

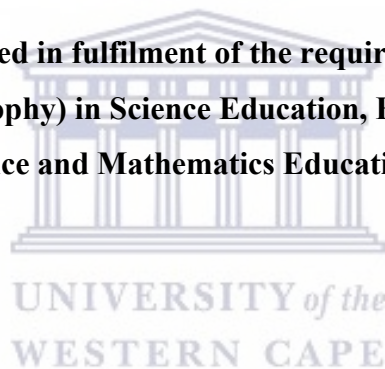
**EXAMINING TEACHERS' EXPERIENCES OF IMPLEMENTING THE  
GRADE 12 LIFE SCIENCES CURRICULUM**

**By**

**Barry Booyesen (2483214)**

**(Diploma in Education; ACE; B.Ed. (Hons); PGDiP in Ed; M.Ed.)**

**A thesis submitted in fulfilment of the requirements for the degree:  
Ph.D. (Doctor of Philosophy) in Science Education, Faculty of Education, School of  
Science and Mathematics Education (SSME)**



**University of the Western Cape**

**Supervisor: Prof. M.B. Ogunniyi**

**December 2021**

## ABSTRACT

The implementation of the Curriculum and Assessment Policy Statement (CAPS) in different subjects in South Africa has been studied before, but the literature is generally lacking on the lived experiences of life sciences teachers implementing the Further Education and Training (FET) phase life sciences curriculum (Davids, 2018; Dlova, 2019; Imenda, 2016; Koopman, 2013; Koopman, 2018; Mabusela, 2016; Ngidi, 2016; Riffel, 2020; Siseho, 2013 Sitwala; 2016). Lived experiences in phenomenology means those often taken for granted experiences that we encounter in our daily lives. To address the gap in the literature, this study focuses on some life sciences teachers' lived experiences while implementing the Grade 12 life sciences curriculum using a phenomenological approach. A phenomenological approach is concerned with both the design itself and a theoretical framework which states that humans know and perceive the world through their lived experiences (Ojikutu, 2017). Schon's (1970) reflection-on-action constituted the main phenomenological approach underpinning the study. It provided me the opportunity to explore how the participating teachers reflected on their experiences while implementing the Grade 12 life sciences curriculum. To obtain a holistic picture of the situation surrounding the new curriculum and subsequent ones, the study explored the lived experiences of five Grade 12 teachers teaching in four schools in a post-apartheid South African context. Using a phenomenological research design model, the study employed both quantitative and qualitative methods (mixed-methods) to collect data in four public secondary schools in the Northern Cape Province, South Africa. The qualitative data were derived mainly from document analysis, observations, result analysis, and interviews of five teachers while the quantitative data were derived from the responses of 25 teachers to a questionnaire. In pursuance of the study answers were sought to four research questions namely: (1) To what extent did the life sciences teachers understand the basic intention of the curriculum and Assessment Policy Statement (CAPS)? (2) What pedagogic strategies did they use to implement CAPS in their classrooms? (3) What were their perceptions of, and experiences with CAPS? (4) What relationships exist between the teachers' demographic characteristics and their learners' academic achievement? The findings revealed that the stated intention of the curriculum was to enhance social justice and transformation as a way to develop a sense of education for sustainable development which was uppermost in the teachers' minds. Although they were willing to incorporate indigenous knowledge in their science lessons as recommended by the Curriculum and Assessment Policy Statement (CAPS), they lacked the necessary experience to teach an indigenized life sciences curriculum. As a result, they used traditional instruction instead of adopting new pedagogic strategies in the implementation of the new curriculum. Their continued use of traditional instruction was probably due to the way they

themselves were taught. The majority of teachers who participated in the study had over ten years of teaching experience in life sciences. In addition, there was a general lack of adequate resources; particularly those resources which could have allowed them to use innovative strategies. The consequence of all of this was that the performance of learners was rather unsatisfactory both provincially and nationally. From the foregoing, the implications of the findings for policy, training, curriculum development, instructional practices, and future studies were highlighted and recommendations made. However, in view of the small sample involved, no generalization was feasible. Despite this, it was hoped that the findings would be found useful and informative towards attempts directed at future curriculum reforms in the life sciences not only in the Northern Cape Province where this study took place but throughout the country as a whole.



**KEYWORDS:**

Science education, implementation of the life sciences curriculum, science educators, phenomenology, mixed-methods phenomenology research, lived experiences, post-apartheid, Northern Cape Province, Revised National Curriculum Statement (RNCS), Curriculum and Assessment Policy Statement (CAPS)

## OPSOMMING

Die implementering van die Kurrikulum- en Assesseringsbeleidsverklaring (KABV) in verskillende skoolvakke in Suid-Afrika was voorheen nagevors, maar daar is oor die algemeen 'n leemte in die literatuur wat betref die geleefde ervarings van lewenswetenskappe-onderwysers wat die Verdere Onderwys en Opleidingsfase (VOO-fase) van die lewenswetenskappe-kurrikulum implementeer (Davids, 2018; Dlova, 2019; Imenda, 2016; Koopman, 2013; Koopman, 2018; Mabusela, 2016; Ngidi, 2016; Riffel, 2020; Siseho, 2013 Sitwala; 2016). Geleefde ervarings in die fenomenologie verwys na die ervarings wat ons elke dag teëkom en wat gereeld as vanselfsprekend aanvaar word. Om hierdie leemte in die literatuur te vul, word daar in hierdie studie deur middel van 'n fenomenologiese benadering ondersoek ingestel na sommige lewenswetenskappe-onderwysers se geleefde ervarings van hul implementering van die Graad 12- lewenswetenskappe-kurrikulum. 'n Fenomenologiese benadering is gemoeid met sowel die ontwerp op sigself as die teoretiese raamwerk wat meld dat mense die wêreld deur middel van hulle geleefde ervarings verstaan en waarneem (Ojikutu, 2017). In hierdie studie is daar hoofsaaklik gebruik gemaak van Schön se besinning oor handeling (“reflection-on-action”) (1970) as fenomenologiese benadering, wat die geleentheid geskep het die eksplorasië hoe die deelnemende onderwysers besin het oor hulle ervarings met betrekking tot die implementering van die Graad 12- lewenswetenskappe-kurrikulum. Ten einde 'n holistiese beeld van die situasie rakende die nuwe en daaropvolgende kurrikula te verkry, is die geleefde ervarings van vyf graad 12-onderwysers van vier skole binne die konteks van post-apartheid Suid-Afrika verken. Hierdie studie maak gebruik van 'n fenomenologiese navorsingsontwerp, deur gebruik te maak van beide kwantitatiewe en kwalitatiewe metodes (gemengde-metode) om data in te samel in vier publieke sekondêre skole in the Noord Kaap Provinsie, Suid Afrika. Die kwalitatiewe data is hoofsaaklik verkry uit dokument analise, observasie en onderhoude met vyf onderwysers, terwyl die kwantitatiewe data verkry is uit 25 onderwysers se terugvoer op 'n vraelys. Die doel van die studie was om die volgende vier navorsingsvrae te beantwoord: (1) In watter mate het die lewenswetenskappe-onderwysers die basiese oogmerk van die Kurrikulum- en Assesseringsbeleidsverklaring (KABV) verstaan? (2) Watter pedagogiese strategieë het hulle gebruik om die KABV in hul klaskamers te implementeer? (3) Wat was hulle waarnemings van en ervarings met die KABV? (4) Watter verwantskappe is daar tussen die onderwysers se demografiese eienskappe en hulle leerders se akademiese prestasie? Daar is bevind dat die verklaarde oogmerk van die kurrikulum, naamlik om maatskaplike geregtigheid en transformasie te versterk ter wille van onderrig vir volhoubare ontwikkeling, vir die onderwysers 'n prioriteit was. Alhoewel hulle gewillig was om inheemse kennis by hul wetenskaplesse te betrek, soos deur die Kurrikulum- en

Assesseringsbeleidsverklaring (KABV) aanbeveel word, beskik hulle nie oor die nodige ervaring om 'n verinheemsde lewenswetenskappe-kurrikulum te onderrig nie. As gevolg van hierdie leemte het hulle tradisionele onderrig toegepas in plaas daarvan om nuwe pedagogiese strategieë vir die implementering van die nuwe kurrikulum in te span. Hulle volgehoue gebruik van tradisionele onderrig is waarskynlik te wyte aan hoe hulle geleer is. Die meerderheid van onderwysers wat deel geneem het aan hierdie studie het meer as tien jaar onderwys ervaring in lewenswetenskappe. Verder was daar 'n algemene tekort aan voldoende hulpbronne, veral hulpbronne wat hulle in staat sou stel om innoverende strategieë te gebruik. Die gevolg van alles was onvoldoende leerderprestasie op provinsiale en nasionale vlak. Vervolgens is die implikasies van die bevindinge vir beleid, opleiding, kurrikulumontwikkeling, onderrigpraktyke en toekomstige studies belig en aanbevelings is gemaak. Gegewe die grootte van betrokke steekproef was geen veralgemenings egter haalbaar nie. Ten spyte daarvan sal die bevindinge hopelik bruikbaar en informatief wees vir toekomstige pogings tot kurrikulumhervorming vir lewenswetenskappe in die Noord-Kaap Provinsie, waar hierdie studie uitgevoer is, en die land as geheel.



#### **SLEUTELWOORDE:**

Wetenskaponderwys, implementering van die lewenswetenskap kurrikulum, wetenskap opvoeders, fenomenologie, gemengde-metode fenomenologie-navorsing, geleefde ervarings, post-apartheid, Noordkaap Provinsie, Hersiende Nasionale Kurrikulumverklaring (HNKV), Nasionale Kurrikulum- en Assesserig Beleidsverklaring (KABV).

## DECLARATION

I, Barry Booysen, hereby declare that this thesis, “**Examining teachers’ experiences of implementing the Grade 12 life sciences curriculum**” is my own work, that all the sources I have used or quoted have been indicated and acknowledged by means of complete references, and that this work has not been submitted previously in its entirety, or in any part, at any other university for degree purposes.

I hereby cede the copyright of this thesis in favour of the University of the Western Cape.

Barry Booysen

Bellville

Date: December 2021

Signed.....



Copy right © 2021 University of the Western Cape

All rights reserved

## ACKNOWLEDGEMENTS

This doctoral study was a long, lonely, and laborious journey for me. All praise and credit to our Father, Jesus Christ, who has been a source of inspiration to me when things become unbearable. My sincere thanks are extended to the following people for their support, inspiration, and contribution in the completion of the study:

My sincere thanks go to my supervisors Prof. Shaheed Hartley who started the work with me, and Prof. M.B. Ogunniyi who took over, for their continuous motivation, critical comments, feedback, and guidance which helped me throughout the study.

Many thanks to my family, friends, and colleagues for your support and friendship; because without your love and prayers I don't think I would have had the strength and courage to start this project at all. Thank you for believing in me.

Dr Zamani Saul, ANC chairperson and Premier of the Northern Cape Province, who I grew up with in the dusty streets of Petrusville. By obtaining your doctorate in law, you inspired me to soldier on and complete this thesis. Dr J. Snayers, my former school principal, who always encouraged me whenever we met. You are indeed an inspiration to me.

A true friend, Gregory Brown, thanks for the academic advice, political mentoring and endless phone calls to encourage me while I was ploughing through a very difficult time in my life. I am indebted to you.

My cousin-brother, Phillip "Scarry" Duiker, thank you for your support. I will always cherish our conversations about the importance of education and your advice on matters of life.

A big thanks you to the communities of Uitsig, Thembinkosi, Greenpoint and Plakkerskamp in Petrusville who believe in their own and keep us humble.

To my children Clairebelle, Bernelee, Banel and Neill, may you be motivated by this achievement and be inspired, as it was done for you. !Găi!găb (Good luck to you). I hope one day you will find yourself in me.

So too, to Nelia who demanded completion of this thesis. You're nagging, persistence, and walking with me through this journey from proposal stage to the actual thesis is appreciated. Thank you.

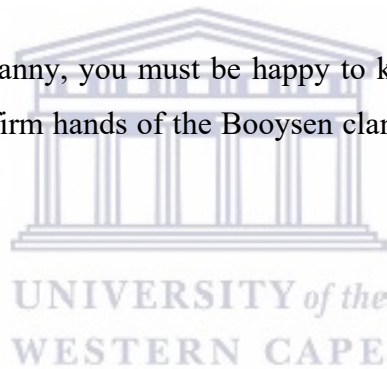
To my wife, Dimakatso Booyesen for your support.

## **DEDICATION**

To my parents, Sanah (Naggie) Booysen, Moos Krans and grandmother, Sarah Oss who made a huge contribution towards my education.

Sons and daughters of Petrusville, you shall have nothing unless you work hard for it – hard work makes anything possible.

Wherever you may be sleeping, Granny, you must be happy to know that the baton you passed on has been well received. It is in the firm hands of the Booysen clan who are running effortlessly with it to the finishing line.





## TABLE OF CONTENTS

ABSTRACT .....	I
OPSOMMING .....	III
DECLARATION .....	V
ACKNOWLEDGEMENTS .....	VI
DEDICATION .....	VII
TABLE OF CONTENTS .....	VIII
LIST OF TABLES.....	XVII
LIST OF FIGURES.....	XVIII
DEFINITIONS.....	XIX
ABBREVIATIONS.....	XX
CHAPTER 1: INTRODUCTION AND ORIENTATION TO THE STUDY .....	1
1.1 Introduction and background .....	1
1.2 Background of the study .....	2
1.3 Context to the background .....	5
1.4 Setting of the study .....	7
1.5 Personal and academic rationale.....	8
1.5.1 Personal rationale .....	9
1.5.2 Academic rationale.....	11
1.6 Problem statement.....	12
1.7 Purpose of the study .....	13
1.8 Aim and objectives of the study.....	13
1.9 Research questions .....	14
1.9.1 Main research question .....	14

1.9.2	Secondary research questions .....	14
<b>1.10</b>	<b>Methodology.....</b>	<b>14</b>
<b>1.11</b>	<b>Theoretical framework of the study.....</b>	<b>14</b>
<b>1.12</b>	<b>Significance of the study.....</b>	<b>17</b>
<b>1.13</b>	<b>Scope of the study .....</b>	<b>18</b>
<b>1.14</b>	<b>Delimitation of the study .....</b>	<b>19</b>
<b>1.15</b>	<b>Limitations of the study.....</b>	<b>19</b>
<b>1.16</b>	<b>Structure of the study .....</b>	<b>19</b>
<b>CHAPTER 2: LITERATURE REVIEW .....</b>		<b>21</b>
<b>2.1</b>	<b>Introduction .....</b>	<b>21</b>
<b>2.2</b>	<b>Phenomenology .....</b>	<b>21</b>
2.2.1	Defining phenomenology.....	24
2.2.2	What constitutes phenomenology? .....	25
2.2.3	Overview of phenomenology .....	25
2.2.4	Intentionality .....	26
2.2.5	Epoché.....	27
<b>2.3</b>	<b>Adopting a phenomenological approach .....</b>	<b>27</b>
<b>2.4</b>	<b>Theorising teachers' lived world and lived experiences.....</b>	<b>28</b>
<b>2.5</b>	<b>Delineation of the phenomenon under research .....</b>	<b>30</b>
<b>2.6</b>	<b>Schön's phenomenological theory of reflection-in-action .....</b>	<b>31</b>
<b>2.7</b>	<b>The husserlian theory of phenomenology.....</b>	<b>32</b>
<b>2.8</b>	<b>Heidegger's interpretive philosophical phenomenology .....</b>	<b>32</b>
<b>2.9</b>	<b>What is a lived experience?.....</b>	<b>33</b>
<b>2.10</b>	<b>The origin of interpretive phenomenology .....</b>	<b>34</b>
<b>2.11</b>	<b>The ontological position of interpretive phenomenology .....</b>	<b>35</b>
<b>2.12</b>	<b>The epistemological position of interpretive phenomenology.....</b>	<b>35</b>
<b>2.13</b>	<b>The south african curriculum and its history .....</b>	<b>35</b>
<b>2.14</b>	<b>The foundations of apartheid and apartheid education.....</b>	<b>37</b>

<b>2.15</b>	<b>An overview of the curriculum in south africa since 1994</b> .....	<b>39</b>
2.15.1	Curriculum 2005 (C2005).....	39
2.15.2	The National Curriculum Statement (NCS).....	40
2.15.3	The Curriculum and Assessment Policy Statement (CAPS).....	41
2.15.4	The general aims of CAPS.....	42
2.15.5	What is comparable and distinctive about NCS and CAPS? .....	42
2.15.6	The similarities between NCS and CAPS.....	43
2.15.7	The differences between NCS and CAPS.....	43
<b>2.16</b>	<b>The Grade 12 life sciences curriculum</b> .....	<b>43</b>
<b>2.17</b>	<b>Re-conceptualised the science curriculum</b> .....	<b>46</b>
<b>2.18</b>	<b>Conceptual framework for curriculum implementation</b> .....	<b>47</b>
<b>2.19</b>	<b>The constructs of profile implementation</b> .....	<b>48</b>
<b>2.20</b>	<b>Profile implementation</b> .....	<b>48</b>
<b>2.21</b>	<b>The curriculum and definitions of the curriculum</b> .....	<b>49</b>
2.21.1	What is a curriculum? .....	49
2.21.2	Definitions of the curriculum .....	50
<b>2.22</b>	<b>Types of curricula</b> .....	<b>52</b>
<b>2.23</b>	<b>The curriculum and subject curriculum</b> .....	<b>54</b>
<b>2.24</b>	<b>Definition of curriculum implementation</b> .....	<b>55</b>
<b>2.25</b>	<b>Curriculum implementation</b> .....	<b>56</b>
<b>2.26</b>	<b>The implementation of the life sciences curriculum</b> .....	<b>57</b>
<b>2.27</b>	<b>Contextualising the curriculum</b> .....	<b>57</b>
<b>2.28</b>	<b>Curriculum design</b> .....	<b>59</b>
<b>2.29</b>	<b>Different approaches to curriculum planning</b> .....	<b>60</b>
<b>2.30</b>	<b>The intended, implemented, perceived and achieved curriculum</b> .....	<b>60</b>
2.30.1	The intended curriculum .....	60
2.30.2	The implemented curriculum .....	61
2.30.3	The perceived curriculum .....	62
2.30.4	The achieved curriculum.....	62
<b>2.31</b>	<b>Challenges of caps in south african schools</b> .....	<b>62</b>
2.31.1	Understanding curriculum implementation.....	63
<b>2.32</b>	<b>Curriculum implementation models</b> .....	<b>64</b>
2.32.1	Ralph Tyler model .....	65
2.32.2	Paulo Freire’s model .....	66

