Science syllabus for Junior Secondary Phase (New curriculum for grades Eight and Nine) and National Subject Policy Guide for Physical Science (grades Eight to twelve). The framework of policy documents or circulars help to justify, confirm or understand what teachers' experiences during the implementation of the RPSC. For example, if teachers felt that the RPSC was exceptionally long, the policy documents or old physical science and revised physical science curricula justify the teachers' experiences. There are some activities in the old curriculum that a short time allocated to them compared to the same

activities in the revised curriculum and this is reflected in the policy documentation. Therefore, the fact that teachers implemented the new curriculum is evidence of how policy document answer the lived experiences by teachers during the implementation. It was echoed by Dilthey (in Van Wyk, 2004:27) that, we may find that our texts are not the only sources, but it is that historical reality is a text itself that has to be understood.

While there are various and different methodologies applicable, I describe my methodological approach as hermeneutic interpretative which is rooted in Gadamer's interpretation and understanding. I tend to align myself with Tan, Wilson and Olver (2009: 4) who observed that from Gadamer's viewpoint, the interaction between a researcher and a participant or between a reader and a text, is a constant discourse, the reason why interpretation is regarded as a collaborative and a central process to understanding something. For Gadamer, understanding is not a straightforward occurrence, but it is an incidence whereby one reasons from information and meanings made and grasped from participants or texts by ways of thinking and analysis of language used. Considering this I draw from Gadamer's experience in document analysis. Laverty (2003:25) rightly puts it that, Gadamer views interpretation as a fusion of horizons, a dialect between the excitation of the interpreter and the meaning of the text. For Gadamer, horizon means to be able to see beyond what is nearby. Kabende (2015: 93) interprets horizon as the understanding the researcher brings with, which includes experiences, research questions, the analysis of concepts, and the research methodology. Without the horizon perspective, one is unable to see far and overvalues what is nearest at hand. While interpreting the old and revised Physical Science curriculum including policies and other documents, I bear in mind Laverty's observation regarding Gadamer and with which I respectfully draw from.

In the next paragraph, I dwell on the analysis of documents or policies to understand issues around the implementation of the revised Physical science curriculum, which will be followed by presentation of information from teachers who implemented the revised curriculum.

4.2 DOCUMENTS AND POLICIES ABOUT PHYSICAL SCIENCE JUNIOR SECONDARY PHASE GRADES EIGHT AND NINE

The Ministry of Education of the republic of Namibia in its circular dated 25.03.2014 informed the education stakeholders and the public at large of the cabinet's approval of the Basic Education and the eight-year implementation plan of the curriculum.

The revised curriculum for junior secondary phase (grades eight and nine) comprise of nine promotional subjects whereby Physical Science as a subject was to be implemented in grade eight and nine as follows: grade eight in 2017 and grade nine in 2018. The documents indicated that there would be teachers' in-service training which would be costed and carried out in 2016 for grade eight and 2017 for grade nine.

Consequently, in one of the press statements regarding the implementation of the basic education reforms released by the Minister of Education in 2018, several changes to be experienced at Junior Secondary phase were stated as follows:

4.2.1 Phasing out of Junior Secondary (JSC) National examinations

The Junior Secondary Certificate (JSC) examinations in the old curriculum written by grade ten learners as a national examination were to be phased out in 2018. This implied that the candidates who failed the final national examinations would improve their grade ten subjects' symbols through part-time institutions registered with the ministry of Education, Arts and Culture and write Grade ten national examinations as part-time candidates in October/ November 2019.

It is imperative to mention here, that the phasing out of the Junior Secondary Certificate National Examinations brought the introduction of semi-external examinations to be written at the end of grade nine as from 2018 to ensure consistency of learning standards across the board. Currently grade nine is the highest grade for Junior Secondary phase while during the old curriculum it was grade ten and semi-external examinations are viewed as an equivalent to former grade ten Junior Secondary National Examinations. There is no Junior Secondary Certificates issued for grade nine, learners only receive school reports.

4.2.2 Changes in the former and latter physical Science curriculum for grades eight and nine

The grade Eight Old Physical Science curriculum (syllabus) indicated the learning content such as themes and Topics, Objectives and Basic competencies while the Revised curriculum (syllabus) the term Specific Objectives is employed. Topics refer to the components of the subject in this case Physical Science which learners are required to study (MoEAC, 2015b:8) while Specific objectives defined as the detailed and specified content of the syllabus, which learners need to master to achieve the general objectives, and on formative assessment as drawn from (MoEAC, 2015b: 8).

It has been observed that the number of topics taught in both former and latter curriculum is the same i.e. five topics which are: Scientific processes, Matter, The Gases of the air, Forces and Electricity. However, the specific objectives of some topics in the revised curriculum covered more content than in the old curriculum. For example, under the theme "Recording and presenting Findings", there are about three new specific objectives in the new curriculum, namely:

- *draw up/tabulate findings of an investigation in tables, heading each column of the table with the name of the physical quantity and the appropriate unit (e.g. time/s).*
- *Select suitable scales and axes for graphs.*
- *Label each axis with the physical quantity and the appropriate unit, e.g. time/s* (MoE: 2015:10).

These specific objectives were basic competences in the old grade nine curriculum. The new grade eight specific objectives were taken from the grade nine old curriculum. I also detected that the number of specific objective bullets are more in the revised grade eight revised curriculum than in the former curriculum. I noticed that in some cases the grade eight learners had to learn the content which was for grade ten in the previous curriculum. An example of the topic Mechanics under the weight and mass theme, learners are expected to define the earth's gravitational strength (g) as a constant of gravitational force of 10 N on 1 kg of mass (10 N/kg), calculate the weight = mass x gravitational field strength (w = m x g) of an object on the Earth if

the mass is given, etc. As per observation, the content in the revised curriculum appears to require more time to complete than the content of the old curriculum. I will analyse the period allocated to the revised curriculum at a later stage. The content of former grade ten syllabus became part of the grade nine revised curriculum. Most of the specific objectives are explained in detail in the newly revised curriculum to enlighten teachers on what learners are expected to learn or to be assessed on. The current content of grade Nine is more than the previous grade nine content, an equivalent to the content of grade ten in the old curriculum.

In the grade nine old curriculum, some specific objectives under the themes only seek reasons for the answers, which is different with the revised one. The same themes in the revised curriculum for grade nine only demand learners to give critical account of the points involved in the phenomena apart from the reasons i.e. explanation and discussion. For example, the theme Resistance in both old grade nine and revised curriculum demanded learners to explain resistance as the opposition to current flow and is measured in ohms using an Ohmmeter. However, the revised one went further to request learners to discuss that varied materials had different resistances.

As mentioned earlier in the chapter the theory of Gadamer was adopted in this study and I noted that he focused on understanding and language. I therefore analyse the texts below which fall under the "resistance" theme from both the old and revised grade nine curriculum as an attempt to clear and interpret what these texts mean by considering the language used.

In the old curriculum it reads; "explain the effect on the resistance of a wire if: *the length, diameter and temperature are increased*." While in the revised curriculum it is written; "explain the effect on the resistance of a wire if: *the length, diameter and temperature are changed*." Though in reality the same experiment can be conducted to explain the effect on the wire's resistance. The meaning can be distorted due to different words used which are *'increased'* and *'changed'*. The word *'increased*' as a specific objective it implies that learners needed to investigate what will happen if the conductor's length increased, meaning that one starts with short length and make it long, longer, and longest. The learners' understanding could be that there is no need to observe effect of the resistance when the length, diameter, or temperature

decreases. Conclusively, the understanding and language used in the revised curriculum is different. Here the word ‘changed’ implies that learners investigated effect of the resistance irrespective of increases or decreases of the conductor’s length if there was a change in the length, diameter, or temperature. This therefore implies that: communication, meaning, understanding and interpretation are very crucial elements to the success of the curriculum.

4.2.3 National Subject Policy guide for Physical Science grade eight to twelve

It has been established, that there is no new policy subject guideline so far printed out. The only one available, is for 2009 which was designed for Physical science curriculum for 2010 which is currently under revision (MoE, 2009). MoE (2010:1) stipulates that National subject policy guidelines for school curriculum make provision for well-organised and orientated programmes regarding teaching and management of subjects in the schools and aims to:

- *provide guidelines for subject managers in controlling teaching and learning activities*
- *guide teachers in organising their administrative duties and in planning teaching and leaning to meet the expectations of the national standards and performance indicators*
- *Provide guidelines for effective teaching and management of Physical Science in the Junior and Senior Secondary phase at National level.*
- *List some roles, responsibilities and accountability of the departmental heads, subject heads, and teachers within Physical Science department of the school.*
- *In cooperation with existing manuals, policies, guidelines, and procedural documents provide effective teaching of Physical Science.* (MoE, 2010:1).

The above issues highlight what the subject policy guidelines wants to achieve. Most important matters are stipulated in this policy document and teachers can use it to implement the curriculum accordingly as they read the policies in conjunction with other related documents.

It was observed that most of the subject-specific issues are explained in this policy document. Issues like Time -tabling, syllabuses, scheme of work, written lesson preparation, homework, maximum Time on Task, Teaching and Learning materials, Teachers ‘manuals, textbooks, exercise books, specialised equipment, practical lessons and laboratories Continuous

Professional Development, Learner-Centred Education (LCE), marking and Moderation, Classroom displays and arrangement, other Resources (including ICTs and Assessment). Though there is no revised subject policy guideline now, teachers relied on the Ministry directives or circulars and manuals on the revised curriculum from the Ministry of Education or its responsible organs such as NIED and DNEA.

4.2.3.1 Timetabling

Since information as regards, timetabling is part of the subject policy guidelines and the new policy has not been printed yet; I have used the 2010 and 2016 National Curriculum for Basic Education documents to analyse the period allocation for both old and revised Physical Science curriculum.

The time allocated in the old curriculum to Junior Secondary Physical science is for a seven-day cycle, implying forty-five minutes per period there are five periods in a cycle or a five-day cycle which is forty minutes per period and four periods in a cycle while the revised new curriculum has only one option which is a seven-day cycle and forty minutes per period and there are five periods in a cycle. This implies that in the old curriculum a subject took two hours and forty minutes (2 h 40 min) in a five-day cycle or three hours and forty-five minutes (3 h 45 min) in a seven-day cycle. For the revised curriculum, it takes three hours and twenty minutes (3 h 20 min) in a seven-day cycle.

With the above calculations, it appears that more time was allocated to the old curriculum in a seven-day cycle than the new curriculum. On the contrary, the new curriculum specific objectives are more than the basic competencies in the old. Given the scenario, Grade nine will be expected to finish with teaching and assessments in the second term yet in the old curriculum teaching and assessment went up to the third term. From experience, it is hard to complete a grade Ten curriculum within two terms unless one utilises holidays and weekends. The current grade nine which is an equivalent of the old grade ten is about twenty-five minutes less than the time allocated for a seven-day cycle yet the time allocation in both cases would have been the same.

4.2.4 Assessment

Assessment for Physical Science syllabus for grades eight and nine in the old and revised curriculum specify what understanding and skills a learner must demonstrate to be awarded a grade. A brief description of each assessment component was given in Chapter 3 under section 3.2.2 Assessment.

Table 4.1 Summary of continuous assessment (CA) tasks. MoE, 2010: 72) Old curriculum.

Continuous assessment Grade 8 and 9						
	Term 1		**Term 2**		**Term 3**	
Components	**Number & marks**	**Total**	**Number & marks**	**Total**	**Number & marks**	**Total**
Practical Investigations	2 x 15	30	1 x 15	15	1 x 10	10
Projects			(1 x 30) ÷2	15		
Topic tasks	2 x 10	20	2 x 10	20	2 x 10	20
Topic tests	(2 x 20) ÷2	20	(2 x 20) ÷2	20	(2 x 20) ÷2	20
End of term tests	65 x 2	130	65 x 2	130		
Term marks		200		200		50
Weighted term marks	200 ÷2	100	200 ÷2	100		

The summary of continuous assessment tasks for grade 8 in **Table 4.1** which is from the Old physical science curriculum. According to the old above assessment policy grade eight and nine teachers were expected to conduct formal and informal assessments from their respective learners. They then harvest marks from valid and reliable structured formal assessments given in line with the assessment policy to provide a continuous assessment (CA) marks for individual learners from practical investigations, projects, tasks, and tests as per the ratio in the table above. Subject teachers would then record the CA mark on the assessment record sheet and add the

examinations mark to get the promotion mark of each learner. In most cases, schools set their examinations for both grades eight and nine.

Table 4.2 Summary of continuous assessment tasks. (MoEAC, 2015b: 57) Revised curriculum.

Continuous assessment of Grade 8						
	Term 1		**Term 2**		**Term 3**	
Components	**Number & marks**	**Total**	**Number & marks**	**Total**	**Number & marks**	**Total**
Practical Investigations	2 x 15	30	1 x 15	15	1 x 10	10
Projects			(1 x 30) ÷2	15		
Topic tasks	2 x 10	20	2 x 10	20	2 x 10	20
Topic tests	(2 x 20) ÷2	20	(2 x 20) ÷2	20	(2 x 20) ÷2	20
End of term tests	65 x 2	130	65 x 2	130		
Term marks		200		200		
Weighted term marks	200 ÷2	100	200 ÷2	100		

Table 4.2 which is from the revised curriculum are the same. Teachers are expected to assess tasks in the revised curriculum with the same magnitudes as in the old curriculum. The assessment tasks for grade eight and nine are compiled in one table in the old curriculum and are alike while in the new curriculum grade eight and nine are compiled separately.