<b>2.33</b>	<b>Elements affecting curriculum implementation in south africa</b> .....	<b>66</b>
2.33.1	Resources .....	67
2.33.2	Teachers .....	67
2.33.3	Learners.....	68
2.33.4	School management teams.....	68
2.33.5	Subject content.....	68
2.33.6	Pedagogical content knowledge (PCK).....	68
2.33.7	Stakeholders .....	69
2.33.8	The Department of Basic Education (DBE).....	69
2.33.9	The environment of the school.....	69
2.33.10	Time management.....	70
<b>2.34</b>	<b>Curriculum implementation through the lens of the teacher</b> .....	<b>70</b>
<b>2.35</b>	<b>The demographic factors of teachers</b> .....	<b>71</b>
2.35.1	Phenomenology studies relevant to science education .....	74
<b>2.36</b>	<b>Chapter summary</b> .....	<b>75</b>
<b>CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY</b> .....		<b>76</b>
<b>3.1</b>	<b>Introduction</b> .....	<b>76</b>
<b>3.2</b>	<b>Ontology and epistemology</b> .....	<b>77</b>
<b>3.3</b>	<b>Research worldview</b> .....	<b>78</b>
<b>3.4</b>	<b>Research methodology</b> .....	<b>80</b>
<b>3.5</b>	<b>Justification for the use of mix-methods phenomenological research</b> .....	<b>80</b>
<b>3.6</b>	<b>Research design</b> .....	<b>81</b>
3.6.1	The quantitative strategy of inquiry .....	83
3.6.2	The qualitative strategy of inquiry .....	83
<b>3.7</b>	<b>The selection of participants</b> .....	<b>84</b>
3.7.1	The data collection plan .....	84
3.7.2	The quantitative sampling method .....	84
3.7.3	The qualitative sampling method .....	85
<b>3.8</b>	<b>Site selection and description of the research location</b> .....	<b>87</b>
<b>3.9</b>	<b>The role of the researcher in phenomenology research</b> .....	<b>87</b>
<b>3.10</b>	<b>The qualitative data collection plan</b> .....	<b>87</b>
<b>3.11</b>	<b>Data collection methods</b> .....	<b>88</b>
3.11.1	Quantitative data collection method.....	89
3.11.2	The questionnaire.....	89
3.11.3	The pilot study .....	90

3.11.4	Qualitative data collection methods .....	90
3.11.5	Interviews.....	91
3.11.6	Document analysis .....	94
3.11.7	Observations.....	94
3.11.8	Result analysis.....	95
<b>3.12</b>	<b>Data explication .....</b>	<b>96</b>
3.12.1	Quantitative data explication.....	96
3.12.2	Qualitative data explication.....	96
3.12.3	Mixing of quantitative and qualitative data.....	97
<b>3.13</b>	<b>Instrumentation design and quality assurance of instruments.....</b>	<b>97</b>
3.13.1	Instrumentation design.....	97
<b>3.14</b>	<b>Quality assurance of instruments.....</b>	<b>98</b>
<b>3.15</b>	<b>Triangulation .....</b>	<b>99</b>
<b>3.16</b>	<b>Trustworthiness and validity in phenomenology research .....</b>	<b>99</b>
3.16.1	Trustworthiness in phenomenology .....	99
3.16.2	Validity and reliability of data .....	100
<b>3.17</b>	<b>Ethical issues of the research .....</b>	<b>103</b>
3.17.1	Gatekeepers.....	103
3.17.2	Bracketing.....	104
3.17.3	Negotiating access to the research space.....	105
<b>3.18</b>	<b>Chapter summary.....</b>	<b>106</b>
<b>CHAPTER 4: EXPLICATION OF THE DATA.....</b>		<b>107</b>
<b>4.1</b>	<b>Introduction .....</b>	<b>107</b>
<b>4.2</b>	<b>Results of the quantitative data construction process .....</b>	<b>108</b>
<b>4.3</b>	<b>Analysis of questionnaires.....</b>	<b>109</b>
4.3.1	The setting for the preliminary data analysis .....	109
4.3.2	The research participants.....	109
<b>4.4</b>	<b>Description of the research sites .....</b>	<b>112</b>
4.4.1	School A.....	112
4.4.2	School B.....	115
4.4.3	School C.....	116
4.4.4	School D.....	118
<b>4.5</b>	<b>Interpretive summary .....</b>	<b>120</b>
<b>4.6</b>	<b>Biographical data.....</b>	<b>122</b>
4.6.1	Gender.....	123
4.6.2	Age groups .....	123

4.6.3	Teaching experience.....	123
4.6.4	Professional qualifications .....	124
<b>4.7</b>	<b>Results of the quantitative data .....</b>	<b>125</b>
4.7.1	Descriptive data.....	125
4.7.2	Section B: Implementation of the life sciences curriculum .....	125
4.7.3	Section C: knowledge and understanding of the curriculum .....	126
4.7.4	Section D: Implementation of the curriculum.....	127
4.7.5	Section E: Policy documents in support of implementation .....	128
4.7.6	Section F: Curriculum implementation at school level.....	128
4.7.7	Section G: Planning for the implementation of the curriculum .....	129
4.7.8	Section H: Teachers' perceptions of the curriculum.....	130
<b>4.8</b>	<b>Interpretive summary .....</b>	<b>131</b>
<b>4.9</b>	<b>Results of the qualitative data .....</b>	<b>132</b>
<b>4.10</b>	<b>The interview process .....</b>	<b>132</b>
<b>4.11</b>	<b>Data analysis and interpretation .....</b>	<b>133</b>
<b>4.12</b>	<b>Teachers' responses .....</b>	<b>133</b>
4.12.1	Interview with Vuyo .....	133
4.12.2	Vuyo's understanding of the intention of the curriculum .....	135
4.12.3	Interview with Carol .....	136
4.12.4	Carol's understanding of the intention of the curriculum .....	137
4.12.5	Interview with Brady .....	138
<b>4.13</b>	<b>Brady's understanding of the intention of the curriculum .....</b>	<b>139</b>
4.13.1	Interview with Neill .....	140
4.13.2	Neill's understanding of the intention of the curriculum .....	141
4.13.3	Interview with Dawid.....	141
4.13.4	Dawid's understanding of the intention of the curriculum.....	143
<b>4.14</b>	<b>Data presentation, findings and discussion of interviews .....</b>	<b>143</b>
<b>4.15</b>	<b>Emerging themes for discussion .....</b>	<b>144</b>
4.15.1	Teacher training .....	144
4.15.2	Curriculum reform .....	145
4.15.3	Social justice and transformation .....	147
4.15.4	Indigenous knowledge systems.....	149
4.15.5	Education for Sustainable Development (ESD).....	151
4.15.5	Pedagogical Content Knowledge (PCK).....	152
<b>4.16</b>	<b>Addressing the intention of the curriculum .....</b>	<b>154</b>
4.16.1	Summary of the findings from the interviews.....	155
<b>4.17</b>	<b>Data gathered from the document analysis.....</b>	<b>159</b>
<b>4.18</b>	<b>Background .....</b>	<b>160</b>

<b>4.19</b>	<b>Findings from the document analysis .....</b>	<b>160</b>
<b>4.20</b>	<b>Data derived from classroom observations .....</b>	<b>163</b>
4.20.1	Teachers observed in practice .....	163
4.20.2	The lessons .....	164
<b>4.21</b>	<b>General comments on how the curriculum were implemented .....</b>	<b>170</b>
<b>4.22</b>	<b>What relationships exist between the teachers' demographic characteristics and their learners' academic performance? .....</b>	<b>171</b>
<b>4.23</b>	<b>Possible influence of teachers' demographic characteristics on learners' academic performance .....</b>	<b>174</b>
<b>4.24</b>	<b>Chapter summary .....</b>	<b>175</b>
<b>CHAPTER 5: DISCUSSION.....</b>		<b>176</b>
<b>5.1</b>	<b>Introduction .....</b>	<b>176</b>
<b>5.2</b>	<b>Key features of chapter five .....</b>	<b>176</b>
<b>5.3</b>	<b>General overview of the study .....</b>	<b>177</b>
<b>5.4</b>	<b>Teachers' experiences and reflections .....</b>	<b>177</b>
<b>5.5</b>	<b>Discussion of the findings .....</b>	<b>180</b>
<b>5.6</b>	<b>Discussion based on research question 1 (RSQ 1) .....</b>	<b>180</b>
5.6.1	Teacher training .....	181
5.6.2	Social justice and transformation .....	181
5.6.3	Teachers' perceptions of curriculum reform .....	182
5.6.4	Indigenous knowledge .....	183
5.6.5	Education for Sustainable Development (ESD) .....	184
5.6.6	Pedagogical Content Knowledge (PCK) .....	184
<b>5.7</b>	<b>Discussion based on research question 2 (RSQ 2) .....</b>	<b>187</b>
<b>5.8</b>	<b>Discussion based on research question 3 (RSQ 3) .....</b>	<b>188</b>
5.8.1	Themes .....	189
5.8.2	Teachers' experiences of implementing the life sciences curriculum .....	189
5.8.3	Teachers' understanding of the life sciences curriculum .....	189
5.8.4	The implementation process of the life sciences curriculum .....	190
5.8.5	Policy documents in support of the implementation process .....	191
5.8.6	The implementation of the life sciences curriculum at school level .....	191
5.8.7	Planning for the implementation of CAPS .....	192
5.8.8	Teachers' perceptions of the life sciences curriculum .....	192
<b>5.9</b>	<b>Discussion based on research question 4 (RSQ 4) .....</b>	<b>193</b>
5.9.1	Results at the national, provincial and district level .....	194

5.9.2	Results of three years before the implementation of CAPS .....	195
5.9.3	Results of five years after the implementation of CAPS .....	196
5.9.4	National Senior Certificate (NSC) results as an indicator of success in schools .....	197
<b>5.10</b>	<b>Chapter summary .....</b>	<b>198</b>
<b>CHAPTER 6: CONCLUSION AND RECOMMENDATIONS.....</b>		<b>201</b>
<b>6.1</b>	<b>Introduction .....</b>	<b>201</b>
<b>6.2</b>	<b>Critical reflections and methodological considerations .....</b>	<b>201</b>
<b>6.3</b>	<b>Key findings of the study.....</b>	<b>202</b>
6.3.1	Research Question 1.....	202
6.3.2	Research Question 2.....	204
6.3.3	Research Question 3.....	206
6.3.4	Research Question 4.....	207
<b>6.4</b>	<b>Implications of the study .....</b>	<b>208</b>
6.4.1	The voices of teachers in curriculum implementation - A culture of silence.....	208
6.4.2	Inadequate training.....	209
6.4.3	Poor resourcing .....	209
<b>6.5</b>	<b>Contributions made by the study .....</b>	<b>210</b>
<b>6.6</b>	<b>Limitations of the study.....</b>	<b>211</b>
<b>6.7</b>	<b>Reasons for involving only five teachers in the main study .....</b>	<b>211</b>
<b>6.8</b>	<b>Direction for further studies .....</b>	<b>211</b>
6.8.1	How can life sciences build social cohesion and advance social justice in schools?.....	212
6.8.2	Research on the lived experiences of learners in the life sciences classroom.....	212
6.8.3	Inadequate resources .....	212
6.8.4	Providing mentoring, support and opportunities for pre-service life sciences teachers in implementing an effective life sciences curriculum .....	213
<b>6.9</b>	<b>General recommendations based on the findings .....</b>	<b>213</b>
<b>6.10</b>	<b>Chapter summary .....</b>	<b>214</b>
<b>REFERENCES .....</b>		<b>216</b>
<b>APPENDIX A: LETTER OF CONSENT TO CONDUCT RESEARCH .....</b>		<b>281</b>
<b>APPENDIX B: CONSENT LETTER TO CONDUCT RESEARCH.....</b>		<b>282</b>
<b>APPENDIX C: LETTER OF REQUEST TO CONDUCT RESEARCH .....</b>		<b>283</b>

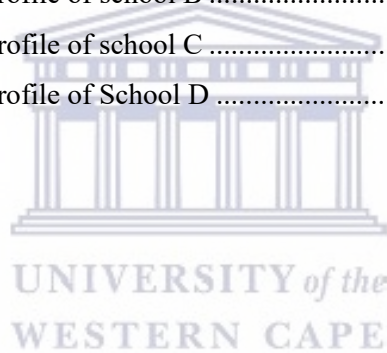


<b>APPENDIX D: CONSENT FORM TO PARTICIPATE IN THE STUDY .....</b>	<b>284</b>
<b>APPENDIX E: CONSENT FORM TO PARTICIPATE IN THE INTERVIEW .....</b>	<b>286</b>
<b>APPENDIX F: LETTER OF REQUEST TO TEACHERS .....</b>	<b>287</b>
<b>APPENDIX G: TEACHER QUESTIONNAIRE .....</b>	<b>288</b>
<b>APPENDIX H: OBSERVATION SCHEDULE FOR TEACHERS .....</b>	<b>293</b>
<b>APPENDIX I: THE LESSON .....</b>	<b>295</b>
<b>APPENDIX J: DOCUMENT ANALYSIS PROTOCOL .....</b>	<b>297</b>
<b>APPENDIX K: INTERVIEW SCHEDULE .....</b>	<b>298</b>
<b>APPENDIX L: GRAPH OF TEACHER DETAILS .....</b>	<b>299</b>
<b>APPENDIX M- DETAILS OF PARTICIPANTS .....</b>	<b>300</b>
<b>APPENDIX O: TRANSCRIPT OF THE INTERVIEW .....</b>	<b>313</b>
<b>APPENDIX S: EDITOR'S LETTER .....</b>	<b>321</b>



## LIST OF TABLES

Table 2.1: A Comparison of Husserlian and Heideggerian phenomenology Approaches .....	23
Table 2.2: Weighting of cognitive demands for the assessment of content in Grade 12.....	45
Table 2.3: Outcomes of NCS and aims of CAPS .....	45
Table 2.4: The Grade 12 life sciences content framework .....	46
Table 2.5: Comparisons between the competence model and the performance model .....	53
Table 2.6: Table 2.6: Typology of curriculum representation.....	59
Table 2.7: Components within effective implementation of the curriculum.....	64
Table 3.1: Characteristics of quantitative and qualitative studies .....	84
Table 3.2: Overview of the data analyses and interpretation processes based on Smith IPA model .....	93
Table 3.3: The observation schedule .....	95
Table 4.1: Biographical data of the five life sciences teachers involved in the study .....	112
Table 4.2: Management structure and profile of school A .....	114
Table 4.3: Management structure and profile of school B .....	116
Table 4.4: Management structure and profile of school C .....	118
Table 4.5: Management structure and profile of School D .....	120



## LIST OF FIGURES

Figure 1.1: Education districts of the Northern Cape DoE.....	8
Figure 2.1: Curriculum implementation model of Rogan and Grayson .....	48
Figure 2.2: Time management model.....	70
Figure 4.1: School A.....	114
Figure 4.2: School B.....	115
Figure 4.3: School C.....	117
Figure 4.4: School D.....	119



## DEFINITIONS

**Curriculum and Assessment Policy Statement (CAPS):** The policy document stipulating the aims, scope, content and assessment for each subject listed in the National Curriculum Statements (NCS) for each grade. According to the DBE (2014), the CAPS is a single, comprehensive and concise policy document which will replace the Subject and Learning Area Statements, learning programme, Subject Assessment Guide for all subjects listed in the NCS (DBE, 2011).

**Curriculum:** Curriculum refers to the means and materials with which students will interact for the purpose of achieving identified educational outcomes. It is the process of the school facilitating the interaction between the learner and the curriculum (Ndawi & Maravanyika, 2011).

**Curriculum implementation:** Entails putting into practice the officially prescribed courses of study, syllabuses and subjects.

**Department of Basic Education:** One of the departments of the South African government. It oversees primary and secondary schooling in South Africa.

**Further Education and Training phase:** FET is defined as the phase that provides learning programmes for Grades 10–12.

**Life sciences:** The study of living organisms, including biology, botany, zoology, microbiology, physiology, biochemistry and related subjects (DBE, 2011).

**Lived experience:** The lived experience is that which is lived by a person at a given time, in a given place. It is pragmatic and implicates the totality of life. It is already there and is part of our awareness (Van Manen 1997).

**Noema and Noesis:** Every intentional experience consists of a noema and noesis. The noema represents the objective experience of the object, whereas the noesis represents the subjective experience.

**Northern Cape Department of Education:** One of the provincial departments of education of the South African government. It oversees primary and secondary education in the province.