Table 4.3 Summary of continuous assessment tasks. (MoEAC, 2015b:57) **Revised.**

Continuous assessment of Grade 9				
	Term 1		**Term 2**	
Components	**Number & marks**	**Total**	**Number & marks**	**Total**
Practical Investigations	2 x 15	30	1 x 15	15
Projects			(1 x 30) ÷2	15
Topic tasks	2 x 10	20	2 x 10	20
Topic tests	(2 x 20) ÷2	20	(2 x 20) ÷2	20
End of term tests	65 x 2	130	65 x 2	130
Term marks		200		200
Weighted term marks	200 ÷2	100	200 ÷2	100

The summary of continuous assessment for grade nine in **Table 4.1** which is part of the old Physical Science curriculum and **Table 4.3** which is adapted from the revised one show different number of assessments expected from this grade. In the old curriculum, the assessment tasks were done in all three school terms. For the revised curriculum, teachers are expected to complete their assessment tasks in the second term. They assess in the same manner as the grade ten in the old curriculum (See **Table 4.4** on page 81). This is a confirmation of what I have alluded to under section "**4.2.1** Phasing out of Junior Secondary (JSC) National examinations" that the current grade nine like the former grade ten. Grade ten was the highest in Junior Secondary phase while grade nine is currently the highest one in Junior secondary phase.

Previously the DNEA was responsible for grade ten external examinations during the junior phase. It could set question papers and take control of the whole external examinations up to the Findings i.e. issuing Junior Secondary Certificates to all grade ten learners. For the revised curriculum, grade nine only writes semi-external examinations yet it is equivalent to the former

grade ten curriculum. In the newly revised curriculum, the DNEA is only responsible for setting and distribution of the grade nine question papers to the schools. Then the papers are marked regionally, and samples moderated by DNEA. No Junior Secondary Certificates are issued for grade nine as was the case for former grade ten Junior Secondary examinations, though the current grade nine occupies the same position. Learners only receive school reports, not junior secondary certificates as was for the previous grade ten which is now phased out of that position. (MoE, 2018:10).

It is observed that what is expected from grade nine learners is like what grade ten learners were expected to do. The question remains if DNEA is responsible for the entire range of exercises for grade ten examinations including marking and whether they moderated the continuous assessment. Is it worth trusting to just depend on promotional marks in learners' reports as a valid way of testing competencies.? Hence, there is a shred of evidence that previously the majority of schools had higher CA average marks then the examination average marks which was a sign of non-correlation (Marongwe, 2012:21).

Table 4.4 Summary of continuous assessment tasks. (MoE, 2010:72)

Continuous assessment Grade 10				
	Term 1		**Term 2**	
Components	**Number & marks**	**Total**	**Number & marks**	**Total**
Practical Investigations	2 x 15	30	1 x 15	15
Projects			(1 x 30) ÷2	15
Topic tasks	2 x 10	20	2 x 10	20
Topic tests	(2 x 20) ÷2	20	(2 x 20) ÷2	20
End of term tests	65	(65 x 2) 130	65 x 2	130

Term marks		200		200
Weighted term marks	200 ÷2	100	200 ÷2	100

Table 4.5 Grade descriptors in the Junior Secondary Phase (Grade 8, 9 and 10). (MoE, 2010:70).

In the Junior Secondary phase, grades A-G and U (ungraded) apply as follows:

Grades	Mark range	Grade descriptor
A	80%+	**Achieved Basic Competencies exceptionally well**. The learner is outstanding in all areas in all areas of competency.
B	70-79%	**Achieved Basic Competencies very well.** The learner is highly proficient in most areas of competency.
C	60-69%	**Achieved Basic Competencies well.**
D	50-59%	**Achieved Basic Competencies satisfactorily.**
E	40-49%	**Achieved a sufficient number of Basic Competencies** to exceed the minimum competency.
F	30-39%	**Achieved the Basic Competencies needed to be considered competent.** The learner needs learning support.
G	20-29%	**Achieved the minimum number of Basic Competencies worthy of a grade.** The learner needs learning support.
U	0-19%	**Did not achieve the minimum level of competence.** The learner needs learning support.

The above grade descriptors are from the Old Physical science curriculum. A final grade is awarded to a learner after the CA mark is added together with the examination mark. The total CA mark is 70 while the examinations mark is 130. In other words, the CA counts 35% of the final grade while the examination takes up 65% of the final grade or promotional mark (MoE, 2010:71). Hence, the promotional marks consist of CA and examination marks. Learners who scored between 20 -29% can still be graded with a G as the least basic competencies worthy of a grade. Ungraded is at the range of 0 -19%.

Table 4.6 Grade descriptors in the Junior Secondary Phase (Grade 8 and 9). (MoEAC, 2015b:54)
In the Junior Secondary phase, grades A-E and U (ungraded) apply as follows:

Grades	Mark range	Grade descriptor
A	80%+	**Achieved objectives exceptionally well**. The learner is outstanding in all areas in all areas of competency.
B	70-79%	**Achieved objectives very well.** The learner achievement lies substantially above average requirements and the learner is highly proficient in most areas of competency.
C	60-69%	**Achieved objectives well.** The learner has mastered the specific objectives and can apply them in unknown situations and contexts.
D	50-59%	**Achieved objectives satisfactorily.** The learner's achievement corresponds to average requirements. The learners may be in need of learning support in some areas.
E	40-49%	**Achieved the minimum number of objectives to be considered competent.** The learner may not have achieved all the specific objectives, but the learner's achievement is sufficient to exceed the minimum competency level. The learner needs learning support in most areas.
U	0-39%	**Ungraded.** The learner has not been able to reach a minimum level of competency in the objectives, even with extensive help from the teacher. The learner is seriously in need of learning support.

The learners' achievements in the revised curriculum are shown in letter grades A- E, where A is the highest and E is the lowest grade while in **Table 4.5** A is the highest and G is the lowest. The range of the lowest grade in the old curriculum is between 20-29% while the revised curriculum is between 40-49%. In the same vein, the ungraded in the former is between 0-19% while in the

latter is between 0-39%. Suggesting that, learners need to work hard since the grading system has been upgraded. They will be required to master more competencies than before. The specific grid below indicates the approximate weighting allocated to each objective for both Continuous Assessments and the written Examination. **Table 4.7** shows the specific grid from the old curriculum while **Table 4.8** shows the one from the revised curriculum. The analysis is done for both grids in **Table 4.8**. below.

Table 4.7 Specific grid (MoE, 2010,73)

Assessment objectives for written examination	
Components	**Weighting**
Objective A Knowledge with understanding	30%
Objective B Handling information, application & solving problems	70%
Total	100%
Assessment Objectives for Continuous Assessment	
Components	**Weighting**
Objective A Knowledge with understanding	10%
Objective B Handling information, application & solving problems	40%
Objective C Practical (experimental and investigative) skills	50%
Total	100%

Table 4.8 Specific grid. (MoEAC, 2015b: 59)

Assessment objectives for written examination			
Components	**Weighting**	**Paper 1 Section A**	**Paper 1 Section B**
Objective A Knowledge with understanding	30%	9 marks	30 marks
Objective B Handling information, application & solving problems	65%	20 marks	65 marks
Objective C Practical (experimental and investigative) skills	5%	1 mark	5 marks

Total	100%	30 marks	100 marks
Assessment Objectives for Continuous Assessment			
Components			**Weighting**
Objective A	Knowledge with understanding		10%
Objective B	Handling information, application & solving problems		40%
Objective C	Practical (experimental and investigative) skills		50%
Total			100%

It was observed that the specific grid for the revised curriculum is detailed. It guides the person responsible for the examination setting. It stipulates how many marks are expected for each section in the written paper. The written paper covers all the three objectives which were not the case in the old curriculum in **Table 4.7**.

4.3 TEACHERS' EMPOWERMENT

I mentioned earlier in the chapter, the teachers' in-service training for 2016 and 2017 was financially planned to match the implementation of the revised grade eight and nine curricula, respectively. As stated in the literature review section, teachers require intensive training in curriculum implementation. It is, therefore, the Ministry of Education and its organs' prerogative to ensure in-depth in-service training or comprehensive staff development is offered. But what exactly is in-service training?

I draw from the British Dictionary; in-service training is defined as a training that is given to employees during employment. Osamwonyi (2016:83), explains that in-service training is any relevant courses and activities in which a serving teacher may participate in to upgrade his professional knowledge, skills, and capabilities in the teaching profession. It includes all forms of pedagogical components and training given to a teacher who is already on the job of teaching and learning to improve his/her professionalism. Ozer (2004: 91) states that Turkey recognised the in-service training of teachers as equally important as pre-service training. Thus, arrangements were made to construct the legal bases of the in-service training of teachers and

several regulations were made in line with National Laws (Civil Servants' Law No. 657 and the National Education Principal Law No. 1739) to plan and carry out the in-service training of teachers.

Furthermore, in-service training is one of the crucial elements in the proper implementation of any new curriculum and it needs to be budgeted for. It plays an essential role in successful education reform. Che Omar (2014:1), supports teachers' in-service training programme as it keeps teachers up to date on the most current concepts, thinking, and research in their field. Plans must be made to keep a budget for it as appropriately as possible. The fact that the 2016/17 in-service training took place, the concerned Ministry chose a value for money and as such valued capacity building as a lifelong learning principle. Teachers with a minimum pedagogical knowledge content in Physical Science can benefit from this training. It is in my considered opinion, that a budget includes all teachers who are to implement the revised physical science curriculum for grades eight and nine irrespective of years of teaching experiences if the teacher is a participant in the programme. The document mentioned above under section 4.2 dated 25.03.2014 which originated from the Ministry of Education served as a guideline, but it was silent about the period of training notwithstanding a program scheduled for three (3) days at the National level located in the Professional Development manual for MOE (2016:1) It implies that the in-service training is planned for only three days. The activities listed in the program are; identification and analysis of three main sections of the syllabus namely: part one and three of the syllabus and comparison of the old and new syllabi and identification of changes, analysing the grade eight and nine learning content, identifying challenging topics and developing sample activities, topic tasks, practical investigations, projects (continuous assessment/ formative assessment/ assessment for learning, integrating ICT and Pedagogical Content knowledge. I also noticed that there was a template for an attendance list used during the regional development workshop and it had also three days like the one in the program (MOE, 2016:37). In my opinion, planning was satisfactory.

Professor Peter Katjavivi, a founding vice-chancellor of the University of Namibia (UNAM) from 1992-2003 during his address at the Commonwealth Parliamentary Association, Westminster Hall, Palace of Westminster, London, United Kingdom on the 26th May 2016

stated that Namibia is among many countries around the world that need to strengthen student preparation in secondary schools in basic Science subjects, Mathematics, and English. My understanding is that the basic science subjects he referred to were partly physical science - Junior secondary phase the area mainly affected by the revised curriculum. Deliberately I am sure that one way of strengthening science subject content is to ensure that its curriculum is revised, which response to the current global development and standards.

He further talked about how teachers were empowered or retrained during school vacations and special training sessions. Whereas school holidays are regarded as one of the best times to train teachers who are already in the field and not engaged in teaching and lesson presentations , it might also be the time to have a break from a hectic school schedule and be with their beloved ones irrespective of whether they have families or not. Therefore, the timing might turn up to be inappropriate or inadequate to serve the purpose. Indeed, as Professor Katjavivi acknowledged in his speech, without staff development in advance as a prerequisite for such an undertaking, there was intense pressure on teachers and schools to transform in a brief period.

While many teachers are generally seen as adequately prepared for the task from the institutions of higher learning or through subject workshops either at national, regional or cluster level, observations have revealed that there are still a lot who require further training especially those who are implementing the new curriculum or novice, subject teachers. The Government of the Republic of Namibia pursed ongoing reform initiatives, intending to further strengthen and reform as well as transform the educational system in the country. Therefore, more policy frameworks such as Education Sector Improvement Programme (ETSIP), Training and Assistance for Namibian Teachers (INSTANT) programme, Mathematics and Science Teachers' Upgrading Programme (MASTEP) were initiated to benefit and train teachers to ensure that Namibia is on par with the outside world.

To enhance Continuing Professional Development (CPD), an in-service programme is needed as it fills the gap created by the changing society, curriculum reform as well as between pre-service training and teacher's effectiveness in the education sector. Subject teachers will continue experiencing changes in the curriculum. Henceforth, in-service training can be regarded as an

integral part of continuing teachers' pedagogical content knowledge. Osamwonyi (2016:85) stated, that no matter the efficiency of the pre-service training we give to teachers, there will necessarily be areas of inadequacies. The In-service training of teachers will continue to fill gaps such as library education services, evaluation techniques, etc.

4.4 TEXTBOOK

The ideal situation in Namibia is that every learner must have a textbook, but a teacher could also have a full class set which is used by all class groups to which a teacher teaches. The Curriculum and Learning Support Materials (CLSM) policy was developed in consultation with all stakeholders including the Ministry of Education officials and representatives of commercial publishing companies (MoEAC, 2015a:1). The policy goals are:

- *to streamline the future learning support material and curriculum review cycles, so that they can be synchronised and contribute not to waste any precious educational resources.*
- *to set up a balanced Public-Private-Partnership in which all the parties can conduct their activities fairly and efficiently.*
- *to provide a regular, timely and curriculum-compliant stream of learning support materials to Namibian learners and teachers.*
- *To spell out the principles that will underlie the new textbook evaluation and selection process in Namibia. (*Adopted from MoEAC, 2015a:1*).*

The evidence from this policy indicates that the Ministry organ which is NIED managed to set plans and organise "to-do-plan" as per policy goals. I noticed that there is a collation between the curriculum review cycle and learning support material evaluation and publishing forward plan. For example, the grade eight and nine curriculum review were done in 2014 and 2015 respectively and the Learning Support Materials procurement and Teacher training was done in 2016 and 2017 respectively while the implementation was done in 2017 and 2018, respectively. The policy further indicated that grade eight curriculum implementation evaluation was scheduled in 2018 while for grade nine scheduled in 2019 (MoEAC, 2015a:3).

From experience, the procurement and processing of textbooks for delivering have been a challenge. When I was a teacher, I witnessed a situation whereby textbooks were delivered a year late and could not be utilised in the intended period. The Namibian textbook life span is at least five years and the curriculum are assessed and reviewed also at least every five years.

Also, the introduction of the new curriculum-compliant books depends on the availability of enough lead-time for new Learning Support Materials development and willingness and the ability of Namibian publishers to respond to the publication demands of the new curriculum timetable (MoEAC, 2015a:13). Any delay in textbook delivery to schools is understandable as it can be affected by one of the reasons mentioned above.