**Outcomes-based education (OBE):** OBE is an educational theory that bases each part of educational system on goals (outcomes) (Killen, 2010).

**Phenomenology:** It is the philosophical study of the structures of consciousness as experienced from the first-person's point of view.

## **ABBREVIATIONS**

<b>ANC</b>	African National Congress
<b>ATP</b>	Annual Teaching Plan
<b>CAPS</b>	Curriculum and Assessment Policy Statement
<b>C2005</b>	Curriculum 2005
<b>CNE</b>	Christian National Education
<b>COPs</b>	Community of Practices
<b>DBE</b>	Department of Basic Education
<b>DH</b>	Departmental Head
<b>DoE</b>	Department of Education
<b>ESD</b>	Education for Sustainable Development
<b>FET</b>	Further Education and Training
<b>GNU</b>	Government of National Unity
<b>HDE</b>	Higher Diploma in Education
<b>HSSREC</b>	Humanities and Social Sciences Research Ethics Committee
<b>IKS</b>	Indigenous Knowledge Systems
<b>LTSM</b>	Learner Teaching Support Material
<b>MM</b>	Mixed-Methods
<b>MMPR</b>	Mixed Methods Phenomenology Research
<b>NCDoe</b>	Northern Cape Department of Education
<b>NETF</b>	National Education and Training Forum
<b>NCS</b>	National Curriculum Statements
<b>NDP</b>	National Development Plan
<b>NDR</b>	National Democratic Revolution
<b>NPA</b>	National Policy for Assessment
<b>NQF</b>	National Qualifications Framework

<b>NSC</b>	National Senior Certificate
<b>NSNP</b>	National School Nutrition Programme
<b>OBE</b>	Outcomes-Based Education
<b>PCK</b>	Pedagogical Content Knowledge
<b>PGCE</b>	Postgraduate Certificate in Education
<b>PoA</b>	Programme of Assessment
<b>REQV</b>	Relevant Education Qualification Value
<b>RSA</b>	Republic of South Africa
<b>RNCS</b>	Revised National Curriculum Statement
<b>SADTU</b>	South African Democratic Teachers Union
<b>SAFA</b>	South African Football Association
<b>SASA</b>	South African Schools Act
<b>SASFA</b>	South African School Football Association
<b>SBA</b>	School-based Assessment
<b>SCK</b>	Subject Content Knowledge
<b>SGB</b>	School Governing Body
<b>SHD</b>	Senate Higher Degree
<b>SLCA</b>	Science Learning Centre for Africa
<b>SMS</b>	Short Message Service
<b>SMT</b>	School Management Team
<b>S U</b>	Stellenbosch University
<b>TIMSS</b>	Trends in international Mathematics and Science Study
<b>UK</b>	United Kingdom
<b>USA</b>	United States of America
<b>UWC</b>	University of the Western Cape



## **CHAPTER 1: INTRODUCTION AND ORIENTATION TO THE STUDY**

### **1.1 Introduction and background**

Since South Africa became a constitutional democracy in 1994, the African National Congress (ANC)-led government has been trying to reform the education landscape of the country as a way to eliminate the ills of the past apartheid government. The apartheid government deliberately sowed the seed of inequality, disparities and injustices in all facets of the South African society (including education) by placing the interests of the minority Whites over and above the majority people of colour. There is a shared agreement in the extant literature that the country's education system suffers from profound and persistent inequality across schools, communities, race, class, gender and provinces (e.g. Bhana, & Moletsane, 2009; Chisholm, 2004; Epstein, Lemon, 2004; Morrel, Spaul, 2013a; Sayed & Motala 2012; Unterhalter; Van der Berg, 2007).

Like any other developing country, South Africa at independence faced a plethora of challenges in terms of curriculum bequeathed on it by the colonial/apartheid governments. The only option open to it at the time was to undertake a major curriculum reform. There was considerable uncertainty about how to implement the various versions of the curricula that was implemented. The problem ranged from poor planning, poor articulation of the curriculum, and poor preparation of the teachers to inadequate teaching and learning resources, large classrooms, lack of administrative support and the stranglehold effect of assessment over the entire education system, just to list a few (Ogunniyi, 2004). Added to this confusion brought about by rapid curriculum reforms within a short period of time. In fact, the initial curriculum developed in 1997 was revised four times within a decade in response to public outcry (Motshekga, 2011).

There seemed to be a misguided assumption that curriculum reforms would automatically bring about total societal transformation. Even the latest reform known as the Curriculum and Assessment Policy Statement (CAPS) has the same inherent assumption that it was capable to redress all the social challenges facing the country. This study was premised on the belief that among others that no matter how elegant a curriculum reform might be, the teacher factor is supreme and must not be discountenanced. In other words, no curriculum can outperform the quality of the teachers who ultimately would implement it (Ogunniyi, 2007a, 2011). It was in light of the above that the study adopted a phenomenological framework to describe the lived experiences of a group of Grade 12 life sciences teachers in a specific locality in the Northern Cape Province, South Africa in their attempt to implement CAPS. Phenomenology is a research approach that attempts to capture the first-hand experiences of several people working in a certain field. Lived experience is concerned with

experiences arising from the encounters in everyday life. So far, most studies exploring the views of science teachers about curriculum reforms in South Africa have focused mainly on the physical science curriculum (Koopman, 2013; Roth & Bowen, 1999; 2000; Roth, McRobbie, Lucas & Boutonné, 1997). The current study examined Grade 12 teachers' experiences of implementing the Curriculum and Assessment Policy Statement (CAPS) for life sciences. This chapter gives a background of the development of post-apartheid curriculum implementation in South Africa. It describes how the first democratically elected government construed the curriculum as a way to acknowledge and develop all the cultural groups within the country (Riffel, 2020). Further, the chapter introduces and positions the study within the broader phenomenological research perspectives. Finally, it provides a brief overview and background, purpose, rationale, and methodology adopted in the study.

## **1.2 Background of the study**

The education system has been undergoing various curriculum reforms since the inception of the new democratic dispensation in South Africa. According to Nakadugo and Siebörger (2001), the focus of the first democratically elected government known as the Government of National Unity (GNU) was to redress the inequities and the social injustices perpetuated by the apartheid education system. To implement the new curricula, an interim syllabus was developed by the Department of Education (DoE) to cater for the needs of learners coming from diversified socio-cultural backgrounds. However, many challenges stood in the way of the implementation of the interim curriculum as the GNU was not yet ready to embark on the implementation process.

Some of the major obstacles facing the new curriculum include: lack of appropriate, updated textbooks and instructional materials; unavailability of teachers with instructional skills to implement such a radically different curriculum from the existing one at the time and so on. Other major challenges faced by the DoE relate to the issue of phasing in the post-apartheid national curriculum known as Curriculum 2005 (C2005) (Chisholm, 2005). Chapter 2 of the study provides a detailed account of the challenges faced by DOE and subsequently, by the Department of Basic Education (DBE) when it replaced C2005 with a more inclusive curriculum known as Curriculum and Assessment Policy Statement (CAPS) in the Further Education and Training (FET) phase which touches on the lived experiences of teachers as they attempted to implement the new curriculum. Priestly (2011) describes education reform in the global context from the late 20th century. In South Africa, curriculum change was driven since the 1990's by the African National Congress (ANC) government's social transformation policy in its endeavour to reduce historical inequalities (Bantwini & McKenzie, 2011). After 1994, a new political order was established in South Africa under the



leadership of President Nelson Mandela and the ANC. They embarked on a process of developing a new education system aimed at abolishing historical inequalities. Teachers were tasked with implementing the first version of the new curriculum, Curriculum 2005 (C2005), which was introduced in 1997. This was followed in 2002 by the Revised National Curriculum Statement (RNCS). The RNCS in turn was followed by a streamlined National Curriculum Statement in 2007, which was again revised with a new curriculum known as the Curriculum and Assessment Policy Statement (CAPS) which come into effect in 2012.

Imenda (2002) argues that curriculum implementation relies heavily on teachers, and curriculum change is all about teachers, learners, policy developers and all those with a part to play in the realisation and effectiveness of a new curriculum. The current study sought to investigate whether or not this is in fact the case with a selected group of teachers tasked with delivering the Grade 12 FET phase life sciences curriculum in four schools in the Northern Cape Province, South Africa.

The central focus of the study was to explore the experiences of a sample of five Grade 12 life sciences teachers in their attempt to implement the ‘new’ (serially revised) curriculum. Faced with what still appeared to be a daunting task in 2017, this group of life sciences teachers reported having to rethink the curriculum so as to make it compatible with the postulates of a hard-won independence and aspirations of all South African people. At the same time the study was concerned with finding out from teachers to what extent they considered the new curriculum to be relevant to the life-worlds of their learners in a multicultural and non-racial society. In addition, teachers were faced with the task of enhancing their learners’ awareness about the significant social and political changes taking place both locally and internationally.

According to Aloovi (2016), any changes in a curriculum or education system in general are not without concomitant challenges and teachers as knowledge transmitters play (or are expected to play) a vital role in confronting these challenges. However, some of the initial responses of the sampled group of life sciences teachers to the idea of recurring curriculum changes had been: “Oh no, not again!” or “But why?” South Africa’s regular curriculum changes (three iterations in the past 20 years) have resulted in “curriculum fatigue”. These responses are representative of the opinion of many South African teachers who have been through a series of curriculum reforms in the recent past. However, while voicing their dismay, most teachers in the current study agreed that change must inevitably occur. In South Africa, the need to change the old apartheid curriculum, as well as Curriculum 2005, was inevitable. However, no matter how necessary and beneficial the change was, the implementation process appeared to have been very difficult and painful for teachers involved in this study. For instance, the teachers under study had been attempting to implement the ‘new’ (or

revised) curriculum starting from Curriculum 2005 (i.e., the year intended for its full implementation), followed by the RNCS in 2004, then the NCS in 2007, and finally the CAPS in 2012. All these curriculum revisions took place in just about a decade. Teachers in this current study had inevitably made all kinds of mistakes, had unpalatable experiences and expressed their misgivings about the various 'new' curricula.

Curriculum reform is often a result of a change in the dynamics of political power and of changes that take place in the economy of the country. It must be understood that curriculum reform does not happen naturally or 'organically'. It has been well documented that curriculum change is always the result of changes that take place in the social-political context in which the curriculum is developed and delivered (Cross, Mungadi & Rouhan, 2002). At the same time, global changes put pressure on politicians in a country to rethink the curriculum in their schools, and these global imperatives influence the nature of the changes most likely to take place. As stated earlier, South Africa has undergone major curriculum reforms in education over the last decade, ending with the introduction of CAPS.

Some critics see these changes as serving the interest or ideology of a particular group(s) at the expense of others and as reflecting the new political order, and this inevitably affects the day-to-day experiences of teachers. The Department of Basic Education (2011) states that CAPS is a follow-up of the previous curricula, the Revised and National Curriculum Statements Grades R–12, that outlines the content teachers need to cover each term. However, South African teachers have not been adequately trained either through pre- or in-service training on how to implement the various curricula. One such example is the change made to the life sciences CAPS which includes certain changes from the previous curriculum. Pinnock (2011) points out that CAPS has come to be constructed as the legitimate curriculum, and as an upgrade from, or improvement on, the NCS. He describes how the pacing, sequencing and content coverage were provided in the NCS, and now the CAPS claims that it has provided the minimum requirements for making teaching, learning and assessment effective as a way to improve learner performance.

The stated intent (and educational philosophy) of the current Department of Basic Education (DBE) was to create citizens who are able to meet the demands of a democratic South Africa, and life sciences was suggested as one of the subjects to be taught in schools to realise that objective. An additional advantage for choosing and studying this subject are the possible careers in the fields of science: biology, medicine, technology and engineering that are available to learners who obtain a good pass mark in life sciences. There is evidence in the diagnostic report of the DBE (2015) for life sciences, that, while there was an increase in life sciences examination candidates in 2015 compared

with 2014, there was a disappointing decrease in the performance of learners in 2015 (DBE, 2015). Various challenges were highlighted in the report (unpacked elsewhere in this thesis), for example the lack of content and terminology knowledge and language issues in our multilingual, multicultural context.

But despite the improvement of the life sciences CAPS over its forerunners, the implementation process has been fraught with diverse problems as was encountered by the former. Various researchers (e.g. Dello-Lacovo, 2009; Marton, 2006; Shan, 2002; Yu, 2003) have pointed out that the implementation of curriculum reform is characterised by a range of challenges. For instance, Dello-Lacovo (2009) points to a lack of financial and governmental support as an issue that prevents the successful implementation of the curriculum. Shan (2002) identifies insufficient training of teachers to implement or utilise new teaching methods and a lack of assistance to integrate learning activities. Yu (2003) showed how teachers in her study failed to design new approaches, and Marton (2006) found that teachers in his study had been left to their own devices, receiving no support from the DoE or from colleagues and subject experts to implement the new curriculum, thus leaving them under- or unprepared. Such problems in the implementation of curriculum reforms are shown to be systemic and complex, and the likelihood that these problems persist is high because they are deeply rooted.

The challenges and problems teachers are grappling with globally are intrinsic to our particular and persistently complex education system in South Africa. In many aspects, the current study can be said to represent a microcosm of the country's education and the challenges faced in the implementation of the 'new' curriculum. I would argue that this current research shows that the FET phase, specifically Grade 12 life sciences teachers who are the enablers of the life sciences curriculum, do not need a quick fix solution to the challenges they face in the implementation of the curriculum. In my view, curriculum implementation and reform should thus not be seen as a destination but as a journey or ongoing process in reflecting where teachers are and how they can from their experiences as they work towards a desirable end.

### **1.3 Context to the background**

The transition of South Africa to a democracy is well addressed and there exist a large research base in the literature (Bloch, 2009; Motala & Pampallis, 2001), together with the ways in which apartheid education legitimised the oppression and indoctrination of black people by a white minority. The urgency for transformation on the part of the DoE in 1994, according to Langenhoven (2014), was the driving force for the institution of reforms, not only in the form of reconfiguring the various

racialized education departments, but also the curriculum. Subsequently, the primary reason for transforming C2005 (first introduced in 1997) was that this first version of a ‘transformed’ curriculum presented various difficulties and mounting pressure from teachers and the broader society to change the trajectory of the curriculum (Hoadley & Jansen, 2002).

This current study concentrates on the concerns of Grade 12 life sciences teachers in 2017. I have also explored the reasons why these teachers’ experienced problems in implementing the life sciences curriculum. In recent years, the South African education system, in pioneering education transformation, changed their perspective from a focus on teachers to a focus on learners. Viewed differently, the focus is now on an outcomes-based education (OBE) perspective as the primary principle and requirement underpinning CAPS (DBE, 2011).

As the successive reformed curricula were published, teachers were faced with serious difficulties in implementing these curricula, including CAPS, where the subjects for one comprehensive CAPS are provided, including details on what teachers needed to teach and assess. The CAPS provides clearly delineated topics for each of the subjects as well as a clear directive on the number and type of school-based assessment tasks per term. In addition, the preamble to the CAPS sets out its social transformational aims, showing them to be “directed towards developing prosperous, truly united, democratic and critical citizens who are able to lead productive, self-fulfilled lives in a country free of discrimination and prejudices” (DBE, 2011, p.2). While these aims might be seen as noble education ideals, educational issues, and agreement on them, are not without problems, not least because in a democratic dispensation these aims involve many stakeholders. It must not be forgotten that previously, the apartheid education system was a mirror image and reproduction of an already divided society, and one which did not encourage critical thinking or questioning citizens (Msila, 2007).

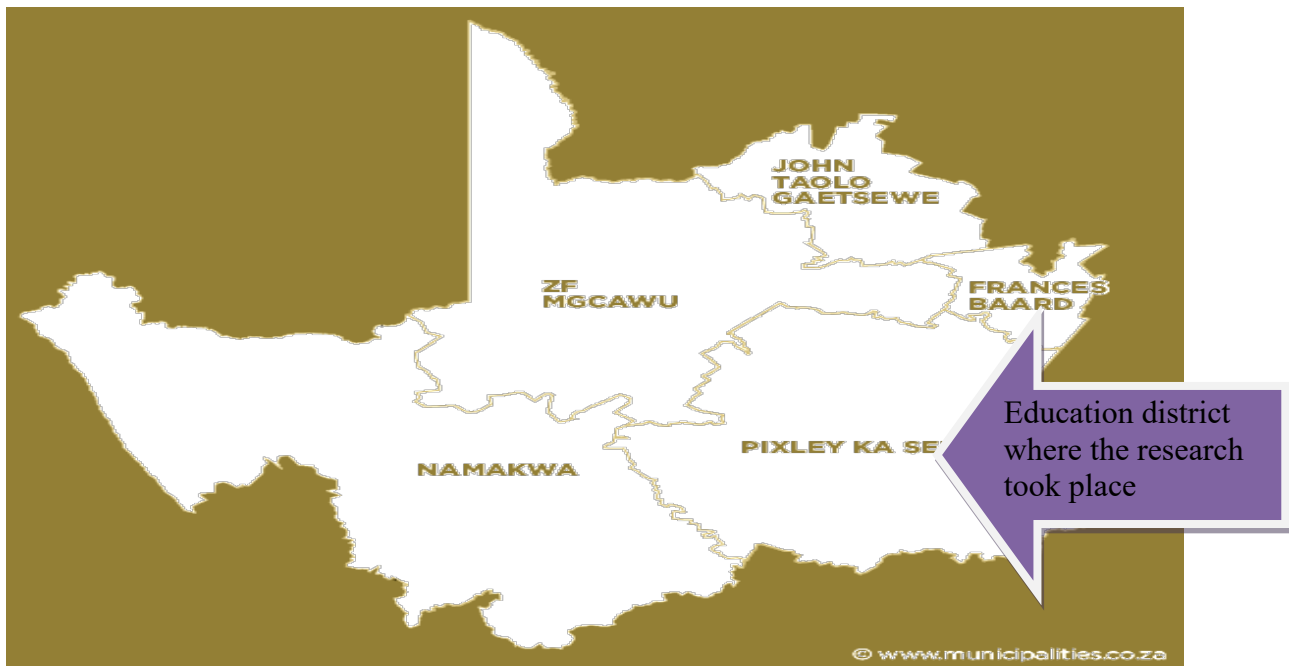
The successful implementation of CAPS is entirely dependent on teachers and the training they receive from the DoE. In-service training thus plays a pivotal role in this process. Teachers are well aware of their own shortcomings in terms of the knowledge and skills required to implement an inclusive science curriculum. The range of challenges posed by the ‘new’ curriculum with regard to teaching methods and assessment strategies has been mentioned. At the time of the research, South African teachers were yet to come to terms with the task to implement yet another curriculum reform. The literature identifies several factors restricting the implementation process, including, but not limited to, issues of time allocation, a lack of support from the authorities, unavailability of teaching resources, poor resourcing, lack of a clear curriculum implementation plan and a lack of skills and content knowledge (Ogunniyi, 2004, 2007a & b; Rensburg, 2000).