It is was noticed also that the CLSM policy outlined a good system from the submission (publishers' textbook submissions), Technical evaluation (specified external labelling required), content and price evaluations and approving and announcing the evaluation Findings. These responsibilities are managed by persons and committees such as:

- *The Textbook Approval Committee*
- *The Evaluation Supervisor*
- *The Evaluation Administrator*
- *The Subject Evaluation Moderators*
- *The Subject Evaluation Panels* (Adapted from MoEAC 2015a:16).

In my view, this system represented an excellent step to ensure that authors and publishers responsible for developing the new generation of school textbooks and other instructional materials complied with the set standards.

To conclude document analysis, the CLSM stipulates clearly how to procure textbooks towards the end of a life span of the curriculum. For instance, textbooks can be procured wholesale during the phase and then the Textbook Catalogue is frozen for a period of five years to avoid publishers continuing to feed the market by submitting new manuscripts. During the freezing of the Textbook Catalogue, the new curriculum textbooks can then be evaluated for the scheduled year (MoEAC, 2015a:13). In my considered opinion, I find it a good practice, to place orders once for the whole phase.

4.5 DEMOGRAPHIC INFORMATION

The interviews that formed part of the empirical text for analysis in this study were conducted at schools and other suitable places identified by individual participants, tape-recorded and later transcribed. The standard questions consisted of fourteen semi-structured questions addressing issues such as teachers' experiences from the new curriculum induction and its implementation, how teachers were equipped, challenges and successes, curriculum implementation at both Private and Public schools.

In Chapter 2, as earlier alluded to, purposive sampling which falls under one of the major classes of sampling i.e. non-probability was employed to select the study participants. According to Tongco (2007:147), a purposive sampling technique, also called judgment sampling is the intentional choice of an informant due to the abilities and attributes the informant possesses. It is naturally used in qualitative research to identify and select powerful information cases for the most efficient use of available resources. Simply put, the researcher decides what needs to be known and sets out to find participants that can and are prepared to provide the information by virtue of knowledge or experience. In the context of this study individuals and institutions that were proficient and well-informed with the phenomenal interest were identified and selected. It is important to mention that participants' choice depended on their specific variables and characteristics which gave quality information on the study. It is therefore in this light, that six Physical Science teachers including Heads of Departments were selected to serve as participants of this study.

The participants selected were all Physical Science teachers busy with the implementation of grade eight and nine revised curricula at selected schools in Oshigambo circuit. I derived from their own experiences and interpreted their views on the implementation of the new curriculum. More so, after being granted permission to research by the Ministry of education, individual school principals were also requested to permit engagement with willing and able teachers, who then communicated their experiences and feelings in an articulate, expressive, and philosophical manner.

Permission from four schools (two Private and Public) was requested anticipating that if one teacher withdrew from my study then my progression was not going to be affected a lot. Schools selected were near the town where I lived. Though two were in a rural area the other two were in town. The ones in the rural area were near a tarred road and about twenty-seven km from my place of work. Among the four schools only one of them, a private school was established after independence, while the other three (one private and two public schools) were established more than fifty years ago, given the length of the period, they possess a rich historical background.

One striking challenge experienced was when one of the participants withdrew from the study. The particular participant kept on postponing the interview appointment after meeting the first day and the content in the consent letter explained to him. He asked me to provide him with the semi-structured interview questions so he could go through it; given that it was his first year to teach grades eight and nine. After a week and a few days, the participant informed me telephonically that I should find someone to fill the position. Some of the reasons given included:

- "I'*m setting the apparatus for practical examinations for other grades call me on Friday*"; "*Today I will not get time call me next week*" etc.

Challenges in time management were also experienced as I could not reach all the participants as per schedule. It took three weeks instead of one to complete the interviews. Some participants were busy invigilating and marking the local examinations while others participated in the marking of the national examinations or they were busy with their examinations. Every year around from September to November various institutions including the one for higher learning administer their examinations. As alluded to before, the interviews took place at different venues whereby five teachers were interviewed after two o'clock when the participants were done with normal teaching and learning, subject to the condition that any participation by teachers did not interfere with the normal teaching and learning process of the school. Further to that, the five participants interviewed, one was a Head of Department of science-related subjects. The intention behind was to interview four teachers and two heads of department, but the public school had no Head of Department. Since the sixth participant was on study leave, my hope to interview her was lost after I learned that her schedule was very tight and there was no single

chance at all. It was a surprise instead of when she suggested that the interview be conducted on a Sunday and at my place of work. Though it was a shock at first, it was all fine when she explained that she normally held private studies in the same place, and she had planned to go there that day.

In conclusion, all the schools selected had grades eight to twelve implying they offered Junior and Senior Secondary classes. The participants in the study had taught at the senior secondary phase and during the period of the study, they were either responsible for Junior Secondary phase (grades eight and nine) or both phases.

4.6 INTERVIEW QUESTIONS

The interview was conducted in English which is an official language and medium of instruction from grades four to twelve in all public schools and most of the private schools included the selected one in this study. The sample size was six Physical Science teachers who participated and interviewed. I got an assurance from all participants that they were conversant with English and the conversation would be done in English. The following interview questions were administered:

1. Tell me your experience from the new curriculum induction towards its implementation?
2. What do you experience about the new curriculum implementation concerning your daily planning?
3. How has the implementation changed your way of teaching?
4. How did you experience the suggested assessment procedures?
5. How has a new curriculum influenced the academic performance of your learners?
6. What new and creative ways have you utilised to ensure learners' performance?
7. Describe how you presently feel about the new curriculum?
8. What are some of the best practices you may want to share with other Science teachers?
9. What are the other factors, (not mentioned yet) which may have facilitated the implementation of the new curriculum?
10. What are some of the difficulties faced in the implementation of the new curriculum?
11. What support structures have the Ministry introduced to assist you to implement the revised

curriculum?

12. What measures has the school administration instituted to ensure the successful implementation of the revised curriculum?
13. What have you sourced to enable you and/ or your colleagues to implement the new curriculum?
14. What else do you feel is necessary to share with me about your experiences during the implementation of the new curriculum?

4.7 ANALYSIS OF INTERVIEW DATA

The audiotape was used to eliminate distraction and concentration during the interview, and it allowed me to take a fresh look at the interview data. Of the six teachers interviewed the longest session lasted for twenty-eight minutes while the shortest lasted for fifteen minutes with the majority ranging between twenty-two and twenty-six minutes. This implies that most of the participants shared much of their experiences on the implementation of the revised curriculum while a few had little to say when asked questions. All Participants made an effort to respond to all fourteen semi-structured questions that I set earlier, which were part of the document verified by the study supervisor and attached to my ethical clearance application (see appendix **E** for interview protocol. Apart from participants mentioned in the consent letter (see appendix **D** for consent to the participants), semi-structured questions were conducted as well as follow up questions that sought more clarity from participants.

The raw data was transcribed and presented in the form of themes that emerged from responses. It was observed that some of the themes emerged from all or some participants were not from the same question and some of the questions were answered partially before asked which made it difficult to present the data systematically, logically and consistently. However, I considered coding my data in simple terms so that I could directly access them. I applied pseudonyms in order to hide participants' identity. In this way, I was adhering to the ethical view of safeguarding personal integrity, privacy, confidentiality, and respect for the participants. Participants were coded as teachers A, B, C, D, E, and F. They appear as TA, TB, TC, TD, TE, and TF in this study.

As indicated earlier, data was collected through fourteen semi-structured open-ended questions that were prepared before interview sessions. The data has been presented in the form of six themes that summarise the content of the interview questions and that of the four research sub-questions. The themes are: Teachers induction, Planning using a blueprint, Support offered by Ministry and schools, Teachers' perceptions on the new curriculum, Assessment, Success, and Challenges. Themes were aligned in an orderly manner, corresponding to the four sub-questions of this study. In the following sections, I present and discuss the themes mentioned above emerging from semi-structured questions.

4.7.1 Teachers' induction

A Professional Development training manual for Junior Secondary Physical Science grade eight and nine was developed by NIED (2016) to facilitate teachers' inductions towards the revised curriculum whereby it was first rolled out with trainers of trainees.

An interview conducted with six teachers revealed that two teachers were inducted to implement the revised curriculum while the other four teachers were not. Those who attended the training workshop explained that the training was more of a comparison between the old and new curriculum, identifying recent changes in the revised curriculum. Additionally, they also identified challenging topics, discussed them intending to help one another to master the competencies. Che Omar (2014:3) supports the statement above, he explains that in-service training places teachers at the centre of any improvement effort. In this context, teachers increased knowledge, self-confidence, changed behaviour and attitudes and primaries wider content areas of their subjects through interactions. In addition, inducted participants stated that the training provided lasted for two days contrary to the norm. Ibrahim (2015:187) argues that in most cases, staff development activities are organised by an Institution, a corporate body, associations, or Government or its organs and normally last for a brief period.

One participant said this:

- *"We were inducted on the new curriculum and particularly about Physical Science, the training that we received may be described as inadequate, but it was kind of removing one content and putting one here and so forth"* (TB, 07/11/2019).

The above quotation implies that teachers who attended the training workshop believed that the training was not adequate for them as curriculum implementers. The activity was more of looking at what was added or removed in the revised curriculum in comparison with the old one. Furthermore, another respondent who took part in the induction felt the workshop brought to light topics that were omitted in the new curriculum and rearranged so that they match the follow up of concepts of actualisation. The participant felt that he did not experience many differences in the grade eight workshop simply because the content was slightly the same. However, there was an increase in the level of difficulties, for example, a topic like electricity where learners are asked to find current which not the case was in the old curriculum.

The other four participants were senior teachers but were not inducted and found themselves implementing the revised curriculum based on their past teaching experiences since they have taught senior grades (grades eleven and twelve) for a while. In a simple term, they were at least ahead in terms of understanding the content. One of the participants found that the revised curriculum had advanced and increased content levels in comparison to the old curriculum specifically grade nine. In another response a participant stated that the new curriculum played a pivotal role bridging a gap between Upper Primary and the Junior Secondary as it is focusing on equipping and preparing learners for the Senior Secondary level while other participants had these to say:

- "*It seems what used to be covered in grade ten is now covered in grade nine; That is what I have experienced, it is not a new content as such but just a switch of content. For teachers who taught grade ten before like myself, it won't be a major thing but for novice-teachers, it could be a concern", hence induction was very important as a support to teachers though not necessary for the new curriculum but also for other work that required a teacher to do* (TC, 12/11/2019).

- *"The new curriculum for grade nine is a bit challenging because learners just enter grade nine from grade eight and they encounter some new specific objectives which they*

> *had never been taught before and some of these objectives are equivalent to former grade ten, eleven or twelve. For me, though it is my first time to teach grade nine it is not that much hard for me to deliver the content to those learners because I experienced some of those topics in grades eleven and twelve"* (TE, 14/11/2019).

The above quote shows that most of the grade nine content was taken from the old curriculum for grade ten. Teachers who were exposed to grades ten to twelve old curriculum content understood the issues in the grade nine new curriculum and hence could not struggle with the content or specific objectives. As such, they valued induction as crucial and they felt support or training would assist them to deal with some issues which hampered successful implementation of the revised curriculum. In addition, a response from the TE indicated that even the knowledgeable teachers of Physical Science as a subject experienced a challenge in the curriculum implementation even though their lightweight in the workshop was necessary.

On the other hand, TE believed that there was a need to be trained on how to deal with learners who had never been introduced to advanced content level in grade eight but they must meet advanced concepts and content in grade nine. TC felt remorseful for the novice teachers who might find themselves implementing the revised curriculum without any training. As alluded to in Chapter 3, when curriculum reform is being implemented, so many things happen at the same time, though one cannot easily establish a strict sequence of changes that are likely to take place, one can observe some logical connections like; grading cannot function effectively without a curriculum that expresses common achievements or expectations for groups of learners.

Both Private and Public-school teachers had similar occurrences concerning the revised curriculum induction. Good experience of this is when some of the Public-school, as well as Private school teachers, were not trained on the implementation of this curriculum. The statements below were from two such teachers, TD was from a public school while TF was from a private one. These participants had these to say respectively:

- *"I have just given these classes: grade eight and nine after people have already conducted the workshop and there was been no any other workshop called for teachers*

teaching these grades for the first time or new teachers recruited this year (TD, 12/11/2019);

- *"I did not undergo any workshop since I started this year because the workshop had already happened in 2016 and 2017. So, up to now, I have not undergone any training which had to do with the new curriculum"* (TF, 14/11/2019).

Both participants (TD and TF) explained that the training was conducted in the absence of subject teachers of grades eight and nine. From these expressions, it is clear that there was no additional training organised for new teachers. Their language intonation indicated that they were expecting at least a follow-up training or a refresher course for teachers implementing the revised curriculum.

4.7.2 Planning using a blueprint

Most of the teachers interviewed acknowledged that the content for grades eight and nine had changed to a bigger magnitude compared to the old one. They applauded the Physical science scheme of work provided which is user-friendly in terms of implementation because the core of it related to what the world was and when delivering lessons most of the things they encountered or did in class involved day to day life and they were hands-on. Teacher B decried how the content and objectives including lesson planning had changed and as such there was a need to study the Physical Science syllabus for grades eight and nine and understand it thoroughly. Teachers' efforts and concentration had been shifted from the old way of doing things. For instance, grade nine in the old curriculum was not really valued or treated analogously with the grade ten but now considerable energy has been diverted to grade nine lamented one participant.

In another interview, one participant had this to say:

- *"I have to plan a lot of work because the scope, so to say, the scheme of work for grade nine covers only two terms. In the past, we normally covered grade nine work in three terms. Therefore, this time around more activities are planned for one lesson. With regards to grade eight, we have learners from grade seven and the content in grade eight*

is of a bigger magnitude compared to their level. I have to break down all the concepts into simple terms to help them catch up" (TA, 05/11/2019).

Teacher A looked at the workload of grade nine and discovered that to complete the scheme of work and implement the revised curriculum as prescribed in the Ministry's organ planning needed to change the status of quo. The implication is that more activities need to be covered within a brief period. The same teacher demonstrated that one needed to understand learners' background knowledge to prepare them for the new concepts. Pre-teaching key concepts that are essential to facilitate understanding and when learners know them, they usually focus more of their energy into understanding the text. This is a signal that anyone preparing to teach needed opportunities to learn how to examine contexts for prominent features to decide how to move ahead with effective teaching. So, the art of teaching learners is a complex decision-making process and dependent on individual knowledge and skills.

Yet in another interview session the participant responded in this way:

- *"The implementation of the new curriculum has required me to prepare thoroughly, sometimes I have to search for information from the internet to plan my daily lesson for grades: eight and nine. This new curriculum has given me much work when it comes to planning. There are topics shifted from grade nine to eight or from grade ten or eleven to grade nine and this has made the syllabi to be exceptionally long and more time is thus required for learners to master new concepts and digest the information that I gave them. I have always to do proper planning and preparation to ensure that at least my learners pass or achieve the objectives that were planned for in the revised curriculum*. (TD, 13/11/2019).

It is clear Teacher D focused on setting a good standard and linear pattern of lesson planning, instruction, and assessment. There is also an element of professional knowledge and professional development where this teacher had tried to gain content knowledge using technology. Materials posted on web pages for subject content or assessments or other curriculum resources are of immense help to teachers to create conduced learning environment that develops learners' abilities to use words to understand content/ texts. In other words, this teacher tried to improve learners' learning and well-being by ensuring that learners performed and excelled well.

In an additional interview Teacher F had this to say:

- "*If you are not resourceful you can just try to be innovative and plan with some resources around the school or with resources that are available. I can say in short, our daily planning for this new curriculum is something easier for the facilitators and the teachers"* (TF, 14/11/2019).

Bearing in mind that there is a wide range of teaching and learning materials available in and outside of the school environment. Teacher F was careful to say that a teacher cannot claim that there no adequate resources or just to depend on prescribed textbooks, but one needed skill of using available materials in teaching and learning processes. As some of the participants mentioned that the new syllabus is more detailed as it suggested activities and resources in and outside the schools, this can be understood to be another factor which made lesson preparation easier.

The new curriculum changed teachers' planning at the public and private schools to a certain degree. In this regard, teachers have intensified their lesson planning and preparation in both grades eight and nine but more strengthened for grade nine because this class group has to write semi-external examinations and their performance exposes the school to the outside community. The sentiment above was supported by one respondent who said the following:

- *"You have to put enough effort and energy to get extra sources, that is to say, outsourcing extra resources from outside just to make sure that your grade nine learners do much better than before because now they are no longer considered as internal people. They are very crucial to the school because their performance exposes the nature of the school to the outside world"* (TC, 12/11/2019).

To a larger extent, the implementation of the new curriculum has changed a lot of things especially in teaching and learning of grades eight and nine Physical Science, specifically grade nine. As teacher D explained that she found herself planning to teach on Saturdays to have enough time with her learners because the syllabus is too long, and one needs to take time to cater for individual differences within learners. Teacher F observed that planning for a new curriculum makes him and other teachers move away from chalking writing on the chalkboard

and talking. Curriculum implementation requires intensive learner involvement, it is more of learner-centred and it requires a humanistic approach because learners learn and participate more in day to day lessons.

4.7.3 Assessment

The majority of the participants did not encounter problems with grade eight assessment criteria. They vowed that they knew the components assessed in the previous curriculum and there was no radical change in the assessment criteria in comparison to the old curriculum. However, they spotted a noticeable change which was in the grading system example; the learner's summative achievement in the specific objectives had to be shown in letter grades A to E, where A is the highest and E the lowest grade for learners achieving minimum competency level. Ungraded (U) ranged between 0-39 percentages while in the old curriculum it ranged between 0-29 percentages. The letter grading F is not in the new curriculum grading system, as E symbol is the lowest grade ranging between 40 to 49 percentages.

Five participants felt that it was difficult to assess all objectives in the grade nine syllabus since the Continuous Assessment (CA) was only harvested from two terms (terms one and two).

Table 4.3 in this chapter summarises CA tasks for grade nine in the revised curriculum and whatever would be done in the third term cannot add up to CA and eventually to the final grade marks (MoE, 2015:57). Some of the participants' emphasis was on the implementation of the curriculum which in teachers' assessment is characterised as formalities in **Table 4.3** rather than on the routine practices of teachers' classroom assessment, which at least go beyond the formalities.

- On the assessment theme, the participants interviewed said the following: *"I think the assessment of grade nine was supposed to spill into the third term because this is where we have a lot of revision with learners as well as a lot of tests. So, assessing them just in the first and second terms I feel their time has been shortened because most of these learners are moving from grade eight. There is a lot of disturbance within the term, but*

the proper assessment is the record we have in term two. This is where one can see the exact performance of the learners up to the third term" (TF, 14/11/2019).

- *"They suggested that we can give two tests per term; two topic tests for terms: one and two in grade nine. We only assess for terms one and two, the assessment is too minimal it is supposed to be increased to three topic tests and two topic tasks per term, and the practical investigation can remain two tests. Otherwise, if we stick to this format, we will not expose our learners to effective assessment"* (TC, 12/11/2019).

Teachers were focusing on the formal requirements of recording and reporting achievement. They interpreted the summative assessment in such a way that. He/she would only give two tests per term because **Table 4.3** suggested so. But surprisingly some teachers felt assessment should be minimised in term one and have more formal assessments in term two and three. This implies that more teaching and less assessment in term one. However, Assessment considered an on-going component of the curriculum, designed to evaluate the effectiveness of the instruction and to keep track of continuous progress in the learning process (MoE, 2018:3).

4.7.4 Success and Challenges

Three participants out of six participants and who were both from public schools expressed the shortage of textbooks as a challenge. Some class group learners did not have a single textbook while some had a set of copies that the teacher took to the class during the lesson. Textbooks and instructional materials are the primary tools that teachers use to organise their lessons and make content knowledge and skills available to learners. These provide learners with access knowledge, and learners can only learn knowledge and skills that they have access to (Oakes & Saunders, 2002:5). In addition, learners get content and text they are expected to learn from textbooks and teachers focus their instruction on the materials included in the textbooks they use. Concerning the topic under discussion the participants interviewed had this to say:

- *"The main challenge is textbooks; I am teaching grade eight and no single textbook for all three classes in a total of about 96 learners. For grade nine I have textbooks which are more than twenty that I have to share among learners that are just kept by the teacher"* (TA, 05/11/2019)

- *"Textbooks are not enough learners are sharing the textbooks, it is not only in physical Science teachers experience this challenge but many teachers at school. Now the ratio for sharing textbooks is around four to one"* (TC, 12/11/2019).

In this chapter under section 4.4, I indicated what the Ministry of Education through its organ NIED does planning. The ideal situation in Namibia is that every learner must have a book, but a teacher could also have a full set of books which are used by all class groups which the teacher attends to. Therefore, the ministry developed a Curriculum and Learning Support Materials (CLSM) policy in consultation with all stakeholders including representatives of commercial publishing companies (MoE, 2015:1). The policy strives to provide learning materials to every child especially textbooks and create a good and smooth chain of procuring and dispatching textbooks to schools.

Though textbooks are a central tool in almost all grades and the main resource for teachers and learners to implement a curriculum and give "being" to the subjects taught in the classroom, TA and TC participants, maintained that the ministry did not reach the one learner: one textbook ratio yet. It has been observed that the ratio is either four learners to one textbook or a class set of learners to no textbook at all. The notion of a textbook ratio is central to achieving academic success as researchers worldwide indicate that textbooks are universal and generally used in schools and also in classrooms.

Teacher B observed that some materials previously used in the old curriculum become obsolete. And some of the materials which the school thought it had been not at their disposal. It was observed that the school of the respondent is a private one, and of good financial standing, it procured most materials at the eleventh hour, unlike public schools whereby stringent measures and bureaucratic tendencies are a bottleneck in the role out.

In another public school, Teacher C explained that he experienced problems with diagrams. The new curriculum had more themes that had diagrams, yet the problem of textbook scarcity prevailed. The fact that teachers have to rely on a duplication machine to print out copies enough for all learners and unreliable logistical conditions given financial uncertainty poses yet another challenge to curriculum implementation.

Other challenges experienced by Teachers E (from a public school) and F (from a private school) apart from textbooks were a teacher to learner ratio and laboratory resources.

- According to the former, one class had a ratio of about 1:45. Data in Education Management Information System (EMIS) showed that about thirty-nine schools (two percentages) in 2017 have more than forty learners per teacher (MoE, 2017:3). The learner: teacher ratio (LTR) in Namibian schools has not changed significantly according to the 2016 Fifteenth School Day Survey.

Physical Science is a practical subject, the assessment objectives for written examinations and CA, objectives B and C in Table 4.8 indicates that seventy percent of written examinations and ninety percentage of CA require learners to demonstrate experimental skills and handling of the information or data from the practical investigation.

- Teacher E experienced a shortage of practical materials and in some cases, materials were not available to carry out practical lessons.

- Teacher F stated that learners were not involved much in practice because the school science laboratory was under construction instead of learners carry out the practical investigations, the teachers end up doing a demonstration in the classroom.

This implied that learners were not getting enough time and chances for just putting hands-on experiments and work on themselves.

From my experience, most schools I visited during the Rossing Foundation mobile laboratory outreach programme were without or with quite a few practical materials and equipment.

- Teacher D says, *"Sometimes you want to conduct practical but there are no materials and equipment"*.

During the same programme, I had also discovered that some rooms designed for laboratories were converted to computer laboratories while some were used as a fixed classroom for a specific class group. This made other grades not to access the laboratory at all or to utilise it minimally.

Furthermore, the time factor was also one of the challenges experienced by some of the participants**.** Teacher D says,

- "*Time is not enough, that is what made me teach sometimes on Saturday extra lessons or in the afternoon during study time lessons for Physical science for grades eight and nine".* On the contrary, one participant out of six had a different view about the content of the new curriculum versus teaching time. The respondent contended that:

- "At *least they have measured content versus the time of teaching we were able to finish teaching and assessing on time, although I know some teachers will say there is no enough time but if you compare it to the content I think it is something that one can comment ... the content suit the teaching time unlike in the previous context".* (TB, 07/11/2019)

Looking at the above observation, it is was clear that the time constraint mentioned was for teaching or lesson delivery. There is an attempt for the participant to clarify whether the Saturday and afternoon classes were for remedy and the response is clear that there was minimal or sometimes no remedial teaching was conducted. In simple terms, not enough time was given to remedial teaching in the form of afternoon classes. The respondent, therefore, experienced a problem in implementing the curriculum within the stipulated time allocated to Physical Science lessons and the implication is that the syllabus content was too long. The respondent needed to complete all the specific objectives before the end of the year examinations. In other words, this participant was more concerned about teaching to finish the syllabi before the final assessment without really minding about the quality as examinations were regarded as the pushing factor.

4.7.5 Support offered by Ministry and schools

To find out whether the ministry and schools put up a structure or measures to assist teachers to implement the revised curriculum at schools, the following questions were poised to the participants:

- What support structures have the Ministry introduced to assist you to implement the revised curriculum?

- What measures have the administration at this school instituted to ensure the successful implementation of the revised curriculum?

From the information gathered, different responses were eminent, and it comes out clearly that the ministry conducted only one workshop for each grade i.e. one workshop for grade eight in 2016 and another one for grade nine in 2017. Most of the participants referred to the Physical Science syllabus, the scheme of work, and the very few copies of textbooks given to schools as the only support the got in addition to the workshop offered. Several attempts were made to find out how teachers just received one copy from the Ministry and why they were given only one during or immediately after the training workshops. It was discovered that these copies given were not from the Ministry but different publishers like Namibia Publishing House, Pearson, Cambridge University Press (NAMCOL), and others as a marketing strategy after the Ministry finalised the textbook evaluation and informed the publishers which textbooks were up to standard. Following this, different publishers or their "middleman" went around schools sometimes displaying and giving schools or teachers their products during training workshops which became teachers' reference books.

Furthermore, the data collected from some participants revealed that no structure or further assistance was offered to the participants after the training workshops held in 2016 and 2017, respectively. Although the curriculum and learning support materials review policy of the MoE (2016), has a provision of curriculum evaluation by the Ministry the following year after implementation, the information gathered from participants interviewed indicated that there has never been an evaluation whatsoever.

Below are some of the views given by the participants:

- *"I cannot remember any ministerial support structure"* (TC, 12 /11/2019),
- *"I think colleagues who attended the workshop benefitted a lot, this kind of workshops or seminars can play a very important role in teachers' support, maybe it must be something which should continue so that everyone is equipped"* (TF, 14/11/2019).

As seen above, participants wanted to see an arrangement whereby the MoE followed a support plan for teachers regularly and ensured that all teachers involved in curriculum implementation benefited.

With regards to teacher support from school administration, the interview revealed that school management monitored teachers' work by conducting class visits and checking the assessment record. One of the teachers stated:

- *"There are measures in place for monitoring our work. Our administration does carry out class visits and monitor our assessment record just to see if our teaching and learning are assessed fairly"* (TA, 05/11/2019).

The respondent also clarified that after the class visits, the feedback is given the same day. This was one of the measures taken to support teachers in the implementation of the revised curriculum.

Another respondent had this to say:

- "*The principal engages with almost every teacher just to hear the challenges and difficulties experienced regarding the implementation of the curriculum daily. He invites teachers to what he termed 'Performance dialogue' whereby he/she expects teachers to raise their concerns, challenges and to see what could be done to address them"* (TC, 12/11/2019)

The above statement showed how principals tried to get primary information from teachers to render proper support on the curriculum implementation. During the 'performance dialogue', teachers brought to the principal and management members' attention that teaching materials and equipment were not enough if not available. They also applauded the management for their efforts to avail photocopying and duplicate machines to supplement textbooks and other materials that helped learners to perform better. Farther Interview with participants revealed that schools tried all the best to assist teachers acquire teaching and learning materials, but the biggest challenge was a financial constraint.

Another participant noted that:

- "*As far as I am concern, we share our challenges but there is little the school is doing and we understand it is money issue"* (TC, 12/11/2019).

To re-enforce the above, one participant had this to say:

- "*We organise our staff development workshops at school to discuss ways and methods of implementing the revised curriculum. So, that is what our administration has done so far so that those who are equipped can also share the information with other staff members"* (TF, 14/11/2019).