In the Northern Cape Province, where this study was conducted, teachers cited a lack of adequate training as a challenge. A major teacher union in the Northern Cape Province also cited its concern. For instance, they were not satisfied with the quality of in-service training teachers were receiving. They were of the view that a once-off training on curriculum implementation, or a short in-service training course, seldom leads to deeper understanding and is not enough for the successful implementation of a new curriculum (Mphalala, 2015). Taylor (2008) concludes that short training courses of three to five days have little or no impact on the successful implementation of a curriculum.

I was interested in what Grade 12 life sciences teachers' experiences were during the implementation of the life sciences curriculum, as well as their views and perceptions of teaching the subject. An investigation of their perceptions and experiences in this context highlighted the general quality of curriculum delivery in the school. In this regard, I was interested to find out to what extent the teachers interacted directly with curriculum planners, their understanding and interpretation as well as their sense of ownership of CAPS. However, in order to capture the teachers' own interpretations of CAPS in terms of its aims and content, together with their day-to-day experiences of its implementation I solicited their views and experiences and, from this I attempted to outline the implications of their teaching experiences during the implementation of CAPS in their respective schools.

#### **1.4 Setting of the study**

According to Ball (in Teise, 2013), education research that ignores the place and setting of the research is of limited value. It is therefore necessary to specify that this study was intentionally conducted and contextualised within the Northern Cape Province of South Africa. The Northern Cape Province is the largest in South Africa, making up nearly a third of the country's land area. However, it has also the smallest population. The province is divided into five education districts with its provincial head office based in Kimberley. The districts are Frances Baard, John Taolo Gaetsewe, Namakwa, ZF Mgcawu and Pixley ka Seme Districts. The four schools involved in the study, is where the primary data were collected, and were particularly selected for their close proximity to me. These schools have a rich sociocultural history founded on a value system and the spirit of *Ubuntu* (Ogunniyi, 2015).



**Figure 1.1: Education districts of the Northern Cape DoE**

The setting for the study, Pixley ka Seme education district, is a district in the Northern Cape DoE. The district is situated in the south-eastern part of the Northern Cape Province and borders on the Free-State Province to the east and the Eastern Cape Province and Western Cape Province to the south. The main mother tongue languages are Afrikaans, (76.9%) isiXhosa (17.48%), Setswana (1.60%), and English (1.63%) (Census, 2011). The district consists of secondary and combined schools that cater for life sciences learners. Of the secondary/combined schools, the majority offer life sciences as a subject, and four of these schools are targeted in this research. The Pixley ka Seme education district has the smallest number of learners of the province's districts. This study is intended to contribute to the ongoing discussion around curriculum implementation, with particular focus on factors that influence the processes needed to guide the curriculum path followed by teachers under study. I was also able to have valuable contact with the life sciences teachers in the district as I hailed from the same district. We share a common understanding of the challenges and socio-economic problems that might influence the current research.

### **1.5 Personal and academic rationale**

The rationale of the current study is divided into a personal rationale and an academic rationale which provides the reasons for engaging in the research in the first place. Many teacher- researchers use a rationale to explain how the research emerged. On the one hand the impetus for this study emerged from my own personal experience as a life sciences teacher, my observation of other teachers, and my observation of the prevalent instructional practices in the area and on the other hand

I try to understand and look for answers to the “curriculum fatigue” we have experienced over the past two decades as teachers in South Africa.

### **1.5.1 Personal rationale**

Ballenger (1992) emphasises the importance of research questions that emanate from the lived experience of a person engaged in a particular activity e.g. a life sciences teacher/researcher attempting to implement CAPS. First, my personal rationale for this investigation stems from my own personal experience as a life sciences teacher undertaking a doctoral study in science education in a South African University. Second, I was asked by my first supervisor to share what I learned from reading a doctoral thesis titled, “*Teachers’ Experiences of Implementing the Further Education and Training (FET) Science Curriculum*” with other masters’ students at a departmental seminar. Third, in the face of continued poor performance of life sciences learners in the matric examination, I felt compelled to find out more why life sciences teachers were not favourably disposed to CAPS and what could be done to mitigate the unsavoury situation and so on. The poignant question confronting me then was, “Why do the life sciences teachers so vociferously opposed the new curriculum?”

In 1996, I started my career as a biology teacher in a disadvantaged school in the Free-State. The casual exploratory phase of my investigation began with my role in the implementation of C2005, which was introduced in 1997. My growing awareness of the challenges associated with C2005 equally motivated me to take a closer look at the preparedness of the teachers who were supposed to implement it. As time went on, C2005 pushed the entire discourse of curriculum implementation and transformation to the centre of education reform in the late 1990s. It also became obvious that there could be no genuine transformation in the education system if there was no consensus among the stake holders especially between the curriculum planners and the teachers who would implement the curriculum in their classrooms.

According to Langenhoven (2014) the new South African natural science and life sciences curricula, which were at the time concentrating on the potentially problematic reconciliation of standard ‘Western’ school science with indigenous knowledge (IK), presented new and complex difficulties for many teachers. The outcries from science teachers in particular about C2005 were neither random, nor without basis. They represented a collective response indicating teachers’ unhappiness about the new science curriculum whose aim was the inclusivity rather exclusivity of all relevant knowledge corpuses. For instance, the new curriculum encouraged science teachers to include learners’ local or indigenous knowledge with canonical school science in their lessons notwithstanding the apparent conflicts between the two. In agreement with Langenhoven (2014), I

am of the opinion that the new life sciences curriculum should improve teaching and learning with a reframed and well-thought-out emphasis on the blending of relevant aspects of a science-IK curriculum with school science.

A student entering the FET phase can take life sciences as one of the elective subjects in certain schools or as a core subject in other schools. This subject can be taken for the National Senior Certificate (NSC) examination conducted and certified by the DBE. As indicated by the Department of Basic Education (DBE) survey of the results, learners in many schools are not performing well in their Grade 12 life sciences examinations, and this has led me want to find out where the problem lies and what can be done to ameliorate the situation. Questions that arose in my mind include: (1) Are learners' poor performance in the matric life sciences examination due to poor teaching strategies? (2) Do the teachers' lack subject content knowledge? (3) How motivated are the teachers? (4) Do the teachers have adequate administrative support? (5) Have they been prepared adequately to implement the new curriculum? (6) Have they been part of the curriculum development process? We can go on and on but it suffices to say that no curriculum can outperform the quality of the teachers who are saddled with the task of implementing it (Ogunniyi, 2004, 2007a). My reflection on these questions led me to the exploration of the experiences and instructional practices of some life sciences teachers, whose experiences in turn might be representative of others.

One of my starting points was to examined the aims and ideals enshrined in our Constitution, and to look at how they align with the stated aims and the educational philosophy/ideals underpinning the new South African curriculum, the first version of which was introduced in 1997. The preface to the Constitution of South Africa (1996) outlines the aims of the Constitution:

Heal the divisions of the past and build up a general public that depends on law-based qualities.

Improve the personal satisfaction everything being equal.

Lay the establishments for a law-based and open society.

Build an assembled and equitable South Africa ready to accept its legitimate spot as a sovereign state in the group of countries (Constitution of South Africa, 1996).

The designers of the new curriculum, and one that aligns with the aims and ideals of the Constitution of a new democratic and just South Africa, have a significant task in realising and incorporating these aims (DBE, 2011). The current study was principally motivated by the acknowledgement that the new life sciences curriculum should offer meaning to the information, abilities and qualities worth acquiring by learners' as future citizens in South African schools. The expectation of the new



curriculum is that learners will obtain and apply information, aptitudes and values significant to them personally and to them as citizens contributing to a just and equitable society (DBE, 2011).

In my literature review, of curriculum implementation in South Africa and the work of teachers and curriculum advisers, I focused on the research that studied in-depth, theorised and elucidated, both globally and locally, teachers' encounters with issues seen by them to hamper their successful implementation of the life sciences curriculum. Based on my review of the literature I became more aware of the method I should adopt to gain more insight into the lived encounters of life sciences teachers who were engaged with implementing the new life sciences curriculum with the hope to add to the knowledge base in the area.

### ***1.5.2 Academic rationale***

Since 1994, South Africa has been making spirited efforts to redesign the curriculum with the hope to reduce the stranglehold effect of apartheid on the entire education system. The continuous curriculum changes, beginning with C2005, as described by Reddy, Dlamini and Ntshilinga-Khoza (2004), have already been alluded to earlier. Teachers were expected by the Department of Education and later Department of Basic Education (DBE) to comprehend, absorb and reflect the ramifications of the changes in their instructional practices. It was my view like other life sciences teachers that such an expectation was a tall order, so to speak. But instead of resenting the curriculum or hating the imposition from the top I saw it as an important issue warranting a closer investigation.

I began to formally investigate teachers' experiences in attempting to reflect on the expectations of the curriculum in their classroom practices in 2017. I considered that appropriate and quality training should address the necessities and desires of life sciences teachers. Bearing in mind the difficulties encountered by teachers relative to curriculum reforms, I was interested in knowing how well they were coping with the newly introduced Curriculum and Assessment Programme Statement (CAPS).

A further issue that Mack (2010) points out is that of an increasing number of teachers who started to lead with their own interpretations and practices and coming up with ways to improve their own practices. They therefore play the roles of both an external researcher and a life sciences teacher through designing approaches to creatively meet the demands of their classrooms. I was of the view that these participating teachers, and other teachers, were restless and anxious with every curriculum change as they felt the burden of being the ones having to actualise the new curriculum. In this way they became visible and accountable agents in the execution of the implementation process.

Although the Department of Basic Education (DBE) designed the new curriculum it became the responsibility of teachers to decipher and actualise the document. However, without proper training

and guidance of DBE it became a matter of survival of the fittest. In other words, the enactment of the new curriculum in line with what it was designed to accomplish depended largely on the teachers' individual and subjective perception of the intention of that curriculum. Thus, what occurred in one classroom was most probably different from what took place in another classroom or what was intended by the curriculum planners. Thus, for new or revised life sciences curriculum to be executed adequately and for equity to prevail in schooling, appropriate educational implementation became inevitable.

No doubt, the topic of the study was influenced by my perception of what curriculum revision entailed. As a beginner teacher with limited experience of curriculum changes, I had been trained in the old pre-1997 curriculum. On some occasions, I felt lost and discouraged by the various curriculum reforms and revisions. I was required to adapt to the changes from the old curriculum to C2005, then National Curriculum Statement (NCS), then the Revised National Curriculum Statement (RNCS) and finally the Curriculum Assessment and Policy Statement (CAPS) all within a period of one decade. I found the whole experience as very trying while simultaneously being uncertain of what was expected of me both in the implementation process as well as subject content knowledge and my pedagogical content knowledge.

After searching various databases, I found that no broad research in South Africa existed at the time on teachers' phenomenological experiences with regards to the implementation of the Grade 12 life sciences curriculum. However, as the study progressed, my knowledge of the curriculum development process steadily increased and my commitment to the teaching profession deepened than was previously the case. As a life sciences teacher, I had a profound interest and enthusiasm for the subject, and these factors motivated me to explore the lived experiences of Grade 12 life sciences teachers. I wished to investigate the triumphs, challenges and difficulties the teachers in this subject experienced, and hoped to be able to make helpful suggestions to other teachers as well.

## **1.6 Problem statement**

It is well documented in phenomenological research in science education in South Africa that teachers generally lack an understanding of the implementation of a new curriculum (e.g., Aloovi, 2016; Koopman, 2013; Negumbo, 2018). While these studies investigated the lived experiences of teachers, and, despite research being undertaken in the last decade on curriculum implementation, educators continued to face challenges regarding the implementation of the new curriculum (e.g., Sparapani, Calleio, Gould, Hillman and Clark, 2014; Vasconcelos, Tores, Moutinho, Martins & Costa, 2015; Zerafa & Gatt, 2014).

A review of international studies indicates that many teachers in various educational settings experience challenges in the implementation of new curricula. Potenza and Monyokolo (1999) highlighted the important role played by teachers in curriculum implementation, with their input being a requirement for successful curriculum implementation. As stated earlier, I did not come across any studies in the field of science education specifically concerned with examining the lived experiences of life sciences teachers in South Africa attempting to implement the new curriculum. This lacuna created an opportunity for me to study life sciences teachers' experiences while implementing the 'new'/revised curriculum, using a phenomenological lens.

It was my hope that findings from the study would stimulate more interest in the area. In pursuance of this goal, the study reviewed several published studies in the area (e.g., Aldous & Rogan, 2009; Hewson & Ogunniyi, 2011; Keane, 2008; Koopman, 2013, 2018). These studies indicate that, from the inception of the new curriculum, teachers have had continuous struggles implementing the CAPS curriculum. Also, as I have mentioned, the effective implementation of any curriculum largely depends on the competencies of the teachers. In other words, no curriculum implementation can outperform the competencies of the teachers implementing it. It was against this background that this study investigated the specific ways in which a group of Grade 12 life sciences teachers attempted to implement the curriculum in their classrooms.

### **1.7 Purpose of the study**

The main purpose of this study was to examine life sciences teachers' lived experiences while implementing the new curriculum known as CAPS using a phenomenological approach (Wallen & Fraenkel, 2001). Exploring teachers' lived experiences aims at:

- Illuminating the intention of the curriculum as interpreted by a group of teachers.
- Assessing the ways in which the curriculum has been implemented by teachers.
- Determining how they understood the intentions and subject content of the curriculum and the outcomes for the learners' performance.

### **1.8 Aim and objectives of the study**

More specifically, the study examined Grade 12 life sciences teachers' lived experience while implementing CAPS in terms of:

- a) Determining to what extent a group of Grade 12 life sciences teachers understood the basic intention of the CAPS.
- b) Finding out what pedagogic strategies they used to implement the curriculum.
- c) Investigating their perceptions of what implementation of CAPS entailed.

- d) Analysing the outcomes of their effort to implement the curriculum.
- e) Determining to what extent the teachers' demographical variables e.g., gender, age, teaching experience and qualifications influenced their learners' academic performance.

## **1.9 Research questions**

In pursuance of the above aim and objectives, answers were sought to the following primary and secondary questions:

### **1.9.1 Main research question**

What were the Northern Cape Province Grade 12 life sciences teachers' experiences with the implementation of CAPS?

### **1.9.2 Secondary research questions**

- a) To what extent did the life sciences teachers understand the basic intention of CAPS?
- b) What pedagogic strategies did they use to implement CAPS in their classrooms?
- c) What were their perceptions of, and experiences with CAPS?
- d) What relationships exist between the teachers' demographic characteristics and their learners' academic achievement?

## **1.10 Methodology**

According to Ritchie and Lewis's (2003), the methodology that a researcher uses is highly influenced by the aims of the research and the specific questions that need to be answered. This view helped me in choosing phenomenology as the most suitable approach to execute the study. First, it is an approach known for its flexibility and latitude to accommodate diverse perceptions of people who have been exposed to something new for which they have not been adequately prepared. Second, it is an approach that is amenable diverse challenges that a researcher might encounter along the way (Levering, 2006).

## **1.11 Theoretical framework of the study**

The Philosophy of Education with its pluralistic problem-centered approach articulates various theoretical frameworks that bring other views of how social sciences researchers could approach their research studies. According to Higgs (1995, 1997, 2000) some of these theoretical frameworks encapsulate: logical empiricism, critical rationalism, critical theory, African philosophy, phenomenology and hermeneutics. Further, these theoretical frameworks pave the way for educational discourses with regard to how methods are being used and their applicability to research

into education. In the current research study, the phenomenological approach was deployed as a theoretical framework to explore the implementation of the Grade 12 life sciences curriculum in the Northern Cape Province. In phenomenological research, locating a suitable framework is important as it can assist in addressing the research questions.

At this stage it is important to explain how phenomenology has been used in this study, given that there are a multitude of interpretations of phenomenology amongst social theorists in the literature (e.g. Appelrouth & Edles, 2012; Budd & Velasquez, 2014; Fendt et al, 2014; Finlay, 2009; Giorgi, 2008; Husserl, 1997; Layder, 1996). For Giorgi (2008) and Appelrouth and Edles (2011), phenomenology is the study of people's ability to construct and sustain meaning. Berggren (2014) and Layder (1996) view phenomenology as the way people experience their social world through their senses, and how presuppositions can change the lived experience of people. In light of this, my study was premised on the assumption that the best way to understand a phenomenon perhaps is to experience that phenomenon directly or vicariously such that one has a sense of that phenomenon i.e., one has a lived experience of it (Dimmock and Weeks, Fendt, Jenkins, Wilson, 2014).