Furthermore, most participants enlightened that their schools got extra support from the Non-Governmental organisation, Rossing Foundation. They got support in practical investigations and pedagogical content knowledge in Physical Science.

Some of the participants had these to say:

- *"I attended a workshop which was in Rossing Foundation funded by Stellenbosch University Department of Science, the training was more on practical investigations, an example of building an electrical circuit"* (TA, 05/11/2019).
- *"We got support from the local institutions, I can mention of Rossing Foundation. When we need certain materials or certain concepts that we do not understand we normally use to take learners or invite the educators from that institution to come and helps us"* (TE, 14/11/2019).
- "*We also borrow items that we do not have for some practical activities from Rossing Foundation. We use them and return them, sometimes as a teacher when you find that the experiment you wanted to carry out the following day and the materials are missing then you rush to Rossing Foundation"* (TC, 12/11/2019).

The support given to schools and the Ministry at large by Rossing Foundation officers were mostly attributed to relativity between the regions, schools, the professionals and Educational stakeholders in the communities. It was discovered that participants from the visited schools understood the role of the Rossing Foundation in the Education fraternity. Therefore, they were part of the beneficiaries of its free Educational programme.

4.7.6 Teachers' perceptions of the new curriculum

During the interviews with the participants, five of them had a positive feeling about the revised curriculum. They felt that the curriculum was good, and it had a lot of information, and most of the learners would be well polished at the end of Junior Secondary level. This does not imply that the RPSC is a finished and perfect product which should be cast in stone, but this was an indication that teachers accepted and appreciated the RPSC. There would be no curriculum implementation without critical criticism as Aloovi (2016), Iipinge and Kasanda (2013) and Negumbo (2016) reveal that the curriculum change and implementation is and still poses a challenge in the education sector in many countries, including Namibia. Teacher C expressed the following view about the new curriculum.

- "*I think it is a good thing, I have no problem with the new curriculum because it is trying to address the reality like now the grade nine learners after completing, they go to grade ten and eleven and if they just want to do this minor course they are free to go and register at tertial institutions unlike before when everyone is forced to remain in school until grade twelve but now the grade twelve is reserved for those who want to go for major courses which are the good thing. And another thing about the new curriculum, our learners are choosing their field of study at a very young age that provides them enough time to focus in one area of study and become successful in it. The choice for a field of study is done in grade nine but before they used to choose in grade eleven which was too late for them. In general, the new curriculum is fine"* (TC, 12/11/2019).

Teacher E relates how essential and beneficial the new curriculum would be to the learners that would go through this revised curriculum. This respondent had this to say:

- "I *feel it is good, thus most of the learners will be well polished when they enter the senior grades. They may not encounter problems that some of them wanted to go up to grade twelve where the curriculum, let me say the syllabus is for higher grade only. So, it may not be a problem for them at all. I think it will help these learners"* (TE, 14/11/2019).

The participants considered the revised curriculum as also a learning curve for both teachers and learners. As much as learners were introduced to the new concepts and specific objectives, some teachers too, felt they needed to expand their pedagogical content knowledge before or during the implementation of the revised curriculum. Teacher A related how:

- *"I have a positive feeling; I'm fine with it. Because personally, it gives me personal growth. Where I find myself struggling sometimes, I feel I should study or register a different course about the subject so that here I can be well equipped when it comes to mastering the content. So, I am in a good relationship with the new curriculum. It gives me a better attitude towards the subject. It also boosts my knowledge about the subject because I am learning new things"* (05/11/2019).

Although Teacher D felt the revised curriculum was good, she considered these learners were not ready to handle more variable and complex puzzles in the revised curriculum. Below is Teacher D's views:

- *"I think the new curriculum is good as it has a lot of information and I want learners to explore more. This syllabus is really good it has many topics that will help our learners grow professionally. They are now developing into knowing what Physical Science is. I do not have any problem with this new syllabus it is fine. The problem that I had is only that learners were not ready. At least we should prepare them first to be ready for the newly revised curriculum on Physical Science. But the curriculum is okay it is fine"* (TD, 13/11/2019).

It was understood that the above respondent felt that the capacity of the minds of grades eight and nine learners was not ready to respond to or endure challenging concepts or to cope with the magnitude of the revised syllabus. It meant that learners needed a learning step beyond, and teachers desired to employ some approaches and strategies before they were introduced to a revised curriculum. The respondent's perception left me to think that learners were not well equipped from the previous grades and it was not necessary that they did not reach the 'Junior Secondary maturity stage' or because some participants' perception was that the syllabus was too long.

Teacher A affirmed:

- "*What I have seen is a content gap to what Junior and Senior Secondary learners have been introduced to; the new concepts which have no build-up or progression from the early grades. I will take an example of the gap that I have seen between grade nine and grade ten and grade eleven, perhaps I will not talk about grade twelve. In grade nine they are doing Physical Science while in grade ten they are introduced to chemistry and Physics. As an example, the concept vector in physics has no reference to anything that is being done in grade nine and also in grade eight there is a kind of huge gap. It is the only thing that makes the Junior Secondary Syllabus not well aligned to Senior Secondary. Even the chemistry is like you came up with a very big burden on top of the kids. I feel there is still something needed to be done between Junior and Senior Secondary"* (TB, 07/11/2019).

It is worth noting that teacher B's perception of the revised curriculum was about the gap between Junior and Senior Secondary curricula. However, this study focuses on the Junior Secondary curriculum only. Nevertheless, his views were pivotal and in agreement with scholars such as Carl (2012), Kirk & Macdonald (2001), and Negumbo (2016) who argue that teachers voices are often excluded in curriculum development.

One of the participants felt that the revised curriculum made teaching easier as learners were well fully engaged in their learning while a teacher acted as a facilitator. He contended that current teachers were different from old teachers. The view was old teachers were more of instructors as opposed to current teachers who assumed more the role of facilitators. This participant was coded teacher F and had this perception:

- *"The involvement of learners in teaching and learning makes me just facilitate how they learned and did. It appears as if we are discovering learning. You just prompt a question and they find out themselves. They experiment on their own and as a facilitator, I sum up with them and they start picking interest in what they found out on their own. I feel very comfortable with this new curriculum"* (TF, 14/11/2019).

One of the participants looked at the assessment and spoke about the current standard i.e. the final grades which determined whether a learner was successful or not. Below is Teacher D views:

- *"I think Assessment is too high at 40% for a mere E symbol. Perhaps 35% would be appropriate for an E. Sometimes learners are struggling for a score of just 40% because they just left grade seven and Physical Science as a subject is still new to them. It means they need time so that at least they know what they are required to do. The reason I find grade eight assessment not encouraging learners to pick interest in the subject of Physical Science."* (TD, 13/11/2019).

4.8 CHAPTER SUMMARY

In this chapter, document analysis and demographic information for teachers was highlighted. Gadamer's viewpoint was used in document analysis. For Gadamer, understanding is not a forthright occurrence, but it is an incidence whereby one reason from information (data, material, evidence, news) and meaning made and grasped from participants or texts by ways of thinking and analysis of language usage.

Policies, circulars and other documents about the new and old curriculum were analysed and revealed that there were several changes to be experienced at Junior Secondary phases such as the Junior Secondary Certificate National Examinations, timetabling and assessment. The Junior Secondary Certificate National Examinations for grade ten phased out and saw into force the introduction of semi-external examinations to be written at the end of grade nine as from 2018 to ensure consistency of learning standards across the board.

The time allocated in the old and new curriculum to Junior Secondary Physical science for a seven-day cycle was different. For the old curriculum, it was forty-five minutes per period while in the new curriculum it is forty minutes per period. This implies that in the old curriculum a subject took three hours and forty-five minutes (3 h 45 min) in a seven-day cycle while for the revised curriculum it takes three hours and twenty minutes (3 h 20 min) in a seven-day cycle. The same changes can also be observed in the assessment.

As indicated earlier the demographic information highlighted, originated from six participants who were coded as teachers A, B, C, D, E, and F and appeared as TA, TB, TC, TD, TE, and TF in this study. More information was harvested and grouped under six themes listed as follows: Teachers induction, Planning using a blueprint, Assessment, Success and Challenges, Support offered by the Ministry of Education, schools and teachers' perceptions on the new curriculum.

CHAPTER 5

KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In chapter 4, I analysed the data from policies, circulars and documents relating to the new and old curricula and interview transcripts. I analysed the former and latter sources to understand the teachers' experiences of the implementation of the newly revised physical science curriculum for grades eight and nine. The meanings and interpretations of the themes that occurred were also established. In the next part, I draw some conclusions from the themes that emerged.

The themes were in line with the main research question of this study, which is: How do grades eight and nine physical science teachers at both private and public schools in Namibia experience the implementation of the RPSC? The sub-questions were: What are the successes and challenges of implementing the Junior Secondary phase (grades eight and nine) physical science curriculum at both private and public schools? How are the physical science teachers equipped to implement the Revised Science Curriculum? Is there a difference in implementing the new Physical Science curriculum between a private and a public school? and How do the physical science teachers (PSTs) articulate their experiences of the implementation of the newly Revised Physical Science curriculum?

This chapter starts with a discussion of the findings from the literature review, followed by an analysis of policies and circular documents, and the last part is an analysis of the interview transcripts. The chapter ends with some recommendations and a list of possible future research areas, followed by some concluding remarks.

5.2 FINDINGS FROM LITERATURE REVIEW

Several of the pieces of literature that I reviewed were focused on the experiences of teachers concerning the implementation of a new curriculum in general. Some of the Namibian researchers (Aloovi, 2016; Haimbangu, 2018; Iipinge & Kasanda, 2013; Kasanda, 2004; Negumbo, 2016; Nghishongwa, 2017) focused either on performance improvement, teachers' support, challenges experienced in science subjects, and underperformance of learners. Although there was no specific paper or study that focused on teachers' experiences on the implementation of grade eight and nine "Newly Revised Physical Science" curriculum, a lot of relevant extracts from the work of the above-mentioned scholars were drawn into this study.

The study conducted by Nghishongwa (2017) shows that the teaching and learning of physical science, or rather the implementation of its curriculum, was hampered by poor or no laboratory equipment at some schools or by overcrowded classrooms. This made some participants conclude that the biggest barrier to the roll-out of the new curriculum could have been external factors, as mentioned by Nghishongwa (2017).

The Ministry of Education (MoE, 2010a) reminds us that one of the important aspects of science subjects in a school curriculum is that science education focuses predominantly on teaching the subject-matter content in preparation for high-stakes examinations, while other aspects of scientific literacy, such as inquiry skills and the understanding of the nature of scientific knowledge, ought to develop in the learners indirectly. However, the literature shows that this approach has not been effective in helping learners' and teachers' understanding of the nature of science.

5.3 FINDINGS FROM ANALYSIS OF POLICY DOCUMENTS

In this section, some of the policies, circulars and documents relating to the implementation of the Physical Science revised curriculum are analysed. The following four main parts were identified and used as focal points to form the basis of the conclusions:

- Timetabling,

- Assessment,
- Teachers' empowerment, and
- Textbooks.

5.3.1 Timetabling

As presented in the old (2010) and new (2016) documents of the national curriculum for Basic Education, the former had more time allocated to teaching lessons, namely three hours and forty-five minutes (3 h 45 min) in a seven-day cycle, while the latter has only three hours and twenty minutes (3 h 20 min) in a seven-day cycle. There is a difference of about 25 minutes per seven-day cycle. The reduction in teaching time does not match with the increased number of specific objectives that are to be covered in the new physical science curriculum. Instead of more time being allocated to the new curriculum, less was given.

5.3.2 Assessment

From the newly revised physical science syllabi for grades eight and nine (2016 and 2017), I came to learn that the specific objectives stipulated what must be implemented and suggested some pathways to be followed for successful curriculum implementation. Furthermore, I observed that the curriculum reform strived to enhance the improvement of findings, thus adjusting the assessment component which also plays a significant role regarding learner performance.

There is a change in the assessment in the new curriculum for grade nine, whereby teachers are expected to harvest learner marks within the first two school semesters, while in the old curriculum it covered all school semesters. Another significant observation was the change in the grading system, whereby the learner's summative achievement in the specific objectives had to be shown from letter grades A to E, while the old curriculum had letter grades A to F. "A" remains the highest grade in both curricula, and E the lowest grade, ranging between 40 to 49 percent for learners achieving a minimum competency level in the new curriculum. Ungraded

(U) ranged from 0 to 39 percent, while in the old curriculum it ranged from 0 to 29 percent. The letter grading F is not in the grading system of the new curriculum.

5.3.3 Teachers' empowerment

As mentioned by Osamwonyi (2016) and discussed in Chapter 4, in-service training is a pivot for any relevant courses and activities in which a serving teacher should participate to upgrade his or her professional knowledge, skills and capabilities in the teaching profession. It was found in the study that the Ministry of Education conducted a training workshop on the new physical science curriculum for grade eight and nine in 2016/2017. I also discovered that more policy frameworks, such as the Education Sector Improvement Programme (ETSIP), Training and Assistance for Namibian Teachers (INSTANT) and the Mathematics and Science Teachers' Upgrading Programme (MASTEP), were initiated to benefit and train teachers to ensure that Namibia is on par with the outside world.

Another remarkable observation from the literature reviewed (see Che Omar: 2014, MoE, 2015a; Osamwonyi, 2016; Ozer, 2004) is that in-service or pre-service training is essential, thus policy frameworks and regulations were created to support teachers' empowerment. Further, they corroborated that school holidays were regarded as one of the best times to train teachers who were already in the field and not engaged in teaching and lesson presentations, although it might also be the time to have a break from a hectic school schedule and be with their beloved ones, irrespective of whether or not they have families. Contrary to these findings, teachers' training in 2016/2017 was not done during the holidays but during class hours, to the effect that teaching and learning were disrupted for about three days.