Gibson and Hanes (2003) argued that phenomenology as a research methodology focuses on the meanings of the human experience and thus, could be used to explore human experiences within the context of education. Finlay (2009) also posited that phenomenological research methods need to recognise both the phenomenon itself and the subjective interrelationship between me and the researched. In his seminal work, Giorgi (1997) argued that the use of phenomenology can make the qualitative analyses of phenomena rigorous and scientific. A number of empirical studies have used the phenomenological paradigm to explore people's lived experiences of a particular phenomenon (Eskandari et al, 2016; Fendt et al, 2014; Gill, 2014; Rosetti & Henderson, 2013). The term 'lived experience' is used to describe personal knowledge, experience or first-hand accounts of a phenomenon gained as a result of direct involvement in daily life undertaking.

A phenomenon can be described as the actions that happen in the individual's consciousness or experience (Budd & Velasquez, 2014; Fendt et al. 2014; Gill, 2014). Layder (1996), Appelrouth and Edles (2012) and Fendt et al. (2014) trace the different approaches to phenomenology back to the original studies in the late 19th and earlier part of the 20th century of Edmund Husserl, Martin Heidegger, Max Schreder and Merleau-Ponty and to the contribution of Schön (1987). Over the years, phenomenology theorists have built on these theories of phenomenology, but the groundwork was laid by Husserl and Heidegger (Gill, 2014). Phenomenological studies have been linked to one of three distinct phenomenological approaches: the descriptive, interpretive or post-intentional

approach (Creswell, 2007; Gill, 2014). Heidegger's interpretive approach focuses on the ways in which the modus of being phenomena are constituted within particular meaning-contexts. The post-intentional approach is based on the ways in which phenomena are always in the process of changing and becoming. The descriptive and interpretive approaches phenomenology researchers have used the concept of "bridling" instead of bracketing (Soule, 2013). Bridling goes beyond the focus of an individual's preconceptions (Dahlberg, 2006). Essentially, according to Bogdan and Biklen (2003), phenomenology as a philosophy is used as a lens to elucidate the lived experience of people. For Koopman (2013), phenomenology creates a platform for individuals to exchange their life experiences with the purpose of highlighting previous misconceptions and the unknowns. These authors further noted that, by doing so, a variety of life experiences is put forward so that one can understand the research participants and the issues they are living and grappling with.

It is of importance that the research methodology of the study corresponds with the theoretical framework employed in this study. The philosophical stance for this study is based on Schön's (1987) phenomenological framework. The framework will be discussed in more detail in Chapter 2. In the phenomenological tradition descriptions are allowed to illustrate how individuals make sense of the world around them (Bryman, 2012; Husserl, 1997). Hence, the main purpose of the phenomenological framework in the context of this study will be to examine the experiences of life sciences teachers in their everyday practice. Moreover, by exploring the 'inner' experiences of teachers, one can gain insight into what their experience is like (Husserl, 1997). As observed by Anakwe (2002) and Azolukwam and Perkins (2009), teachers are confronted by the curriculum they ought to implement and the world (school) they work in, hence a phenomenological approach can help gain an insight into the world of teachers. It is therefore important in this study to understand how teachers use their experiences to create or shape the contextual structures.

Schön's (1987) important contribution to the theory and practice of learning has a significant bearing on the ways in which we understand his theory. His seminal work on learning systems aligns with the work of Argyris and Schön (1974) around professional effectiveness and organisational learning. The theoretical framework of Argyris and Schön (1974) not only addresses these cognitive and organisational barriers but brings to the fore the practice of reflectivity. In the field of experiential learning theory, Dewey, Lewin, Vygotsky and Piaget saw all learning as beginning with experience. Reflective practice then, integrating theory, practice, thought, and action, as Schön (1987) described, a "dialogue of thinking and doing through which I become more skillful" (p. 31).

Using this theoretical research framework, I approached the participating teachers and invite them to reflect on their experiences in their classrooms when they were in the process of implementing the

'new' curriculum. This framework fit in well with the Heideggerian interpretive phenomenological framework, together with traces of the work of Schön (Yanow & Tsoukas, 2009). Many qualitative researchers have used phenomenology as a research approach, but from the literature reviewed, relatively few have used the approach in science education (Lucas & Boutonné, 1997; Roth & Bowen, 1999; Roth, McRobbie; Volkmann & Zgagacz, 2004). This trend should not be surprising, since, as Creswell (1998) contended, phenomenological research is inherently difficult. Various researchers have held different views about phenomenology. Tight (2015) describes it as a research design, methodology and theory while Pang (2003) views phenomenology as a traditional empirical research method whose aim is to investigate qualitatively a phenomenon of people's experience(s) of, and responses to, a particular problem.

Marton (1986) construes phenomenological research approach in a more nuanced way. He sees it as a way to investigate the multiple and complex ways people experience or think about a phenomenon. The current study is underpinned by the theoretical tradition of phenomenology as inspired by Heidegger, and in this context, studies the lived experiences of a group of teachers (Van Manen, 1984). More recently, Moran (2000) describes phenomenology in terms of a radical, anti-traditional style of philosophising, one which emphasises my attempt to get to 'the truth', to describe phenomena in the broadest and deepest sense of whatever appears, that is, as it manifests itself to the consciousness of the experienter.

In summary, phenomenological reflection-in-action is a theoretical framework which provides a suitable framework for exploring the participating life sciences teachers' lived experiences and their reflections (consciousness and awareness) thereof in the process of implementing the Grade12 life sciences curriculum. Based on the foregoing, Schön's (1987) reflective practice theoretical framework has an important role to play in the research process.

The reflective framework of teaching and learning serves not only as a distinguishing feature of the research process, but is also critical for understanding the ways in which the two can fuse in practice. Reflective practice can be considered to be of value in seeking solutions to the challenges in curriculum implementation, particularly in a setting such as the one for this study. Experienced life sciences teachers are the main participants in the study. Experienced teachers in this study are trained teachers with an undergraduate and post-graduate university-level qualification and several years of life sciences teaching experience. The contexts in this study are the schools within which the research was conducted.

## **1.12 Significance of the study**

According to McMillan and Schumacher (2001a) the significance of a study demonstrates the essence of the study and illuminates the reasons for my development of an interest in finding out to what extent some teachers have been able to implement the new life sciences curriculum in the Northern Cape Province of South Africa. As has been mentioned earlier, neither the positive impact of curriculum change envisaged by the designers nor the negative effects of the curriculum has changed substantially the effectiveness of teaching and learning in life sciences. As will be seen later the testimonies of the Grade 12 life sciences teachers involved in the study are further evidence of what has been reported in the extant literature namely, that teachers could make or break a curriculum reform depending on how well they have been trained. I believe therefore, that studying their experiences might provide additional insights into their professional practice and why the status quo as has been reported in other studies (e.g. Connelly & Clandinin, 1999; Elbaz-Luwisch, 2007; Koopman, 2013, 2018; Olson & Craig, 2001) is still the case. To my knowledge, no similar study on life sciences teachers' lived experiences has been conducted in the Northern Cape Province. It is hoped that the outcomes of the study would contribute to the existing knowledge base on curriculum implementation in particular science curricula and curriculum reform. It is also hoped that the findings and the narratives of other life sciences teachers would be useful in assisting other Grade 12 and FET phase life sciences teachers to successfully implement the life sciences curriculum. The findings might also prove to be informative and useful to the DBE, education professionals, policy formulators, researchers, and other stakeholders.

### **1.13 Scope of the study**

The main, qualitative part of the study involved five life sciences teachers selected from four previously disadvantaged schools while 20 additional teachers were selected to complete a questionnaire which provided data for the quantitative part of the study. In addition, the latter provided the necessary contextual setting for the subjects generally. The qualitative aspect was derived from an in-depth interview befitting a phenomenological study while the context presents a broader detail of the historical and demographical make-up of the study. Groenewald (2004) regards two to ten participants as sufficient for a phenomenological study. Likewise, Boyd (2001) concurs with Groenewald (2004) that two to ten participants are adequate for reaching saturation. Two reasons dictated the choice of the Pixley ka Seme District. The first was that it provided me with a convenience sample since I resided and worked in that district. The second was that the Northern Cape Province at the time of the study was generally a rural Province and I considered that the experience of teachers in this setting would be different to that of teachers in other Provinces such as Gauteng, Free-State, or the Western Cape.



### **1.14 Delimitation of the study**

Ogunniyi (2011a) describes the delimitation of a study as having to do with the scope of the study. He views delimitation as providing the focus for the study; otherwise, the study might venture into issues beyond the ambit of that study (Ogunniyi, 2011b). In light of this, the nexus and focus of the study was the process of coming to an understanding of the lived experiences of life sciences teachers in a pedagogic process of implementing the Grade 12 life sciences curriculum in the Further Education and Training (FET) phase. In order to demarcate the boundary of the study, it is imperative to state that this study has looked specifically at life sciences teachers' implementation of the Grade 12 life sciences curriculum. The experiences of the study participants are based on their particular narratives.

### **1.15 Limitations of the study**

This study was confined to only one education district out of the five districts in the Northern Cape Province. It is understood that teachers from other districts in the province within the same discipline may not necessarily report the same data as the teachers participating in this study. If further studies were to be conducted with the rest of the life sciences teachers in the province or the country, they might not only yield different results but may also prove to be more comprehensive. Language was another factor which posed a limitation to the research process. Teachers participating in the research study had Afrikaans as their language of instruction except for one teacher, and yet all the data collection tools were in English. The mother tongue of four of the participants is Afrikaans, while that of the other participant is isiXhosa.

The interview and questionnaires were presented in the participants' second language namely, English, rather than in their mother tongue(s). This might have made it difficult for the participants to express their views as fluently and as clearly as might have been the case. Afrikaans is the dominant language of the district. Though relevant, the learners' viewpoints were not explored as this might go beyond the scope of the study. Therefore, the participants were limited only to life sciences teachers and their experiences with the new curriculum.

### **1.16 Structure of the study**

This thesis consists of six chapters, including this introductory chapter. Chapter 1 provides the introduction and orientation to the study, together with the problem statement of the research and sets the context of the study. The phenomenology conceptual framework underpinning the research methodology is outlined and explained, including its historical roots and its appropriateness for this study. The research questions are presented and the research design described.

Chapter 2 provides insights into recent developments in curriculum reform and implementation and presents a review of the literature pertaining to curriculum reform in general and the ‘new’/revised life sciences curriculum in particular. This chapter focusses on the CAPS FET phase life sciences curriculum as part of the history and the conceptual framework underpinning curriculum implementation research.

Chapter 3 offers a description of the research method and methodology employed to answer the research questions and achieve the aims and objectives of the study. The chapter also includes the justification for the choice of a mix-methods phenomenological research approach. The chapter concludes with an outline of the ethical considerations of the study.

Chapter 4 focuses on the explication process of the data.

Chapter 5 presents a discussion of the results in relation to the extant literature.

Chapter 6 is the concluding chapter and presents a summary of the findings.



## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

The current study attempts to provide a reflection on the experiences of the participating teachers and the realities of dealing with the implementation of the revised life sciences curriculum. The previous chapter discussed the appropriateness of using phenomenology as a research methodology and theoretical framework for understanding the participating teachers' daily experiences. The origins of interpretive phenomenology underpinning this study are briefly discussed in this Chapter. The aim of this chapter is to establish some appropriate philosophical and theoretical frameworks for the study.

In the first section of this chapter, the theory of phenomenology is presented and unpacked to describe the daily realities of the participants. More specifically, the study draws on Schön's (1987) notion of the teacher as a reflective practitioner, where the teacher is a technician implementing a giving curriculum, and the "lived-experience" theory of Husserl, (1990) to give teachers a voice and share their daily experience in implementing the curriculum. To this end, this study will provide life sciences teachers the opportunity to express what they experienced while implementing the new curriculum.

The second subsection will give a historical overview of the South African curriculum implementation. This is followed by a discussion of the Grade 12 life sciences curriculum. The third sub-section will examine factors affecting the implementation of the curriculum and the factors that hindered the successful implementation of the curriculum. Reference is made to the demographic details of teachers involved in the study. Also, this part discusses different approaches to curriculum designs (intended, implemented, perceived and attained) as used in the current research study and how such concepts differ and are interrelated. The fourth sub-section describes the nature of lived experience and will review phenomenological studies conducted in the field of science education. Finally, the last section explains the data explication framework used to analyse the findings.

As indicated in Chapter 1, phenomenology forms the central focus of this study. However, it is apposite to state that since different people attach different meanings to phenomenology, it is imperative to indicate which one was adopted for the study and in particular, Schön's (1987) phenomenological theoretical framework namely, reflection-in-action was adopted for the study.

### **2.2 Phenomenology**

Social theorists (e.g. Appelrouth & Edles, 2012; Budd & Velasquez, 2014; Dimmock, Fendt, Finlay, 2009; Giorgi, 2008; Husserl, 1997; Jenkins, Layder, 1996; Weeks & Wilson, 2014) hold different

views of phenomenology. Certain scholars (e.g., Appelrouth & Edles, 2012; Giorgi, 2008) define phenomenology as the study of how people view the world. Others (e.g. Berggren, 2014; Layder, 1996) construe phenomenology as how people make sense of, and understand the social world and how it can shape the lived experiences of individuals. In other words, a ‘phenomenon’ can be best understood from how an individual experiencing what has been lived (Fendt et al, 2014). A phenomenon is regarded as anything that happens within individuals in their conscious experience, therefore it is for this reason that Fendt et al (2014) argue that a phenomenon only exists if the individual experience is present. Budd and Velasquez (2014) as well as Gill (2014) share a similar view.

The different definitions of phenomenology can be traced back to the work of Edmund Husserl (1859-1938), Martin Heidegger (1889-1976), Max Scheler (1874-1928), Jean-Paul Satre (1905-1980), Maurice Merlau-Ponty (1908-1961) and the works of Schön (1987) as well as Alfred Schutz (1899-1959) (Appelrouth and Edles, 2012; Bryman, 2012; Creswell, 2007; Fendt et al, 2014; Layder, 1996). Many social theorists formulating their philosophy of phenomenology drew on the work of Edmund Husserl or Martin Heidegger (Gill, 2014). To most theorists, Edmund Husserl (1997) was the ‘fountainhead’ of phenomenology; though Alfred Schutz was probably the first to come up with the philosophical idea in the social sciences (Budd and Velasquez, 2014; Fendt et al., 2014; Giorgi, 2008).

Phenomenologists appear to struggle in framing phenomenological approaches (Fendt et al., 2014). In this regard, phenomenological studies are either classified as Husserlian or Heideggerian (Creswell, 2007; Gill, 2014). The fundamental differences in these two approaches are located in Husserl’s descriptive method which suggests that a social researcher suspends his/her preconceived views in order to avoid influencing the process of finding empirical data (Fendt et al, 2014). To describe this phenomenon, Husserl (1997) explains it as an epoché which refers to bracketing or suspending one’s own views and understanding of the social world.

In reference to Husserl’s framework, Giorgi (1997) makes a case that phenomenology is qualitative in nature which provides social researchers with rich and thick description of a phenomenon as it is being experienced. Giorgi (1997) posited that it is different from other qualitative methods in that it focuses on subjective data in four areas. He listed the four areas as: (1) all phenomenological researches should be meticulously descriptive; (2) involving the reduction of phenomena; (3) exploring the intentional relationship of agents with structure and culture; and (4) revealing the fundamental nature or patterns of meaning embodied in the human experience.

Van Manen (2007) opposes Giorgi's (1997) view by contending that the interpretative phenomenological approach is concerned with a deep-rooted interpretation of the world in the form of languages and social relations which in turn is intrinsically connected to how we make sense of a phenomenon. In fact, interpretative phenomenology proposes that researchers can use different types of data including one's own personal experience (ibid.). For ease of reference, I have displayed in Table 2.1 below some pertinent differences between the descriptive and interpretative phenomenological approaches.

**Table 2.1: A Comparison of Husserlian and Heideggerian phenomenology Approaches**

Husserlian phenomenological Approach	Heideggerian phenomenological Approach
Descriptive	Interpretive
Questions of what is known	Questions of what is experienced and understood
Mechanical view of person	Person is viewed as a self-interpreting being
Person lives in a world of objects	Person exists in and is part of the world
Analysis focuses on the meaning given to subject	Analysis is the relationship between the subject and the situation
What is shared is the essence of the conscious mind	What is shared is culture, history and language
Meaning is untouched by the interpreter's view of the world	Interpreter's worldview plays a role in interpreting data
Subject's meanings can be reconstituted by perceiving data to speak for itself	The interpretation of subjects' meanings can only highlight what is already understood
Strict procedures of interpretation guarantee validity	

Source: Fendt et al, 2014

Notwithstanding the fact that there are differences in the opinions of phenomenologists as highlighted in Table 2.1, there seems to be a general agreement among researchers that the phenomenological research is primarily concerned with investigating the lived experiences of people (Budd & Velasquez, 2014; Fendt et al, 2014; Finlay, 2009; Giorgi, 2008; Van Manen, 2007). Therefore, the view taken in this study considers the reflective and interpretative phenomenological positions of the phenomenon under study in the social world (Finlay, 2009). This is done to dispel

the notion of Husserlian's bracketing of previous knowledge of worldview and to clearly define the role of bracketing in this study (*ibid.*).