5.3.4 Textbooks

I discovered that the Ministry of Education, in conjunction with representatives of commercial publishing companies, had developed a Curriculum and Learning Support Materials (CLSM) policy. The policy aimed to align the curriculum review cycle (i.e. five-year plan) with the learning support material evaluation and publishing forward plan (i.e. five-years plan). After the

curriculum review was done, the Learning Support Materials Procurement and Teacher Training took place the following year. Thereafter, implementation was followed by evaluation a year later (MoEAC, 2015a:3). Besides, it was stressed that the introduction of the new curriculum-compliant books depended on the availability of enough lead-time for new CLSM development, and the willingness and ability of Namibian publishers to respond to the publication demands of the new curriculum timetable (MoEAC, 2015a:13). Therefore, any delay in textbook delivery to schools was understandable, as it could be affected by one of the situations mentioned above.

5.4 FINDINGS FROM INTERVIEW DATA

The interpretation or break-up of the data from the interviews highlights some of the key findings that I present in this section. The following categories arose during the study and formed the basis for the conclusions:

- Teachers' induction,
- Planning using a blueprint,
- Assessment,
- Success and challenges,
- Support offered by Ministry and schools, and
- Teachers' feelings about the new curriculum.

5.4.1 Teachers' induction

Key findings

- Findings in this study revealed that the induction of the new physical science curriculum was inadequate, and there was no teacher workshop administered for teachers teaching grades eight or nine for the first time, or new teachers recruited after the workshop had already happened in 2016 and 2017.
- Furthermore, the findings show that four participants out of the six were not inducted or trained to implement the new grade eight and nine curriculum.

- The experienced teachers had taught senior grades before, and in the absence of training they will not experience major problems, since the new content was shifted from either grades ten, eleven or twelve.

Discussion

The ministry deemed in-serve training as crucial for curriculum implementation, therefore in its circular dated 25.03.2014, the teachers' in-service training was mentioned and it was suggested that a fund must be made available to cater for the training. However, the findings in this study revealed that more teachers from the sample taken were not trained, and that these teachers were either from a public or a private school.

In the literature review, I viewed in-service training as a way of developing knowledge, ideas, skills and attitudes and enhancing the profession of teachers to face challenges and implement reform or transformation in education. I contend that many of these teachers were not retraining, reskilling, or updating their knowledge. The development of staff and the identification of individual teachers, which Osamwonyi (2016) defined as a deliberate and continuous process that improves the quality of education, were completely unmet.

It is proper to mention that senior teachers who have dealt with the grade ten, eleven and twelve curricula before will not experience major problems in implementing the new curricula. However, the language used, namely that they "won't experience major problems", implies that teachers still experienced a couple of challenges. Mahara (2016) warns that untrained teachers often lack the theoretical knowledge and the familiarity with principles informing the implementation change, i.e. curriculum changes.

5.4.2 Planning using a blueprint

Key findings

- The findings show that teachers' efforts and concentration on daily planning had changed, especially for grade nine. The scheme of work for grade nine now covered only

two terms, while it covered three terms in the past. More activities are planned for one lesson and extras like teaching on Saturdays has been thrown in.

- Furthermore, teachers searched for information from the internet to plan their daily lessons for grades eight and nine. The study revealed that the new curriculum overloaded planners, because there were topics that shifted from grade nine to eight or from grade ten or eleven to grade nine. This alone made the syllabi exceptionally long and time consuming for the learners to master the new concepts. For grade eight, the content was of a bigger magnitude compared to their level, as they had just come from grade seven. As such, concepts were broken down into simple terms to help learners catch up.

Discussion

Interestingly, the number of topics taught in the old and the new physical science curriculum were the same, but the scheme of work had to be treated differently. There were even significant differences between the number of specific objectives in the old and new curriculum (MoE, 2015:10). Both new curricula had more components to be covered, hence teachers opted to teach on Saturdays. My contention is that the number of components to be covered should match the time given in the subject's policy.

5.4.3 Assessment

Key findings

- The study indicated that teachers felt it was difficult to assess all objectives in the grade nine syllabus, since the continuous assessment (CA) was only harvested during the first two terms (i.e. term one and two). Participants insisted that the proper assessment is the record for term two and three, since in term one there is always a lot of disturbance and uncertainty on the side of the learners.
- The study further indicated that some teachers felt assessment should be minimised in term one and that they should have more formal assessments in terms two and three.

Discussion

When teachers experience a problem to do reasonable assessments or satisfy specific objectives, then Marongwe's (2012) argument, that in assessment there is evidence of what the learner has done during the period it is gathered, recorded and interpreted for use in decision-making, is partially correct. My contention is that a maximum number of assessments should be done to make an informative or justified curriculum reform. The Directorate of National Examinations and Assessment (DNEA) should harvest proper assessment findings that properly cover specific objectives and, when analysed by curriculum custodians, they should arrive at better decisions.

5.4.4 Success and challenges

Key findings

- The study found out that some private schools had the necessary number of textbooks per class group. This was attributed to their good financial standing, liberal measures and fast tracking by top management during the rollout, in addition to having the needed money.
- The study reveals that participants from public schools experienced a shortage of textbooks or acquired very few textbooks and some class groups did not get textbook copies. No evidence was found to explain why some class groups did not have even a single textbook. It was further confirmed that some class groups had a four-to-one ratio for sharing textbooks. A further analysis disclosed that private schools procured most materials at the eleventh hour, unlike public schools, and learners had enough textbooks.
- The study discloses some factors affecting curriculum implementation, such as lack of materials and equipment to conduct practical, overcrowded classes, and the time allocated to cover all the specific objectives in the physical science lessons for grades eight and nine.

Discussion

Interestingly, private schools seemed not to be struggling with resources, as stated in the literature chapter. Chakrabarti and Peterson (2009) claim that private schools enjoy many advantages, ranging from pedagogical approaches to resource management. They stress that they these schools capitalise on their greater resources to translate dollars into sound outcomes in the form of value addition.

The findings about public schools above substantiate earlier findings by Alabi (2014:269), who found out that ineffective implementation of the new curriculum was caused by a shortage of relevant textbooks. Textbooks play a pivotal role in achievement. Researchers worldwide have proven that textbooks are universal and are generally used in all schools and in classrooms. Therefore, textbooks are a central tool in almost all grades and the main resource for teachers and learners to implement a curriculum and give "being" to the subjects taught in the classroom. More importantly, Kasanda (2004) explains that Namibian teachers who were trained for two years after independence in a Mathematics and Science Extension Programme (MASTEP) were able to implement the International General Certificate of Secondary Education level (IGCSE) curriculum. This was because they were given textbooks and other materials, which made their preparation and implementation of the curriculum easier.

Several studies (Alabi, 2014; Makunja, 2016; Nghishongwa, 2017) support my findings, namely that a lack of materials and equipment for conducting experiments, overcrowded classrooms and so forth are what hamper curriculum implementation. The provision and distribution of the required materials enhances curriculum implementation in schools. Materials such as textbooks, instructional guides, desks and laboratories complement the teaching and learning objectives and ensure the effective curriculum implementation of any of the pedagogic programmes. So, implementing curriculum without these resources makes it difficult to achieve the chief objectives and lesson conformation.

5.4.5 Support offered by the Ministry and schools

Key findings

- The study shows that there was only one workshop for grade eight in 2016 and another one for grade nine in 2017. Teachers referred to the physical science syllabus, the scheme of work, and the very few copies of textbooks given by publishers to schools or training venues as part of their marketing strategy as the only support offered by the Ministry, in addition to the workshops.

- The study also found that schools supported their teachers by encouraging them to raise their concerns and challenges. This interaction was even given a name, "performance dialogue". Also, schools organised "staff development workshops", during which they discussed ways and methods of implementing the revised curriculum. Teachers with curriculum knowledge or who were equipped during the training shared information with other staff members.

Discussion

As revealed in the literature review, teachers need adequate knowledge, skills and competences from proper training (Mulkeen, 2006). Although a teacher might be a novice, diverse support is required in the form of regular workshops, subject conferences and teaching aids, the ministry opted to offer a once-off three days training. Teachers' support is an on-going process and, to avoid haphazard curriculum implementation, what is needed is continuous professional development, in-service training, interpersonal relations, and other relevant forms of teacher-based support (Aloovi, 2016).

There was evidence that schools tried to support their teachers through subject meetings and other platforms. Although public schools had trouble acquiring a reasonable number of textbooks, schools had done much to ensure photocopiers and paper were available and teachers could prepare note bundles for the learners. It is therefore imperative to mention that. In addition, most teachers who participated in this study were experienced ones. However, the Ministry should seriously ensure that content knowledge, pedagogical knowledge and pedagogical content knowledge is acquired by teachers to advocate 'progressive' pedagogies.

5.4.6 Teachers' perceptions

Key findings

- The study revealed that teachers had positive feelings about the new curriculum, they felt it was superb, with a lot of advanced information. They also felt that, if implemented thoroughly, then most of the learners would be well equipped and polished at the end of the Junior Secondary level.

- The study further revealed that the new curriculum was a learning curve for both teachers and learners. Some teachers felt it was high time to register a course about a subject so that they would be well equipped when it comes to mastering the content.
- Although all teachers were happy with the content of the new curriculum, they insisted that the capacity of the minds of grades eight and nine learners was not ready to respond to or cope with the magnitude of the revised syllabus.
- The study also shows that teachers felt that the three days training was not enough, neither a follow up training nor extra support was done, evaluation nor implementation monitoring system was employed at the participants' schools.

Discussion

Although the findings say that teachers were happy with the introduction of the physical science curriculum for grades eight and nine, the Ministry should not take it for granted that all is well. The success of the curriculum implementation would principally depend on the effort and impact of the Ministry of Education on the teachers and stakeholders in general.

As stated in the introduction, Carl (2012) argues that change cannot be successful if teachers focus only on classroom instruction. My view is that teachers need to come out of the 'shell' by finding relevant courses that would enhance the pedagogical content knowledge if they are to perform philosophical wonders, i.e. articulating and defending their own views on curriculum issues.

Given that grade eight and nine learners were not regarded as capable enough to tackle the magnitude of the new curriculum, is a clear sign that learners were not well-equipped in the Senior Primary grades. Hence, they are ill-equipped to match the Junior Secondary level or the scope of the revised curriculum.

5.5 RECOMMENDATIONS

In this section, I offer recommendations to the Ministry of Education, Arts and Culture (MoE); the National Institute for Educational Development (NIED); the regional professional

development officials; the school principals and head of departments; both experienced and novice teachers in Namibian schools; the corporates responsible for social accountability and school governance; and other educational stakeholders such as parents. The offered recommendations are meant to inform the effective implementation of the Newly Revised Physical Science curriculum for grades eight and nine in Namibian schools:

- Teachers should receive extensive training. An appropriate programme should be identified to train teachers during the holidays. This programme should be the same as the "Training and Assistance for Namibian Teachers" (INSTANT) programme. It does not need to be like the "Mathematics and Science Teachers" Upgrading Programme (MASTEP), because no qualification offering is needed.
- The Ministry may assent to allocate funds specifically for teachers' professional development. It is a known fact that not all teachers were trained during the initial workshop, and novice teachers might misunderstand the curriculum and ultimately implement it wrongly.
- The Namibia National Teachers' Union (NANTU) and other unions may consider deliberating on the importance of professional development activities and show their commitment to teachers and government officials. It is much more likely that the government (MoE) would buy in and commit to the suggested teachers' professional development activities if the Union was involved.
- The MoE is recommended to issue the National Physical Science policy guidelines without delay. This is because the national subject policy guidelines for school curricula is the document that makes provision for well-organised and orientated programmes regarding the teaching and management of subjects.
- The MoE may consider ordering equipment and materials needed for practical investigations and distribute them to schools through chief education officers in the regions. First, a thorough inventory is needed to find out how well schools are stocked. Learners can only achieve scientific literacy through understanding scientific processes, their nature, and having the ability to apply such scientific thinking and skills through experimental work. Scientific literacy is indispensable today.
- The MoE, through the Regional Directorate of Education, are encouraged to introduce a "Physical Science Symposium". At that conference, different academic scientists,

researchers and research scholars can present and share their experiences and research findings on all aspects of physical science.

- Regions may consider organising subject symposiums at which teachers who teach the same subjects come together to correctly interpret all the basic competences in the curriculum and prepare notes, assessments and practical investigations under the guidance of a senior advisory teacher or subject expert from an institution of higher learning or non-governmental organisation;
- All schools offering practical subjects, specifically physical science, physics and chemistry, should have laboratories as a prerequisite; and
- Teachers should integrate information technology (IT) in their teaching. In that vein, therefore, experienced teachers should make physical science tutorial videos on different topics or experiments and share them with other teachers in regions.

5.6 LIMITATIONS OF THE STUDY

From the review of the literature, I observed that most studies about public and private schools were either about the learners' performance or the teachers' perception of teaching early literacy in English, or school choice between public and private schools, or curricular implementation in other fields or in general. This means that all the studies I saw did not outline the differences between a public and a private school while implementing the science curriculum, but rather spoke about curriculum from different perspectives. For example, Madsen (1996) deliberated on private and public-school partnerships, while Alabi (2014) and Aloovi (2016) wrote about curriculum implementation in other fields, not physical science.

The time factor was another constraint in this study. I applied for the ethics clearance on 25 July 2019, but it was approved only on 5 November 2019. This meant that it took the Research Ethics Committee (REC) about three months to approve my application. As a consequence, I suffered a time lag before embarking on my research, as I could not proceed without clearance.

Another hindrance was that I could not reach all the participants as scheduled. It took three weeks instead of one week to complete the interviews. Some participants were busy invigilating,

marking local or national examinations, busy with their examinations, or had discontinued participating in this project.

In a nutshell, whereas my study focused on the implementation of the physical science curriculum at a public and a private school, it did not take into consideration factors affecting curriculum implementation.

5.7 SUGGESTIONS FOR FURTHER STUDIES

The experiences shared by the participants, the analysis of policies and circular documents, and the data analysis in this study shaped my recommendations for the further investigation of the implementation of the physical science grades eight and nine curriculum. Also, I maintain that one would gain more insight and understanding of the teachers' experiences of the implementation of the new physical science curriculum for grades eight and nine in Namibian schools based on the suggestions listed below. There is a need for:

- a study that analyses the learners' academic performance in the new curriculum for grades eight and nine
- a comparative study that investigates teachers' experiences at public and private schools on the implementation of the new physical science curriculum for grades eight and nine
- a study to investigate the Education Ministry's perspective on the relevance of semi-external examinations written at the end of grade nine as from 2018
- a study to investigate the best practices supporting teachers to implement the curriculum successfully; and
- a study to investigate the factors affecting curriculum implementation

5.7 CONCLUSION

The curricula in Namibia have undergone several reforms and transformations since independence. The first curriculum transformation cycle started in 1991, and the full curriculum transformation and implementation from grades one to twelve was completed at the end of 1999. Furthermore, the physical science curriculum for grades eight and nine is revised every five

years. The sixth revision for grade eight was implemented in 2016, while that for grade nine was implemented in 2017.

The literature revealed how complex curriculum reforms or transformation processes are due to insufficient preparation and support for already apprehensive teachers. Some of the previous curriculum reforms or transformations were accompanied by large-scale professional development projects focusing on junior and senior secondary school teachers. However, my findings present a different scenario, as there was no intensive in-service training.

Although only a few teachers were trained to implement the new curriculum, the Ministry of Education developed and implemented different circulars and policies to support teachers in service training and in their pedagogical development. It is noted that the Ministry of Education documents and syllabi indicate that science plays a significant role and, for this reason, occupies a key place in the education system. Therefore, it is important and apposite for a large number of serving physical science teachers to participate in any training that will upgrade their professional knowledge, skills and of course competence in the teaching profession.

Only a few studies focused on teachers' experiences in general. Needless to say, the successes and challenges discovered by former studies were similar to the ones experience by the physical science teachers in this study. Returning to the problem statement, I put forward that the absence of extensive support from senior education officers (previously known as advisory teachers) and NIED staff – the custodians of the revised curriculum – can be among the factors that hamper the successful implementation of the curriculum. Classroom overcrowding due to staffing norms in the Ministry of Education could be also a problem in the case of the Oshikoto region. The evidence from both the literature and the data findings presented similar reasons.

In addition, it was evident that public and private schools differ in terms of resources available and their environment. But, despite these differences, all schools used their macro- and micro-level to achieve curriculum implementation efficacy, despite the observed factors that hinder one hundred percent implementation. Teachers applauded the new curricula and felt strongly that

learners would be well equipped and polished at the end of Junior Secondary level. What is required is better understanding, interpretation and implementation efficacy.

In conclusion, I must say the journey was not merely academic, but it also offered me a great opportunity to learn and understand what methodology in research means, and while travelling on the ‘academic writing bridge’, this made appropriate/supporting arguments a bit clearer. The comments and questions from my supervisor on the research proposal and this project have been momentous in such a way that they have sharpened me in relation to most issues that I struggled with or in which I lacked rigorous thinking. Lastly, I have learnt more about the content of curriculum implementation and about other scholars in this field. This research matured and enhanced my abilities and motivated me to the extent of wanting to do more studies on teachers and educators, as well as other stakeholders in curriculum implementation in the education fraternity of Namibia, which I find essential.

REFERENCE LIST

Alabi, F. O. 2014. Implementing the New Senior Secondary School Curriculum for the realization of the objective of Entrepreneurship Education in Ondo State, Nigeria. *European Scientific Journal*,10(10)[Online]. Available: http://eujournal.org/index.php/esj/article/view/4778.

Aloovi, O. 2016. Biology teachers' lived experiences of the Namibian Senior Secondary Certificate (NSSC) curriculum. Unpublished MEd thesis. Stellenbosch: Stellenbosch University.

Amukugo, E. M. 1993. *Education and politics in Namibia: Past trends and future prospects*. Windhoek: New Namibian Books.

Andrews, R. 2003. *Research Questions*. London: MPG Books, Bodmin, Cornwall.

Aoki, T. 2005. Teaching as indwelling between two curriculum worlds (1986/1991). In W. Pinar & R. Irwin (Eds.), *Curriculum in a new key: The collected works of Ted T. Aoki*. Mahwah, NJ: Lawrence Erlbaum, 159-165.

Aveyard, H. 2010. *Doing a literature review in health and social care: A practical guide*. (2nd Ed.). Berkshire: Open University Press.

Bautista, A., Wong, J. & Gopinathan, S. 2015. Teacher professional development in Singapore: Depicting the landscape. *Psychology, Society & Education*, 7: 311-326.

Bevir, M. & Rhodes, R. A. W. 2002. Interpretive theory. UC Berkeley [Online]. https://escholarship.org/uc/item/0bk3k2nq

Bowen, G. 2009. Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2): 27-40.

Brennen, A. M. 1999. *Philosophy of education*. Course work, Northern Caribbean University, Jamaica.

British Dictionary. 2008. *Cambridge advanced learners dictionary* (3rd Ed.). Cambridge, UK: Cambridge University Press.

Brook, A. 2012. What is education?: Re-reading metaphysics in search of foundations. *New Blackfriars*, 94(1049): 32-49.

Burgoyne, J. G. & Reynolds, P. M. 1997. *Management learning: Integrating perspectives in theory and practice*. London: SAGE Publications.

Carl, A. E. 2012. *Teacher empowerment through curriculum development*: *Theory into practice* (4th Ed.). Cape Town: Juta.

Chakrabarti, R. & Peterson, P. (Eds). 2009. Perspectives in public-private partnerships in education. *Journal of School Choice International*, 3: 319-323.

Chakrabarti, R. & Peterson, P. (Eds). 2009. *School choice international: Exploring public-private partnerships.* Cambridge, MA: MIT Press.

Chambliss, J. J. 2009. Philosophy of education today: *Educational Theory*, 59(2): 233-250.

Che Omar, C. M. Z. 2014. The need for in-service training for teachers and its effectiveness in school. *International Journal Innovation Education and Research*, 2(11): 1-9.

Crease, R. P. 1997. Hermeneutics and the natural sciences. *Man and World*, 30(3): 259-270.

Cronin, P. Ryan, F. & Coughlan, M. 2008. Undertaking a literature review: a step-by-step approach. *British Journal of Nursing*, 17(1): 38-43.

Curren, R. R. (Ed). 2007. *Philosophy of education: An anthology*. Malden-USA: Wiley-Blackwell Publishers.

Daher, M., Carré, D., Jaramillo, A., Olivares, H. & Tomicic, A. 2017. Experience and meaning in qualitative research: A conceptual review and a methodological device proposal. *Forum: Qualitative Social Research*, 18(3): 62-85.

Darling-Hammond, L. 2010. Teacher education and the American future. *Journal of Teacher Education*, 61(1-2): 35-47.

Dawson, C. 2009. *Introduction to research methods: A practical guide for anyone undertaking a research project*. Oxford: How To Books Ltd.

Deleuze, G. & Guattari, F. 1994. *What is philosophy?* New York: Columbia University Press.

Fan, S. & Fielding-Wells, J. 2016. *What is next in educational research?* Rotterdam: Sense Publishers.

Fay, B. (1975). *Social theory and political practice*. London: George Allen and Unwin.

Feak, C. B. & Swales, J. M. 2009. *Telling a research story: Writing a literature review*. Michigan: University of Michigan Press.

Fox, I. 1985. *Private schools and public issues: The parents' view*. London: MacMillan.

Fullan, M. 1993. *Change forces probing the depths of educational reform*. London: The Palmer Press.

Furlong, J. & Lawn, M. eds. 2011. *Disciplines of education – Their role in the future of education research*. London: Routledge.

Goodson, I. 1993. *School subjects and curriculum change: Studies in curriculum history*. London: The Palmer Press.

Gray, S. L., Scott, D. & Mehisto, P. 2018. *Curriculum reform in the European school: Towards a 21st century version*. London: Springer International Publishing.

Haimbungu, M. 2018. Practices that help grade 12 learners to improve their performance in Physical Science: A case of Omusati Region, Namibia. Unpublished Master's thesis. Windhoek: University of Namibia.

Hamed, T. 2016. *Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research*. *International Journal of Academic Research in Management*, 5(2): 18-27.

Harrell, M. C. & Bradley, M. A. 2009. Data collection methods: *Semi-structured interviews and focus groups*. Santa Monica, CA: RAND Corporation.

Hart, C. 1998. *Doing a literature review: Realising the social science research imagination*. London: SAGE Publications.

Harvey, L. 1990. *Critical social research*. London: Unwin Hyman.

Hicks, S. 2009. *Introduction to the course: Philosophy of Education* (digital video). https://www.youtube.com/watch?v=ml95d6kJ4kc&list=PL4D15CEFD8356A3D3&index

Hirst, P. H. & Peters, R. S. 1998. Education and philosophy. In: P. Hirst & P. White (Eds.), *Philosophy of education: Major themes in the analytic tradition, Volume 1, Philosophy and Education*. London and New York: Routledge, 27-38.

Hoy, C. D. 1978. *The critical circle: Literature, history, and philosophical hermeneutics*. London: University of California Press.

Ibrahim, A. I. 2015. In-service staff training programme for effective science teaching. *American Journal of Educational Research*, 3(2): 185-190.

Iipinge, S.M. & Kasanda, C.D. 2013. Challenges associated with curriculum alignment, change and assessment reforms in Namibia. *Assessment in Education: Principles, Policy and Practice,* 20(4): 424-444.

Jacobs, A. H. M. 2012. A critical-hermeneutical inquiry of institutional culture in higher education. Unpublished PhD dissertation. Stellenbosch: Stellenbosch University.

Johnson, A. P. 2010. *Making Connection in elementary and middle school social studies* (2nd Ed). Three views of teaching: transmission, transaction, and transformation. London: SAGE Publications.

Jesson, J. L., Lacey, F. M. & Matheson, L. 2011. *Doing your literature review: Traditional and systematic techniques*. London: SAGE Publications.

Kabende, M. M. 2015. A conceptual analysis of institutional culture at a Namibian university. Unpublished MEd thesis. Stellenbosch: Stellenbosch University.

Kandumbu, M. 2005. Exploring education policy transformation in Namibia in terms of democratic change. Unpublished master's thesis. Stellenbosch: Stellenbosch University.

Kasanda, C. & Uugwanga J. S. 2018. Ministry of Education: *Reform Forum Journal for Educational Reform in Namibia*, 26(1): 3-60. Okahandja: NIED.

Kasanda, C. D. 2004. Teacher education in Africa: Why the Mathematics and Science Teacher Extension Programme works in Namibia. Paper presented at the AAI Colloquium on Accelerating Skilled Workforce Development in Africa, 20-23 June, Kalahari Sands Hotel, Windhoek, Namibia.

Kliebard, H. M. 2002. *Changing course: American curriculum reform in the twentieth century*. New York, Teachers College Press.

Koinzer, T., Nikolai, R., & Waldow, F. 2017. *Private schools and school choice in compulsory education*. New York: Springer VS.

Kirk, D. & MacDonald, D. 2001. Teacher voice and ownership of curriculum change. *Journal of Curriculum Studies*, 33(5): 551-567.

Laverty, S. N. 2003. Hermeneutic phenomenology and phenomenology: A comparison of historical and methodological considerations. *International Journal of Qualitative Methods*, 2(3): 21-35.

Le Grange, L. L. L. 2017. *Education research: Study guide*. Stellenbosch: SUN MeDIA.

Lim, P. & Pyvis, D. 2012. How Singapore junior college science teachers address curriculum reforms: A theory. *Issues in Educational Research*, 22(2): 127-148.

Linge, D. E. 1976. *Philosophical hermeneutics*. London: University of California Press.

Madsen, J. 1996. *Private and public-school partnerships: Sharing lessons about decentralization*. London: Falmer Press.

Mahara, J. H. 2016. Teachers' experiences of the implementation of the curriculum and assessment policy. *Africa's Public Service Delivery and Performance Review*, 4(3): 371-388.

Makunja, G. 2016. Challenges facing teachers in implementing competence-based curriculum in Tanzania: The case of community secondary schools in Morogoro Municipality. *International Journal of Education and Social Science*, 3(5): 30-37.

Maree, K. 2016. *First steps in research* (2nd Ed). Pretoria: Van Schaik Publishers.

Marongwe, A. D. 2012. An enquiry into the formative and summative assessment procedures, and perceptions thereof, of grade 10 Mathematics teachers. Unpublished MEd thesis. Grahamstown: Rhodes University.

Marples, R. 2010. The aims of education. *International Encyclopedia of Education*, 2(9): 103-107.

Matheson, D. 2015. *An introduction to the study of education*. London: Routledge.

McGregor, S. L. T & Murnane, J. A. 2010. Paradigm, methodology and method: Intellectual integrity in consumer scholarship. *International Journal of Consumer Studies*, 34(4): 419-427.

Ministry of Education, Arts and Culture (MoEAC). 2015a. Curriculum and Learning Support Materials Review Cycle Policy. Okahandja: NIED.

Ministry of Education (MoE). 2010a. *Physical Science Syllabus. Junior Secondary Phase*. Okahandja: NIED.

Ministry of Education (MoE). 2010b. *National Curriculum for Basic Education*. Okahandja: NIED.

Ministry of Education (MoE). 2009. *National Subject Policy Guide For Physical Science*: *Grades 8-12*. Okahandja: NIED.

Ministry of Education, Arts and Culture (MoEAC). 2015b. *Physical Science syllabus. Junior Secondary Phase*. Okahandja: NIED.

Ministry of Education and Culture (MEC). 1993.*Toward education for all*: *A development brief for education, culture and training*. Windhoek: Macmillan Publishers.

Moore, T. W. 2010. *Philosophy of education: An introduction*. New York: Routledge Taylor & Francis.

Mouton, J. 2001. *How to succeed in your Master's and Doctoral studies: A South African guide and resource book*. Pretoria: Van Schaik.

Muhammad, M. 2012. The Role of Curriculum Scholars in Current Curriculum Debates: *International Journal of Academic Research in Business and Social Sciences*, 2(9): 87-97.