Van Manen (2007) has argued that it is not possible to completely bracket one's own idea of what constitutes the social world. To bridge the gap, Finlay (2009) argues that phenomenological researchers could engage in a dialectic movement between suspending any prior knowledge and exploring it reflexively as a source of knowledge. Finlay (2009) and Van Manen (2007) concur with this view. Finlay (2009) is of the opinion that phenomenological research should be responsive to the phenomenon under study. Phenomenological research as research methodology should therefore make use of rich and thick description of the 'lifeworld' or lived experiences (Anosike et al, 2012; Appelrouth & Edles, 2012; Bryman, 2012; Ehrich, 2005; Englander, 2012; Finlay, 2009; Giorgi, 2008; Husserl, 1997; Layder, 1996; Van Manen, 2007).

In the phenomenological approach, the lifeworld is representative of human activity which is often downplayed in everyday life. Conscious of the lifeworld is the notion that individuals and the world are inextricably link to the lived experiences of individuals (Budd & Velasquez, 2014; Giorgi, 1997; Husserl, 1997; Sandberg & Dall'Alba, 2009). As such, the lifeworld becomes the social world of individuals (Sandberg & Dall'Alba, 2009). It is for this reason that phenomenology seeks to locate all human activity within the lifeworld (Smith, 2004). The phenomenological approach adopted in this study draws on Schön's (1987) phenomenological theory of reflection-in-action as well as the interpretive phenomenological perspective (Fendt et al, 2014; Finlay, 2009; Van Manen, 2007) which places emphasis on the lived experiences of teachers as they attempted to implement the Grade 12 life sciences curriculum in their classrooms.

### **2.2.1 Defining phenomenology**

Williams (2021) suggests that the study of phenomenology refers to what can be experienced. According to the author it is difficult to settle for one definition. Social theorists (e.g., Appelrouth & Edles, 2012; Budd & Velasquez, 2014; Fendt *et al.*, 2014; Finlay, 2009; Giorgi, 2008; Husserl, 1997; Layder, 1996) have diverse views about phenomenology. As a result, there is a plethora of definitions for the term and consequently it has been extensively defined in the literature, with a view of using it as a research method or as a theoretical/conceptual framework. In this study, phenomenology is construed as a theoretical framework which attempts to explicate life sciences teachers' experiences and the manner in which such experiences are presented (Sokolowski, 2000). For Smith (2008), phenomenology is the study of structures of consciousness through the lens of an individual. Addyman (2009) describes phenomenology as the science of lived experience while Koopman (2013) views phenomenology as a philosophy that is concerned with lived experiences of humans.

According to (Appelrouth & Edles, 2012; Giorgi, 2008) phenomenology can be viewed as the study of how people actively make and sustain meaning. Generally, phenomenology relates to how people construe the social world (real world) or a specific phenomenon through their senses, and how these perceptions can give shape and meaning to peoples' lived experiences (Berggren, 2014; Layder, 1996;). Therefore, it can be inferred that a 'phenomenon' can only be understood from the experience of the individual (Fendt *et al.*, 2014). As stated in Chapter 1, the different definitions of phenomenology in the literature can be traced back to the work of Edmund Husserl (1859-1938), Martin Heidegger (1889-1976), Max Scheler (1874-1928), Jean-Paul Sartre (1905-1980), and Maurice Merleau-Ponty (1908-1961) (Layder, 1996; Creswell, 2007; Appelrouth & Edles, 2012; Bryman, 2012; Fendt *et al.*, 2014).

### **2.2.2 What constitutes phenomenology?**

The term phenomenology refers to both a philosophical movement and different research approaches (Kafle 2013). In phenomenology, the lived experiences of people must be grounded in those people's experiences of that social reality (Gray, 2011). I will start to give an overview of phenomenology, including Schöns' (1987) phenomenological theory of reflection-in-action, followed by Husserl's (1990) theory on phenomenology and lastly Heidegger's (1967) interpretive philosophical phenomenology.

### **2.2.3 Overview of phenomenology**

Various philosophers such as Kant, Hegel, Heidegger and Husserl use phenomenology in different ways. For the purpose of this study, phenomenology is construed as the individual's experience while implementing a given activity or programme e.g., the life sciences curriculum. The term phenomenology is derived from the Greek word "*phainein*", which means to appear, and it was first used by Immanuel Kant in 1764. Since the aim of this investigation is to portray the lived experiences of Grade12 life sciences teachers as they implement the curriculum in contemporary South Africa. Phenomenology is appropriate for the research, because it concentrates on human experience as the object of the research (Marton, 1986; Van Manen 1990). Racher and Robinson (2003) depict phenomenology as a way of thinking, an approach and an exploration strategy.

Phenomenology has its foundation in the way one comprehends the meaning of a phenomenon by means of descriptions (Van Manen, 1990). It is for this reason that phenomenologists use the data regarding the participants' subjective experiences. Inductive analysis strategies are then used to reduce the data to themes. These themes are a reduction of the data and capture the main points. For Polkinghorne (1983), themes serve as important structures of human experience. They act as

organising principles in order to make sense of experience and allow us to decipher one experience from another. In this study, phenomenology is also considered as a research methodology. It is expected of phenomenological researchers to explain fundamental implications in our lived experiences that might be underestimated (Giles, 2008). Phenomenological research is about the investigation of experiences as they are lived, which is anticipated through an individual's cognisance (Lakateb, 2014). As indicated by Brentano, awareness is a movement between the dynamic subject and an object he is aware of (Roche, 1973).

According to Woodruff (2013) phenomenology alludes to the investigation of structures of awareness as experienced from the individual perspective. It centres on depictions of what individuals experience and how they are encountering specific phenomenon. The experience is coordinated towards an item or object by virtue of its content (Aloovi, 2016). Merleau-Ponty (1964) depicts phenomenology as a philosophical technique of watching and deciphering lived understanding through distinctive and point by point portrayals. This infers that consciousness means consistently being conscious of something. In this study, I have sought to explore the awareness of the Further Education and Training (FET) phase life sciences teachers about their experiences as they implement the FET phase life sciences curriculum. But before elaborating further on the theme of phenomenology, I shall briefly discuss some related concepts.

#### **2.2.4 Intentionality**

There is a relationship between perception and objects according to Husserl (1970). Human consciousness is able to create the object of the experience. Humans are constantly thinking about something with consciousness. Consciousness however, never stands alone. Perceiving an object or event is necessary (Holstein & Gubrium, 2000). It is for this reason that Husserl (1931) believes that intentionality is one of the corner stones of phenomenology that directly refers to consciousness. Intentionality can be described as an intentional act such as going to the shops for a purpose. It does not infer that one does something without considering it, such as reading the licence plates of a car that drives in front of you. Aristotelian phenomenology terms "intention" as the orientation of the mind (Kolkemans, 1967; Moussakas, 1994).

Further, intentionality reflects the relationship between the object and appearance of the object in one's consciousness. In this study, the phenomenon is teachers' experience of implementing the curriculum. Implementing the curriculum is an intentional experience on the part of teachers. Therefore, the act of experience is related to the meaning of the phenomenon under investigation. The importance of the phenomenon is derived from the act of teachers' experiences with the implementation of the curriculum. In the phenomenological tradition, intentionality has two



perspectives, namely: noema and noesis. Noema is the object of experience reflecting the perceptions, emotions, memories and judgement about the object. The noesis on the other hand refers to the act of experience that is directed to the meaning of the phenomenon. In this study, while curriculum refers to the noema of the experience, implementation is the noesis of the experience. Noema and noesis coexist and cannot be separated. They are used in an interrelated way; the one is dependent on the other (Cilesiz, 2010).

### **2.2.5 Epoché**

The word epoché originated from the Greek meaning ‘to stay away’ or to ‘refrain’ from one’s own presupposition or judgement about the phenomenon under investigation (Langdrige, 2007; Moussakas, 1994). Epoché requires me not to be judgemental when faced with a known object, but to set aside my own preoccupation with the phenomenon. It is for this reason that research in the phenomenology tradition does not make any hypotheses or inferences as is the case with quantitative research. According to Langdrige (2007) epoché is a way to empower me to describe things and set aside my own attitude or opinion or other assumptions that I may possess about the real world or a phenomenon. In sum, epoché expects me to be free of any bias and to explain the phenomenon from a bias-free and objective perspective.

In analysing the data, I should allow the process of epoché to prevail. This effectively means that in studying the phenomenon under investigation I should put aside (bracket out) my own experience and knowledge regarding phenomenology. By maintaining an attitude of significant distance, I will be able to collect a less biased data set than would have otherwise been the case. In other words, I become less judgemental about the phenomenon under investigation and in this case the success or otherwise of the implementation of the curriculum by teachers. I should set aside the experience about the implementation of the curriculum. With the above explanation, it is now apposite to elaborate more on the central concern of the study, i.e., phenomenology.

## **2.3 Adopting a phenomenological approach**

The philosophical approach employed in this research study has been guided by the research questions which seek to understand the life sciences teachers’ lived experience within a specific contextual lifeworld, that of the South African education system. From existing approaches in research, phenomenology seems to be an appropriate philosophical approach to study teachers’ (an individual) lived experiences within any social context (Fendt *et al.*, 2014). It is only in a phenomenological approach that individuals who have encounter a certain phenomenon can give an account as it was experienced, therefore a phenomenon can only be known from the experience of an individual’s perspective (Fendt *et al.*, 2014; Husserl, 1997; Mapp, 2008; Merleau-Ponty, 1945).

In the phenomenological tradition it is possible to study teachers in their work setting who are inter-subjectively linked by being human agents with an inner consciousness and shared purposes (Budd and Velasquez, 2014). According to Budd and Velasquez (2014) it is equally important to understand that the connection should be incidental (in that all participants belong to the same organisation and share common goals and objectives). Similarly, Anosike, Ehrich and Ahmed (2012) have argued that phenomenology can be applied as a research method for any educational phenomena. Anosike *et al.* (2012) also posited that phenomenology as a scientific qualitative inquiry method can be applied to generate a thick, deeper and richer understanding of practices.

Ehrich (2005) and Shaw (2010) claim that a phenomenological framework brings a different and new understanding to research. However, as I have stated earlier, studies demonstrating the application of phenomenology in life sciences are extremely few and certainly not in the Northern Cape Province where the study was carried out. The few that have been carried out in South Africa have focused mainly on physical science education and accounting education (Koopman, 2013, 2018). Advocates of phenomenology (e.g., Anosike *et al.*, 2012; Appelrouth & Edles, 2012; Englander, 2012; Fendt *et al.*, 2014; Finlay, 2009; Giorgi, 2008; Husserl, 1997; Koopman, 2013, 2018; Layder, 1994; Van Manen, 2007;) believe that a study is 'phenomenological' only if it displays rich descriptions of the lived experience of an individual. Gibson and Hanes (2003) consider phenomenology as a research methodology that can direct studies and assist explaining the human experience. For Gibson and Hanes (2003) phenomenology as a methodology can be employed to illuminate in-depth insight and features of the consciousness of workers (teachers) to reveal their experiences.

Finlay (2009) emphasises that there should be an alignment between phenomenological research methods, and the research participants. In Giorgi's (1997) view, the use of the phenomenological methodology can make the qualitative analyses of the research both rigorous and scientific. Giorgi (2008) and Finlay (2009) argue that the methodology employed in a phenomenological study is inherently of a qualitative nature and that a lived experience does not always mean an objective narration of events. This is because objectivity frequently means trying to explicate an event or experience as distinct from its related surroundings. In the next sub-section, the theorising of the lived experience as experienced by individuals will be put into context. The concept of lived experience stands central to phenomenology as an approach and theoretical framework in this current study. Moreover, lived experiences of teachers are the foundation of this study.

## **2.4 Theorising teachers' lived world and lived experiences**

The introduction and implementation of the Curriculum and Assessment Policy Statement (CAPS) within the South African education system have pushed the whole matter of the curriculum and curriculum implementation to the foreground. At the time of this research study there was still a lot of uncertainties about CAPS. In its current form CAPS is the only official policy document that dictates teaching and learning in schools in South Africa. This study was not only about the implementation of the life sciences curriculum generally, but to determine to what extent Grade 12 teachers understood the basic intention of CAPS. It also wanted to find out what pedagogic strategies they used to implement the Grade 12 life sciences CAPS. In addition, the study was concerned with investigating the teachers' perceptions regarding the implementation of the CAPS. Lastly the study was interested in analysing the outcomes of their effort to implement CAPS as well as assessing learner performance. Evans (2000) found that policy makers produce curriculum policy change with little or no consultation with teachers who are the implementers of the curriculum. In this regard, certain scholars (e.g., Brodie, Zaheera & Modau, 2009; Hargreaves, 2002) caution that, such lack of consultation tends to impact on the success of curriculum implementation negatively and hence curriculum planners need make a paradigm shift. Teachers interpret and interact with the curriculum through the lenses of their own experiences, beliefs, theories, dogmas, and so on (Koopman, 2013). This results in teachers producing their own understanding of policy and the curriculum, differently from what is intended.

No education system is more important and bigger than the calibre of its teachers (Ogunniyi, 1986). Teachers are the implementers, interpreters and analysers of the curriculum. Therefore, it is inevitable that standards will drop because of the attitude, passivity and internalised resistance that teachers might show towards curriculum policy change. The perceptions of teachers and their personal disposition and feelings towards the curriculum are fundamental for effective curriculum implementation (Koopman, 2013). Fullan (1992) is of the view that to understand the subjective world of teachers is a necessary pre-requisite for effective curriculum implementation. The subjective way helps an investigator to see how: (1) teachers mitigate meaning through assumptions and perceptions; and (2) they go about attempting to realise the educational goals. Therefore, teachers must be consulted in the formulation and design of a new curriculum instead of being at the receiving end only. Life sciences teachers being central in this current research study, I will now present teachers' lifeworld and that of their lived experiences as I understand it based on my perusal of the literature. Although phenomenologists (e.g., Anosike *et al.*, 2012; Finlay, 2009; Giorgi, 2008; Van Manen, 2007) agrees that research that involves phenomenology also involves the lifeworld or lived experiences, however there seems to be less agreement on what the focus of such research should be.

This study explored the experiences of teachers, which is viewed as an essential feature of the education system in South Africa or any education system for that matter. Based upon the theoretical framework of this study, teachers in this study lifeworld consists of the institutions they teach in and the policies and practices as they are conceptualized or reflected upon by teachers (Husserl, 1997; Van Manen, 2007). In addition, the focus of a phenomenological research is on the lived experiences of teachers. In order to address the research questions (set out in Chapter 1), this study will focus on teachers' lived experiences as they implemented the curriculum, therefore it becomes imperative to reiterate that all lived experiences take place within the confines of the lifeworld and likewise the lifeworld is the collective human activity which informs people's lived experiences (Husserl, 1997; Van Manen, 2007). Although teachers' life-worlds and lived experiences are somehow interrelated, nevertheless, they are distinct in certain respects (Husserl, 1997; Finlay, 2009).

## **2.5 Delineation of the phenomenon under research**

Wertz (2005) stresses the significance of delineating a phenomenon in a phenomenological inquiry and clarifies this component of the research process as “locating and delineating” the presence of phenomenon in the world. Todres and Holloway (2004) term the process as “articulating an experiential wonder for intrigue.” They explain that, during this stage, I should “recognise and make explicitly clear the underlying interest and plan” (Todres & Holloway 2004). This idea is supported by the philosophical affirmation of Husserl (1931) whose view is that the start of our comprehension is informed by our human embeddedness and cooperation in the experiential life (Todres and Holloway 2004).

The beginning stage for me is to discover a phenomenon of intrigue that highlights the importance of lived understanding (Todres, 2005). Out of moral concern, I must locate a phenomenon that is both significant and relevant (Todres & Holloway 2004). The subject for delineation outlined in the investigation is curriculum implementation. This topic has been viewed as applicable and intriguing as curriculum implementation has been hailed for its role in advancing quality education in the context of the South African education system. As such, this study is timely and the results would be of great importance in shaping the landscape in this field. A literature review in a phenomenological study explicitly serves to “find the point and the topic in a general manner that can be associated with ordinary human concerns and directions” (Todres & Holloway, 2004, p. 84).

A researcher's concern incorporates personal and academic interest. In this study, the phenomenon curriculum implementation has emerged from a variety of factors, including my own personal experience as a life sciences teacher and enthusiasm for both curriculum implementation and

phenomenology as a research strategy. A phenomenologist is careful and has an unequivocal interest and a known agenda. However, the research process should dictate and outline the limits of the phenomenon (Wertz, 2005). From the foregoing, it is evident that the purpose of the literature review in a phenomenological study is to elucidate not only the theoretical boundaries of the phenomenon of interest but also my interests and agenda in the analysis (Fry, 2016).

## **2.6 Schön's phenomenological theory of reflection-in-action**

Schön (1987) is of the view that education should be built on further advancing the teacher's (practitioner's) ability to "reflect-in-action", which means that learning takes place while doing and enhancing the ability for learning on a continuous basis and the solving of problems throughout. Schön's notion of reflective practice is a reaction against the instrumentalist application of teaching, where the teacher is seen as a technician implementing others' knowledge in practice (curriculum). It is for this reason that there is a need for change – a change from a technical rationality model towards a model that encourages internalisation (Pitsoe & Maila, 2013).

Drawing on Schön's theory of reflective-in-action, I argue that curriculum implementation should be approached from a reflective practice perspective. Reflective practice is promoted by many professionals in all fields. It is usually accepted as being a critical component across sectors ranging from the education sector and health-related sectors to social security. Thus, my obsession with reflection-in-action is because of the influence of Donald Schön's and John Dewey's work, which seeks to address a technical rationality.