Mugo, F. W. 2002. *Sampling in research*. Retrieved from Social Research Methods: http://www.socialresearchmethods.net/tutorial/Mugo/tutorial.htm

Mulkeen, A. 2006. Teachers for rural schools: A challenge for Africa. Working paper. Biennale on education in Africa (Libreville, March 27-31, 2006). Association for the Development of Education in Africa. Available: www.adeanet.org/portalv2/adea/biennial-2006/.../B2.2. mulkeen-en.pdf

Naukushu, S. T. 2016. A critical theory enquiry in the development of number sense in Namibian first year pre-service secondary mathematics teachers. Unpublished PhD thesis. Stellenbosch: Stellenbosch University.

Negumbo, T. A. N. 2016. An investigation into underperformance in Social Studies Grade 5-7 in selected Namibian primary schools. A case study. Unpublished MEd thesis. Stellenbosch: Stellenbosch University.

Nghishongwa, F. N. 2017. Challenges faced by senior secondary school learners when preparing science fair projects in the Omusati educational region, Namibia. Unpublished Master's thesis. Windhoek: University of Namibia.

Ngololo, E. 2012. Continuing professional development needs analysis report [Online]. www.unam.edu.na/sites/default/files/cpd-regional1/cpd-needs-analysis-report.pdf

Njabili, A. F. 2004. *Adopting an international system to meet national goals: A regional perspective.* Windhoek: John Merneit Publishers.

Nxawe, L. 2002. Can critical theory contribute towards enacting democratic policy implementation in schools? Unpublished MEd thesis. Stellenbosch: Stellenbosch University.

Oakes, J. & Saunders, M. 2002. *Access to textbooks, instructional materials, equipment, and technology: Inadequacy and inequality in California's public schools.* https://escholarship.org/uc/item/4ht4z71v

Oliver, P. 2012. *Succeeding with your literature review: A handbook for students*. London: Open University Press.

Osamwonyi, E. F. 2016. In-service education of teachers: Overview, problems and the way forward. *Journal of Education and Practice*, 7(26): 83-87.

Ottevanger, W., Van den Akker, J. & De Feiter, L. 2007. *Developing science, mathematics, and ICT education in Sub-Saharan Africa*. Washington, DC: The World Bank.

Ozer, B. 2004. In-service training of teachers in Turkey at the beginning of the 2000s. *Journal of In-Service Education*, 30(1): 89-100.

Paterson, M. & Higgs, J. 2005. Using hermeneutics as a qualitative research approach in professional practice. *The Qualitative Report*, 10(2): 339-357.

Pershing, J. L. 2002. Using Document analysing and evaluating Performance. *International society for performance improvement*, 41(1): 36-42.

Phillips, D. C. 2014. *Encyclopedia of educational theory and philosophy*. London: SAGE Publications.

Porter, S. E. & Robinson, J. C. 2011. *Hermeneutics: An introduction to interpretive theory*. Cambridge: Wm. B. Eerdmans Publishing Co.

Randolph, J. J. (2009). A guide to writing the dissertation literature review. *Practical Assessment, Research & Evaluation*, 14(13): 1-13.

Reed, S. K. 1999. *Word problems: Research and curriculum reform*. New Jersey Mahwah: Lawrence Erlbaum.

Rhoades, E. A. 2001. Literature reviews: *Volta Review*, 111(3): 61-71.

Ridley, D. 2012. *The literature review: A step-by-step guide for students*. London: SAGE Publications.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1): 68-78.

Schurink, W. 2003. Qualitative research in management and organisational studies with reference to recent South African research. *South African Journal of Human Resource Management*, 1(3): 2-14.

Schlebusch, G. & Thobedi, M. 2004. Outcomes-Based Education in the English Second Language Classroom in South Africa. *The Qualitative Report*, 9(1): 35-48.

Schroeter, L. 2004. The limits of conceptual analysis. *Pacific Philosophical Quarterly*, 85: 425-453.

Shanyanana, R. N. 2014. Examining the potential of an ethics of care for inclusion of women in African higher education discourses. Unpublished PhD thesis. Stellenbosch: Stellenbosch University.

Sloan, A. & Bowe, B. 2014. Phenomenology and hermeneutic phenomenology: The philosophy, the methodologies and using hermeneutic phenomenology to investigate lecturers' experiences of curriculum design. *Quality & Quantity*, 48(3): 1-22.

Smith, S., Booth, K. & Zelewski, M. 1996. *International theory: Positivism and beyond*. New York: Cambridge University Press.

Srivastava, A. K. 2014. *Basics in education*: *Textbook for B. Ed. course*. New Delhi: National Council of Educational Research and Training.

Tan, H., Wilson, A. & Olver, I. 2009. Ricoeur's theory of interpretation: An instrument for data interpretation in hermeneutic phenomenology. *International Journal of Qualitative Methods*, 8(4): 1-15.

Tashakkori, A. & Teddlie, C. (Eds.). 2003. *Handbook of mixed methods in social & behavioral research*. Thousand Oaks, CA: Sage.

Teichman, J. & Evans, K. C. 1991. *Philosophy: A beginner's guide* (1st edition). New Jersey: Wiley-Blackwell.

Tematie, L. F. 2004. The lived experiences of teachers in a particular multilingual context. Unpublished MPhil thesis. Stellenbosch: Stellenbosch University [Online]. http://scholar.sun.ac.za/handle/10019.1/16504

Thanh, N. C. & Thanh, T. T. L. 2015. The interconnection between interpretivist paradigm and qualitative methods in education. *American Journal of Educational Science*, 1(2): 24-27.

Thorne, S. 2000. Data analysis in qualitative research. *Evidence-Based Nursing*, 3(3): 68-70.

Tongco, M. D. C. 2007. *Purposive sampling as a tool for informant selection*. http://hdl.handle.net/10125/227

Tse, N. C. 2013. Identify different concepts and definitions of 'curriculum' and show how they can be related to what you do as a teacher in the classroom. http://www.eduhk.hk/aclass/

Vandermause, R. K. & Fleming, S. E. 2011. Philosophical hermeneutic interviewing. *International Journal of Qualitative Methods*, 10(4): 367-377.

Van Wyk, B. 2004. A conceptual analysis of transformation at three South African universities in relation to the National Plan for Higher Education. Unpublished PhD dissertation. Stellenbosch: Stellenbosch University.

Waghid, Y. 2013. *Educational research methodology*. Stellenbosch: SUN MeDIA.

Walker, P. & Wood, E. 2010. *Physical science experiments*. New York, NY: Facts on File.

Wellington, J. 2015. *Educational research: Contemporary issues and practical approaches* (2nd Ed). London: Bloomsbury Publishing.

Whiting, L. S. 2008. Semi-structured interviews: Guidance for novice researchers. *Nursing Standard*, 22(23): 35-40.

UNAM, 2011. University of Namibia prospectus centre for external studies 2011. Centre for External Studies. Windhoek: Namibia

UNESCO.2006. World Data on Education: Country Basic information, http://www.ibe.unesco.org/fileadmin/user_upload/archive/Countries/WDE/2006/SUB-SAHARAN_AFRICA/Namibia/Namibia.htm

UNESCO. 2010. World Data on Education: Données mondeales de l'éducation Datos Mundiales de Educación VII Ed. 2020/2011. http://www.ibe.unesco.org/en/document/world-data-education-seventh-edition-2010-11.

Yin, K. R 2009. *Case study research: Design and methods* (4th Ed.). Thousand Oaks, CA: Sage Publications.

APPENDIX

Appendix A – REC Ethics clearance – Stellenbosch University

UNIVERSITEIT STELLENBOSCH UNIVERSITY

NOTICE OF APPROVAL

REC: Social, Behavioural and Education Research (SBER) - Initial Application Form

5 November 2019

Project number: 11054

Project Title: Physical Science Teachers' Experience of the Junior Secondary Revised Curriculum for Grades 8 and 9, Oshikoto Region, Namibia

Dear Mr Jona Pohamba Shiwomwenyo Mushelenga

Your REC: Social, Behavioural and Education Research (SBER) - Initial Application Form submitted on 4 November 2019 was reviewed and approved by the REC: Humanities.

Please note the following for your approved submission:

Ethics approval period:

Protocol approval date (Humanities)	Protocol expiration date (Humanities)
5 November 2019	4 November 2022

GENERAL COMMENTS:

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: Humanities, the researcher must notify the REC of these changes.

Please use your SU project number (11054) on any documents or correspondence with the REC concerning your project.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

FOR CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD

Please note that a progress report should be submitted to the Research Ethics Committee: Humanities before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary)

Included Documents:

Document Type	File Name	Date	Version
Data collection tool	bd7_Information on Revised Curriculum Ministry of Education 2014 updated on 29th August 2014 (1)(1)	25/03/2014	number not indicated
Data collection tool	speech_at_commonwealth_16	26/05/2016	not indicated
Research Protocol/Proposal	Mushelenga MEd proposal 22 Oct 2018	22/10/2018	Final
Budget	Tentative budget to my study	22/10/2018	Final
Default	ACCESS LETTER REQUESTING PERMISSION TO CONDUCT RESEARCH At school 1 (AutoRecovered)	02/04/2019	current
Default	Letter from Prof	02/04/2019	1
Default	Directorate of Education Letter	04/04/2019	current
Data collection tool	INTERVIEW PROTOCOL QUESTIONS SEMI-STRUCTURED QUESTIONNAIRE	22/04/2019	current

Default	Heroes' Private School Letter	14/05/2019	current
Default	Oshigambo High Private School	21/05/2019	current
Default	Onuukwiyugwemanya SS Public School	23/05/2019	current
Default	Hans Daniel SS Public Scool	27/05/2019	current
Default	Prof Van Wyk_B CV	25/07/2019	current version
Data collection tool	JSC_Syllabuses_PS_Sep2016.pdf Mushelenga MEd reference 2019	25/07/2019	current
Data collection tool	JSC_Syllabuses_PS_Jul2007(1)	25/07/2019	previous
Informed Consent Form	CONSENT LETTER TO PARTICIPANT	04/11/2019	2
Default	CONSENT LETTER TO PARTICIPANT	04/11/2019	2
Default	RESPONSE LETTER TO REC	04/11/2019	1

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za.

Sincerely,

Clarissa Graham

REC Coordinator: Research Ethics Committee: Human Research (Humanities)

National Health Research Ethics Committee (NHREC) registration number: REC-050411-032.
The Research Ethics Committee: Humanities complies with the SA National Health Act No.61 2003 as it pertains to health research. In addition, this committee abides by the ethical norms and principles for research established by the Declaration of Helsinki (2013) and the Department of Health Guidelines for Ethical Research: Principles Structures and Processes (2nd Ed.) 2015. Annually a number of projects may be selected randomly for an external audit.

Investigator Responsibilities

Protection of Human Research Participants

Some of the general responsibilities investigators have when conducting research involving human participants are listed below:

1.**Conducting the Research**. You are responsible for making sure that the research is conducted according to the REC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research. You must also ensure that the research is conducted within the standards of your field of research.

2.**Participant Enrollment**. You may not recruit or enroll participants prior to the REC approval date or after the expiration date of REC approval. All recruitment materials for any form of media must be approved by the REC prior to their use.

3.**Informed Consent**. You are responsible for obtaining and documenting effective informed consent using **only** the REC-approved consent documents/process, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least five (5) years.

4.**Continuing Review**.The REC must review and approve all REC-approved research proposals at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period**. Prior to the date on which the REC approval of the research expires, **it is your responsibility to submit the progress report in a timely fashion to ensure a lapse in REC approval does not occur**. If REC approval of your research lapses, you must stop new participant enrollment, and contact the REC office immediately.

5.**Amendments and Changes**.If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the REC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written REC review and approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the REC should be immediately informed of this necessity.

6.**Adverse or Unanticipated Events**.Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research related injuries, occurring at this institution or at other performance sites must be reported to Malene Fouche within **five (5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the RECs requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch University Research Ethics Committee Standard Operating Procedures. All reportable events should be submitted to the REC using the Serious Adverse Event Report Form.

7.**Research Record Keeping**. You must keep the following research related records, at a minimum, in a secure location for a minimum of five years: the REC approved research proposal and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the REC

8.**Provision of Counselling or emergency support**. When a dedicated counsellor or psychologist provides support to a participant without prior REC review and approval, to the extent permitted by law, such activities will not be recognised as research nor the data used in support of research. Such cases should be indicated in the progress report or final report.

9.**Final reports**. When you have completed (no further participant enrollment, interactions or interventions) or stopped work on your research, you must submit a Final Report to the REC.

10.**On-Site Evaluations, Inspections, or Audits**. If you are notified that your research will be reviewed or audited by the sponsor or any other external agency or any internal group, you must inform the REC immediately of the impending audit/evaluation.

APPENDIX B – Semi-structured interview questions

INTERVIEW PROTOCOL

Main research question

How do the grades 8 and 9 Physical Science teachers at a Private and a Public school in Namibia experience the implementation of the Revised Physical Science Curriculum (RPSC)?

Sub-questions

- How do the Physical Science teachers (PSTs) articulate their experiences on the implementation of the newly Revised Physical Science curriculum?
- How are the Physical Science teachers equipped to implement the Revised Science Curriculum?
- What are the implementation successes and challenges with the Junior Secondary phase (Grade 8 to 9) Physical Science curriculum at a Private and a Public school?
- Is there a difference in the implementation of the new Physical Science curriculum between a Private and a Public School?

1. Tell me your experience from the new curriculum induction towards its implementation?

2. What is your experience of new curriculum implementation in relation to daily planning?

3. How has the implementation changed your way of teaching?

4. How did you experience the suggested assessment procedures?

5. How has the new curriculum influenced the academic performance of your learners?

6. What new and creative ways have you utilized to ensure learner performance?

7. Describe how you presently feel about the new curriculum.

8. What are some best practices you may want to share with other Science teachers?

9. What are the other factors (not mentioned yet), which may have facilitated the implementation of the new curriculum?

10. What are some of the difficulties faced with the implementation of the new curriculum at this school?

11. What support structures have the ministry introduced to assist you to implement the revised curriculum at this school?

12. What measures have the administration at this school instituted to ensure successful implementation of the revised curriculum?

13. What have you sourced to enable you and/or your colleagues to implement the new curriculum at this school?

14. What else do you feel is necessary to share with me about your experiences during the implementation of the new curriculum?