Reflection, revision, evaluation and critical dialogue are central dimensions to curriculum implementation. They are essential for the improvement of South African classrooms, where the curriculum is being implemented. Increasingly, trends in curriculum implementation discourses are preoccupied with the work of Dewey and Schön. The reasons for this are firstly that Dewey advises teachers to take time to reflect on their experience so that they can improve learning. Secondly, Schön's notion of reflective practice is against the grain of the instrumental notion of teaching, where teachers are regarded as technicians who are implementing others' knowledge in practice (curriculum) – it is a rejection of technical rationality for reflectivity (Schön, 1983a, p. 21).

In an education context, reflective practice advocates for those teachers who reflect on the implemented curriculum to improve implementation and highlight shortcomings of the curriculum. There is a rich repository of studies related to reflection-in-action and their applications to higher education teaching and learning environments. These ideas and reflective pedagogy, and the Curriculum and Assessment Policy Statements (CAPS) in particular, do not fully address the

implementation of the South African national curriculum. My conceptualisation of reflection is my ability to think about how I experience the curriculum or my experience in general. Reflection is often regarded as “an exploration of the implications of another’s viewpoint ... to enlighten the enquirer” (Braun & Crumpler, 2004, p. 60). In light of the above, education, and more specifically the implementation of the life sciences curriculum by teachers, can be viewed through the lens of reflection-in-action.

## **2.7 The husserlian theory of phenomenology**

Husserl (1859–1938) is hailed by many scholars as the father of transcendental phenomenology, on which other forms of phenomenological methods were built during the twentieth century (Schweitzer 1983). Husserl was a student of Franz Brentano (Bernet, 2002; Holloway, 2002), who initiated the movement of the *intentional nature of consciousness*. According to Brentano, consciousness is the “unitary connection of intentional representations that are accompanied by a pre-reflexive internal consciousness” (Bernet, 2002, p. 330). For Husserl, the consciousness of an individual surpasses the factual knowledge directed towards the truth about objects (Koopman, 2013). Koopman further asserts that Husserl was responsible for developing the theory of phenomenology.

Husserlian phenomenology concentrated on the human consciousness, with a focus on whether the mind has the capacity of being aware of a phenomenon and to bring a person’s state of mind to actuality. This means that consciousness is more interested in the memory of an event which takes place at a certain time and place. It recalls events that represent different experiences imprinted on it. The human mind can recall a series of events or information through reflection. Husserlian phenomenology differs from other categories of phenomenology in that it lacks interest in the physical basis of consciousness. Husserl reflects on “consciousness (in German, *Bewußtsein*) as remembering, imagining, judging, hoping, fearing and so on. All of these words describe the level of consciousness. In other words, the Husserlian theory focuses mainly on “the human consciousness” (Husserl, 1983, pp. 80-81).

## **2.8 Heidegger’s interpretive philosophical phenomenology**

According to Laverty (2003), Husserl (1931) was the mentor of Heidegger. Laverty (2008) suggests that Husserl and Heidegger, however, differ about techniques for investigating “lived experiences”. According to Tan and Oliver (2009), Heidegger (1889-1976) accentuates a more ontological approach to phenomenology. Heidegger’s way of dealing with phenomenology is in the foundation in which the consciousness cannot be divorced from the world. Instead, he believed that the

consciousness is a combination of historical experiences. My contention, however, is that one's real-life experience is part of his/her consciousness and how he/she makes sense of that experience.

McConnell-Henry, Chapman, Frances, Husserl & Heidegger (2011) contend that Heidegger is of the opinion that humans are self-interpreting beings. This means that to have life is to listen and to make sense. Heidegger tries to make sense of the shared meaning of individuals and what is implanted by culture from infancy. Heidegger was a supporter of ontology and contented that one cannot separate ontology from phenomenology. He elaborated on Husserl's work and adjusted epistemologically-based cognisance to ontologically-based consciousness.

In an epistemological position towards portraying phenomenology, the accentuation is a way of knowing. Heidegger thought of phenomenology as being extremely inductive and clear in nature, with the spotlight falling on the subjectivity of experience. Heidegger's theory that he puts forward is about the nature of being. He conceptualises the concept of *dasien* or "being there" and the dialogue between a person and the world (Geanellos, 1999). In essence, the work of Heidegger mostly focused on the lived world. The existential phenomenology of Heidegger was expanded by Jean-Paul Sartre (1905–1980) and Maurice Merleau-Ponty (1908-1961).

## **2.9 What is a lived experience?**

In this section, I have adopted Van Manen's (1990) analogical notion of lived experience. To him, lived experience questions whether or not the phenomenology in the human sciences starts in lived experiences and in the end turns back to lived experience (Van Manen, 1990). Dilthey (1985) recommends that in its most fundamental structure, lived experiences include our quick, pre-intelligent cognisance of life: a reflexive or self-given mindfulness which is, as mindfulness, ignorant of itself. He further contends that a lived experience does not stand up to an individual as something perceived or presented, it is not given to the individual, but the truth of the lived experience is there for that individual since he/she gives a reflexive attention to it. It is only in one's thoughts that it becomes subjective.

A useful example as espoused by Van Manen's (1990) analogy is a novice teacher's experience when standing in front of a class for the very first time. The teacher is aware of the fact that the learners are staring at him/her. This feeling makes it hard to carry on normally and to talk uninhibitedly. The nearness of the learners constrains him/her to know about his/her own experience, while at the same time encountering it. This could result in some awkwardness. Be that as it may, when he/she engages in a lesson and overlooks the nearness of the learners, he/she is normally drawn into the action and forgets about the audience. In the very same vein, a teacher with years of

experience forgets about the presence of the learners as he/she goes about presenting the lesson. According to Van Manen (1990) the novice teacher is constantly aware of the learners, while the experienced teacher is unaware of (or more correctly not threatened by) their presence because he/she is used to situation. This analogy is an example of lived experience: two individuals in the same circumstances have different experiences of the same event.

It is significant to know that lived experience is the starting point of the phenomenological inquiry. The point of phenomenology is to change lived understanding (experience) into a printed articulation of its embodiment in such a way that the impact of the content happens without a moment's delay of a reflexive re-living of something significant (Koopman, 2013). Dilthey (1985) proposes that lived experience is to the spirit what breath is to the body: in other words, just as our bodies need to inhale, our spirit requires the satisfaction and development of its reality in the resonations of enthusiastic life. Lived experience is the breathing of significance. In the progression of life, cognisance inhales significance in a back-and-forth development. There is determinate reality gratefulness in the progression of living and encountering life's breath. In this way, a lived experience has a specific embodiment, a "quality' that individuals perceive all things considered" (1985, p. 35).

On the off-chance that something is called experience; its importance adjusts into the solidarity of a huge entirety. Van Manen (1990) contends that what makes the experience one of a kind is that somebody can reflect on it and discusses it as a specific structural nexus. In the next section, the origin of phenomenology will be discussed, with attention on how the school of interpretive phenomenology developed. Interpretive phenomenology will be portrayed as it pertains to origin, ontology and epistemology. In Willig's (2008) view, it is important that one clearly demarcates the school of phenomenology that will be alluded to, as the different schools have different implications for how one would conduct a study. By so doing, I consider the very important implications such a delineation process has on shaping a study.

## **2.10 The origin of interpretive phenomenology**

As stated earlier, Heidegger's view of phenomenology differed from Husserl's view about how people experience reality. Heidegger was of the opinion that a researcher sets aside previous knowledge. He further points out that the researcher form part of the research process by co-creating the account of the participant. Heidegger justifies his stance by declaring that a person's experience cannot be divorced from the setting in which the experience unfolds (Finlay, 2009; Klein & Westcott, 1994; Koch, 1995; Wojnar & Swanson, 2007). The continuous interplay between me and the setting is illustrated in the hermeneutic circle designed by Heidegger. In the interpretive



phenomenological approach, it is argued that the approach extends beyond describing the experience, as is the case in transcendental phenomenology, by making meanings that are obscured clear (Koch, 1996; Lavery, 2003; Lopez & Willis, 2004; Osborne, 1994). In the following section, interpretive phenomenology will be discussed.

### **2.11 The ontological position of interpretive phenomenology**

Interpretive phenomenology is located within the constructivist paradigm because reality is seen as being internal or “in there” (Giorgi, 2010; Lavery, 2003; Smith, 2008). According to the interpretive phenomenology, reality is located in the mind of an individual (mind-ontology). Interpretive phenomenology postulates that an objective phenomenon cannot be known because one can only know the participants’ contextual interpretation of their experience of an objective phenomenon (e.g., how teachers make sense of their experience of implementing the curriculum). Interpretive phenomenology is preoccupied with how each participant’s experience differs and how the participants make sense of their experience of the phenomenon under investigation within a typical setting (Klein & Westcott, 1994; Koch, 1995; Lavery, 2003; Lopez & Willis, 2004; Osborne, 1994; Smith, 2004).

### **2.12 The epistemological position of interpretive phenomenology**

Interpretive phenomenology postulates that an objective phenomenon cannot be known through their subjective experience. One can only know the contextual interpretations of the participants’ experience of the objective phenomenon. This implies that a subjective epistemology, in which I am required to reflect on the impact that his/her personal biases and previous knowledge could have on this study. This has allowed me to use my personal biases and previous knowledge to understand the participants’ interpretations of their experience of the objective phenomenon in relation to the implemented curriculum – the central focus of this study (Finlay, 2009; Klein & Westcott, 1994; Koch, 1995; Lopez & Willis, 2004; Wojnar & Swanson, 2007).

### **2.13 The South African curriculum and its history**

In this study, I have given an account of the trajectory that has been followed by the South African curriculum that starts with a recollection of the British rule to the current post-colonial, post-apartheid dispensation. This context helps me to understand that curriculum reform started many years ago and as such it is not geographically bound, but happen globally. In short, the central issue to be pursued in this section of the study is the relevance of a changing curriculum to the study – which I will discuss in the sections that follow. In order to position the setting of this study, it is crucial to reflect on the evolution of the South African curriculum. This section provides a brief

history of the South African curriculum, starting from its origin up until the current education and training system that we have today. Earlier versions of the South African education system were rooted in the British colonial education, which came into existence during the nineteenth century with the broadening of the British Empire. Likewise, in other British colonies, it was introduced by Christian missionaries with the sole purpose of enhancing reading skills and thus providing the grounds for training clerks who assisted with the administration of colonial rule (Raselimo, 2010). Following the defeat of the Boer Republics during the Anglo-Boer War (1899–1902), the British took control of South Africa, granting the minority dominance over the natives (African, Asiatic, Coloureds and other mix races) (SAHO, 2011). This was done to entrench British control over South Africa (Msila, 2007). Masila (2007) further states that the government in South Africa was similar to that of other British colonies in Africa and indeed elsewhere throughout the Empire. It also included the education system that was modelled on the British Empire where English was the mode of learning. Christie (1999) framed this approach as their way to enhance their language and take social control over Africans.

It is noteworthy to state at this juncture that English was made the official language of the state. The same language of instruction was used in the Cape Colony alongside Afrikaans, while it was the sole language of instruction in the missionary schools and colleges in the eastern region. Saayman (1991) defined missionary schools as religious schools managed by Christians. This was done to reinforce the culture of the British. During the initial stages of the missionary schools, teachers were imported from Britain in an attempt to westernise the Africans so that they could believe in God and attend church activities.

Christie (1999) posits that the purpose of missionary education was to liberate Africans from their backward ways as well as teach them values that represented the western lifestyle. For Labaree (2003), missionary education did not only serve an educational purpose, but also fulfilled the political mission of the British. However, Muthivhi (2010) held a different view. He contended that the missionary doctrine was largely to advance the scriptural account of the creation.

Missionary education, as was the case with the apartheid government which came later, failed to introduce a science-based curriculum. This was done to maintain social control over Africans (Muthivhi, 2010). According to (Muthivhi, 2010), the overarching motivation for not offering a science-based curriculum was based on the desire to control through omission. At the time, the emphasis of the science curriculum was on the Darwinian Theory, which portrayed the Whites as eminently superior to the natives.

In order to ensure the continuation and success of the missionary agenda, they omitted science from the curriculum. Their political mission was not only to civilise and christianise the Africans, but to keep them enslaved and subservient. The intention was lucid, and through the philosophy of Christianity, they wanted to keep the Africans compliant, obedient and submissive and to show deference. While the British was focused on taming the “barbarians” of Africa, the Afrikaners engineered their own educational system, which they implemented in the Provinces of the Orange Free-State and Transvaal after they attained independence from the British rule in 1948. This was a precursor to the Afrikaner nationalist and apartheid education system (Msila, 2007).

#### **2.14 The foundations of apartheid and apartheid education**

The South African curriculum was built on the apartheid ideology of racism and oppression (Naidoo, 2017). During the apartheid era, different legislations were used to govern the provision of education for the four cultural groups in South Africa, namely the Whites, Indians, Coloureds and Africans. These laws were the Education for the Coloured People’s Act of 1965; the Education for Indians Act of 1969; the Christian National Education Act of 1962 (for the Whites); and the Bantu Education Act of 1953 for the Africans. In all of this, a huge gap existed in the per capita expenditure on education per racial group. The amount that government spent on a white child far exceeded what government spent on a black child (Themabela, 1989).

According to Kallaway (2002), Africans (Blacks, Coloureds and Indians) experienced severe inequalities in terms of educational provisions. The education system for Blacks was designed to provide limited access to the Black child and to create a situation of social conflict that made it very difficult for the Black child to proceed and excel in life (Kallaway, 2002; Themabela, 1989). In other words, the conditions in black schools made effective transmission of knowledge difficult and disadvantaged Black learners, and, as a result, the Black children were usually at the bottom of the food chain of the economy of the country. This ensured that they remained as the main source of cheap labour.

According to Msila (2007), education and training for Afrikaners date back as far as the 1600’s. During the 1800’s, formal schooling for Afrikaners was performed by the parents and church. Some of the earliest schools in South Africa were found in the Cape Colony, which was run by the Dutch Reformed Church. After the Anglo-Boer War (1899–1902), in which the British defeated the Afrikaners, the latter became discontent with the British education system. They viewed the system as a system of oppression and a detachment of the culture. According to Kallaway (2002), the Afrikaners resisted the attempts by the British to impose a policy of Anglicisation on them. What

could potentially be seen as a response to counter the Anglicisation and alienation, the Afrikaner nation crafted its own curriculum, which came to be known as the Christian National Education (CNE).

In 1948 the Afrikaner nationalists implemented the apartheid education system with the CNE policy as the basis. The apartheid education system showed alignment to the education system that was used by the missionaries in that it was established around religion and political context (Msila, 2007). The apartheid education that was introduced by the apartheid government when they gained political power in 1948 intended to preserve what Msila (2007) described as a “master-servant relationship”. According to Gilmore, Soudien and Donald (1999), the structure of apartheid education was built around the development of separate schools for separate ethnic groups. The whole concept was based on indoctrinating people.

Kallaway (1988) points out that the learners in the formerly white schools attended veld camps where the learners were schooled and indoctrinated in the apartheid doctrine and philosophy. The introduction of the Bantu Education Act, Act no. 47 of 1953, assembled education for all Africans under the control of the apartheid Government, which introduced a national curriculum and prohibited post-primary education. Post-primary education was restricted to various homelands or Bantustans (Muthivhi, 2010). Bantu Education was designed for Black in general and Africans in particular.

The colonisation of Africa by western countries, together with the introduction of western science into the education systems of the colonies has brought with it the erosion of certain cultural values and practices of African people (Ogunniyi, 2004). Within this schooling system, the development of the Blacks was restricted and knowledge distorted to ensure control over learners and teachers. The system for the Blacks was designed to keep them political and economically docile. The apartheid government took control of what happened in the classroom and the curriculum. This was done for obvious ideological reasons. The apartheid government failed the African child as they did not provide them with a science-based curriculum (Muthivhi, 2010). The CNE was for the protection of power and white privilege and to promote the political ideology of white supremacy.

It was against this background that the South African government mapped the design and implementation of the curriculum. The most important developments in the post-apartheid South Africa were the introduction of Curriculum 2005 and the implementation of other curricula such as RNCS, the National Curriculum Statement (NCS), and most recently, the Curriculum and Assessment Policy Statement (CAPS).

## **2.15 An overview of the curriculum in South Africa since 1994**

Changes in the South African school curriculum have become a common practice since the dawn of democracy in 1994 (Bantwini & McKenzie, 2011). Education policy after 1994 has attempted to transform the South African education system and to undo the injustices of apartheid. In the following sections I will give an account of the various curriculum changes that took place in the aftermath of 1994.

### **2.15.1 Curriculum 2005 (C2005)**

According to Ogguniyi (2012) “there has been a loud outcry within the South African education fraternity following the introduction of the new curriculum. The curriculum was introduced in response to South Africa’s socio-political history which is believed to be having a contributing factor to the country lagging behind other countries in terms of international learner attainment standards”. Curriculum 2005 (C2005) reviewed twice was a result of issues raised in the NEPI report, which states that: “A new, common curriculum needs to be designed to serve all populations groups equally” (Nzimande, 1992, p. 164). Curriculum 2005 was announced by the DoE as an outcomes-based curriculum. The DoE (1997, p. 11) states that “outcomes-based development starts with the formulation of the purposes of learning and teaching and uses these as criteria for further curriculum development.” According to the DoE (1997), a great focus was placed on the shift from the traditional aims-and-objectives approach to outcomes-based education. C2005 was designed to integrate and group subjects into learning areas and to infuse subject knowledge into general everyday knowledge as experienced on a daily basis (Moadzwa-Taruvunga & Cross, 2012).

C2005 emphasised an education system whose focus is underpinned by a learner-centred and result-driven approach. According to Cross, Mungadi and Rouhani (2002), C2005 was an outcome-based education that forms part of a global education reform phenomenon, tailor made to suit South African conditions. Its origins can be traced back to Australia, Scotland and Canada. It encourages learners to discover for themselves through an activity approach. For Marsh (1993), Jansen (2008) and Pudi (2007) it was important that teachers receive decent training in C2005 and outcome-based education in order to realise the objectives of the curriculum. Pudi (2007) points out that in order for teachers to implement the curriculum in the classroom, training is essential.

The implemented C2005 and subsequent changes in the education system of South Africa have highlighted the whole matter of curriculum change and curriculum implementation. However, since its inception, there had been a myriad of uncertainties at the time of the implementation of the C2005 project. According Hoadley and Jansen (2002), teachers struggled to interpret the curriculum and to make sense of the new and complex terminology of C2005. They further point out that the

curriculum was implemented superficially in order to comply with departmental directives. The shortcomings of the curriculum led to the review of C2005 in 2000. In the next subsection, I will outline the revised curriculum that was put in place to streamline C2005.

### ***2.15.2 The National Curriculum Statement (NCS)***

The National Curriculum Statement (NCS) is the official education policy in South Africa. Beets and Le Grange (2005) noted that a working committee was appointed by the Minister of Education to review C2005. A direct result of that review process was the Revised National Curriculum (RNCS) for the General Education and Training (GET) phase and the National Curriculum Statement for the FET phase. Hoadley and Jansen (2002) state further that a new revised curriculum was introduced in 2003. The new curriculum was not meant to duplicate the syllabuses of C2005 but was expected to come up with minimum standards per grade. The purpose and focus were to identify skills and knowledge across the grades. The minimum standards are performance indicators that prescribe what learners need to achieve. Hoadley and Jansen (2002) further state that these requirements put tremendous pressure on teachers to create conducive environments in the classroom in order to achieve these standards.

During 2003 and 2005, teachers were orientated towards and trained in the NCS. The implementation started with the GET phase in 2005 and was later cascaded to the FET phase in 2006. According to Beets and Le Grange (2002), even though the review of C2005 resulted in the final version of the NCS and RNCS, the latter still had an outcome-based focus as the underpinning philosophy. In other words, the critical outcomes of the curriculum remained the same but the specific outcomes component was dropped out of the new curriculum. They also added that certain features had been made simpler. According to the DBE, the NCS (National Curriculum Statement Grade R–12 (January 2012) “represents a policy statement for learning and teaching in South African schools” and comprises the following (DBE, 2011, p. 1) :

- a) National Curriculum and Assessment Policy Statement for each school subject;
- b) The policy document, National Policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grade R–12; and
- c) The policy document, National Protocol for Assessment Grades R–12 (January 2012).

The National Curriculum Statement Grades R–12 (January 2012) replaces the two national curricula statements, namely:

- Revised National Curriculum Statement (RNCS) Grades R–9, Government Gazette No. 23406 of 31 May 2002; and
- National Curriculum Statement Grades 10–12, Government Gazette, No 25545 of 6 October 2003 and No. 27594 of 17 May 2005 (CAPS, 2011).

### **2.15.3 *The Curriculum and Assessment Policy Statement (CAPS)***

The latest curriculum statement (or more correctly, the latest revised curriculum statement) known as CAPS was the South African government’s flagship project to bring about transformation, equality, human rights, social justice and inclusivity. Pinnock (2011) asserts that CAPS was not a new curriculum but rather an amendment of the National Curriculum Statement. CAPS forms part of the policy statement that is responsible for the teaching and learning process in South African schools. Its emphasis was on strengthening the implementation of the curriculum. It provided much more specific guidelines on classroom practice and improving assessment, teaching and learning. It guides planning, teaching according to planning and assessment.

According to DoE (2011), the pacing, sequencing and the content to be covered are provided in the new Curriculum and Assessment Policy Statements. (CAPS) is an attempt to give clear guidelines on the implementation of the NCS (De Jager 2011). This is to assist teachers with planning as well as facilitate a learner’s transition from one school to another school in terms of content coverage. The CAPS Grade R–12 clarifies in a logical manner what should be taught per term (DoE, 2011). It provides the CAPS for all the subjects from Grade R– 2 as well as the promotion requirements for all grades. CAPS as the new curriculum was implemented in different phases from 2012 for Grade 10 until its final phase, which took place in 2014 for Grade 12 in the FET phase (DoE, 2011). Furthermore, CAPS provides for the minimum that would make teaching, learning and assessment effective and improve learner attainment.

While the NSC subject statements outline what is expected from learners at the end of a learning process, they also specify what content is to be covered and how the teacher should plan, assess and teach during the time allocated for each subject. CAPS, unlike C2005 and RNCS, are specific in terms of the content topics as well as the expected annual, per term and daily targets. It reinforces the utilisation of textbooks as an essential part of the teaching and learning process as identified per subjects (DoE, 2003a). The design features of CAPS are as follows:

- a) Structure: study areas, topics and sub-topics; exemplar lesson plans and annual teaching plans assessment activities; resources are provided;
- b) Planning: exemplar lesson plans and annual teaching plans; and

c) Resourcing: the basic resources for all subjects are listed (DoE, 2011, p 2).

The challenge facing schools was to implement the CAPS curriculum. All schools are by law expected to implement CAPS. Training in and orientation towards the new curriculum are important. The training of teachers prior to the implementation of the CAPS was spaced out for each grade. Spacing as used in the context of this study refers to the distribution of multiple training sessions over time (McDaniel, Padler & Fashler, 2013).

#### ***2.15.4 The general aims of CAPS***

According to the DBE (2011), the general aims of the implemented curriculum for Grades R to Grade 12 are to: (i) focus on knowledge, skills and values that are worthwhile learning in schools; (ii) prepare and make sure learners have access to South African higher education institutions; (iii) apply principles such as: social transformation; active and critical learning; high knowledge and high skills; progression; human rights, inclusivity, environmental and social justice; valuing indigenous knowledge systems; and credibility, quality and efficiency; (iv) produce learners who are able to identify and solve problems and make decisions using critical and creative thinking; work individually as well as in a team; organise and manage themselves and their activities responsibly and effectively; collect, analyse, organise and critically evaluate information; communicate effectively; use science and technology effectively; demonstrate an understanding of the world as a set of related systems; and (v) make inclusive education accessible to all.

The South African national curriculum places more emphasis on learner-centred teaching and assessment. For instance, the implemented science curriculum has turned to innovative instructional strategies such as argumentation instruction to help teachers and learners' transition from traditional teacher-central instruction to the learner-centred methods expected in the new South African curriculum. In the latter the role of the teacher has shifted from being a purveyor of knowledge to a facilitator of knowledge. Equally, the learner has had to shift from copying down from the chalkboard verbatim for examination purposes to discussing, arguing, dialoguing and reaching collaborative consensus (Ogunniyi, 2007).

#### ***2.15.5 What is comparable and distinctive about NCS and CAPS?***

NCS and CAPS have a comparative basis as far as arranging the curriculum inside the aims of the South African Constitution. Furthermore, NCS incorporates a justification and depiction of OBE and a lot of information on the foundation and history of curriculum development since the democratic dispensation in South Africa. Much of this aligns with changing the awkward nature brought about



by politically-sanctioned racial segregation caused by apartheid education (Du Plessis, 2013a). Below are the similarities and differences between NCS and CAPS.

#### ***2.15.6 The similarities between NCS and CAPS***

Both CAPS and NCS contain a rundown of standards which repeats the estimations of human rights, inclusivity natural and social equity. Both documents keep up with a curriculum that depends on an elevated level of abilities and information. Both documents recognise the movement of concepts/skills from easy to complex.

#### ***2.15.7 The differences between NCS and CAPS***

Both documents incorporate the significance of IKS, yet these are discussed in more detail in the NCS where the limited western development of and insight is tested. NCS alludes to concomitant sociocultural issues which are not in CAPS. Both recognise differences in fundamental instructive standards. NCS-OBE is portrayed as participatory learner-centred and action-based education. CAPS focuses on empowering a functional and critical approach to learning rather than repetition and uncritical learning of given facts.

### **2.16 The Grade 12 life sciences curriculum**

In the CAPS curriculum, biology as a subject was substituted with life sciences in 2006 (De Villiers, 2011). In the current South African curriculum, life sciences can be characterised as the consideration of biotic and abiotic life forms and how they associate with each other in their characteristic setting. Life sciences, amongst other life forms provide information with respect to the skills and knowledge learners require in their everyday living. It likewise opens them up to biological studies and decisions about conceivable professions (DBE, 2011), but not to indigenous knowledge. The aim of the new life sciences curriculum was to integrate indigenous knowledge systems into the curriculum (Ogunniyi, 2004). In the literature it has come to light that in countries where attempts have been made to integrate science and indigenous knowledge into the formal curriculum all that has been done was to add some flavour to the standard account of science with certain extraneous accounts of IK e.g. the curriculum programmes designed for the North American Indians or the Aboriginals of Australia. While many of these programmes have been useful in addressing the issue of the learning styles, social patterns, the commonality of knowledge, the communal life styles and the mode of inquiry of indigenous peoples and how these enrich instructional practices have hardly been considered. This can be attributed to the general assumption that indigenous learners enter the classroom as a blank slate (*tabularasa*) so to speak (Ogunniyi, 2004, 2007a & b). However, there are challenges with the implementation of a science-*IK* curriculum in South African classrooms. Firstly,

poor directions from the policy document on how such integration should take place, secondly, there is no consultation with teachers who were the implementers of the curriculum (Ogunniyi, 2007a & b).

Life sciences assist learners with their comprehension of biological concepts, certain processes and frameworks and help them to develop fundamental assessment abilities and be able to analyse and pose inquiries and logical procedures so that they can develop familiarity with biotechnology and learn how life sciences have profited individuals. It additionally provides opportunities for them to see how people have caused damage to the environment, nature and the living beings in it. It is significant for learners to welcome the variety of biomes in Southern Africa and understand the significance of preservation so that they can become more capable residents and value the commitments made by researchers. Learners need to have scholastic and logical proficiency levels that empower them to comprehend, participate in discussions and report on organic procedures, ideas and examinations (DBE, 2011). CAPS expect learners to be able to demonstrate a lucid and in-depth environmental discourse within the life sciences (as highlighted above). More specifically, it takes cognisance of knowledge areas of life sciences.

The content in life sciences is composed of four knowledge strands (DBE, 2011). These knowledge strands are: Knowledge strand 1): Life at the molecular, Cellular and tissue level; Knowledge strand 2): Life processes in plants and animals; Knowledge strand 3): Environmental studies; and Knowledge strand 4): Diversity, change and continuity. With the teaching of life sciences, it is very important to assist learners to identify the links of interrelated topics so that they acquire a thorough understanding of the nature and interconnectedness of life. These links must apply across the different grades in the FET phase.

Teachers have the freedom to expand concepts and to design and organise learning experiences according to their local circumstances, including the availability of resources. The purpose of studying life sciences is to help learners develop scientific knowledge and understand the role science plays in society (DBE, 2011). There are three subject-specific aims in life sciences, which connect to the purposes of learning life sciences. These are: Specific Aim 1, which relates to knowing the subject content (theory); Specific Aim 2, which relates to doing science or practical work and investigations; and Specific Aim 3, which relates to understanding the applications of life sciences to everyday life, as well as understanding the history of scientific discoveries and the relationship between indigenous knowledge and science. The resources necessary for teaching life sciences are documented next to each topic in the CAPS life sciences (Grade 10–12) document in order to assist teaching and learning.

Teachers must have the appropriate qualifications to teach life sciences. The cognitive demands in assessment should be appropriate for the age and developmental level of the learners in the grade (DBE, 2011). Assessment must cater for a scope of cognitive levels and capabilities of learners. Tasks should be painstakingly designed to cover the content of the subject just as the scope of skills and the cognitive levels that have been recognised in the specific aims. The specific aims, themes, content and scope of skills in the subject should be utilised to advise the planning and development of assessments.

**Table 2.2: Weighting of cognitive demands for the assessment of content in Grade 12**

Knowing science	Understanding science	Applying scientific knowledge	Evaluating, analysing, synthesising scientific knowledge
40%	25%	20%	15%

Source: (DBE, 2011)

Regardless of whether or not the curriculum in South Africa alludes to the aims, objectives or outcomes/results, the rule of the fundamental approach remains paramount. In the event that there is a change in the naming of terminology from outcomes in the NCS for life sciences to aims in the CAPS for life sciences, it is imperative that the integrity of the subject matter is maintained. Likewise, the change should be illustrative of what may be named or changed without any loss of focus (Le Grange, 2010).

**Table 2.3: Outcomes of NCS and aims of CAPS**

Learning outcomes of NCS for life sciences	Aims of CAPS for life sciences
<i>Learning Outcome 1:</i> Scientific inquiry and problem-solving skills	<i>Specific Aim 1:</i> Relating to knowing
<i>Learning Outcome 2:</i> Construction and application of life sciences knowledge	<i>Specific Aim 2:</i> Investigating phenomena of life sciences
<i>Learning Outcome 3:</i> life sciences, technology, environment and society	<i>Specific Aim 3:</i> Appreciating and understanding the history, importance and applications of science in society

Source: (DBE, 2011)

Le Grange (2010) states that the learning results of the NCS for life sciences and the specific aims of the CAPS for life sciences are comparable. He makes two observations. The first is that both the NCS and its extension CAPS are supported by the a Tylerian way to deal with the curriculum, with the latter having a heavier touch of this curriculum approach, given its increasingly prescriptive nature as to what, when and to what extent teachers must teach various themes or topics. His second

observation is that, despite the fact that outcomes have to be extracted from the national curriculum for schools, given its heavier touch, CAPS might serve to facilitate the deskilling of teachers and cut learners off from arriving at their maximum capacity. The CAPS describe life sciences as a subject “as the scientific study of living things from molecular level to their interactions with one another and their environments” (DBE, 2011, p. 7). Table 2.4 indicates the Grade 12 life sciences content framework, better known as knowledge strands, which developed progressively over the years.

**Table 2.4: The Grade 12 life sciences content framework**

STRANDS	LIFE AT MOLECULAR, CELLULAR AND TISSUE LEVELS	LIFE PROCESSES IN PLANTS AND ANIMALS	DIVERSITY, CHANGE AND CONTINUITY	ENVIRONMENTAL STUDIES
Grade 12	DNA code of life RNA and protein synthesis Meiosis	Reproduction in vertebrates Human reproduction Nervous system Senses Endocrine system Homeostasis	Darwinism and natural selection human evolution	Human impact taught and assessed in Grade 11

### 2.17 Re-conceptualised the science curriculum

Tetsuo Aoki (1919–2012), a curriculum scholar, has influenced and re-conceptualised science curriculum internationally for over three decades within curriculum theory. Towards the late 1970s, Aoki and his colleagues at the University of Alberta, “launched the phenomenological movement and nearly singlehandedly established it as a major ... contemporary discourse” (Pinar, Reynolds, Slattery, & Taubman, 2008, p. 44). Aoki infused the science curriculum with phenomenology. He believed that both the experiences of teachers and learners are essential for effective learning. As Magrini (2015, p. 274) puts it:

Aoki’s practice of phenomenology reveals an understanding of an attuned mode of human transcendence in learning, which opens the possibility for an authentic educational experience where educators and students dwell in the midst of the curriculum’s unfolding as an ontological phenomenon.

In this study, I present my reflections on Aoki’s views on curriculum implementation and how he tried to find a balance between the three perspectives on schooling. Aoki’s (2004a) views on schools bears three hallmarks. The first hallmark is that a school should be a place of “rational thinking,” where the curriculum concentrates on cognitive skills. The science curriculum can be described as a

‘thinking’ curriculum. Aoki perceives the school as a place where both teacher and student are divided into mind and body. Teaching is seen as filling the learners’ minds with knowledge. The second hallmark of Aoki’s view is that the school is a place for doing and focusing on practical training and skills with the purposes of preparing the learners for the work place.

The school curriculum is market-orientated and produces the workforce for the market. It should be noted that the two perspectives describe schooling as a technicist education. Aoki (2004b) explains in his work entitled, *the dialectic of mother language and second language*, in which the acquired knowledge is obtained instrumentally. The technicist view of education is what Freire (1968) described as the “banking concept” of education in which a key point is highlighted. In this this type of education, the teacher deposits the knowledge into the “accounts” of the learners whether it is of any value to students or not is of course another matter altogether; and hence the knowledge easily becomes obsolete. Magrini (2015) concludes that for many teachers, the curriculum in these perspectives become a commodity dispensed by teachers and consumed by students.

Aoki (2004a) describes a school mainly as “being and becoming” (p.21). Such a school, he claims, is one that nurtures the becoming of human beings. This type of school neglects ‘doing’ but focuses more on the togetherness of ‘doing’ and ‘being’ of individuals. This is the third view of Aoki’s theme of ‘inspired curriculum’, which reinforces the notion that learners do not comply to the curriculum, as the case is with the ‘technicist’ view of education, but rather give direction to the curriculum once it is implemented (Okyere, 2018). This is a clear indication that Aoki is not against the curriculum-as-plan, but that he has difficulties with how the curriculum is implemented. According to Aoki’s view on curriculum implementation, teachers and students should be given power and freedom to select their own curriculum-as-plan to their own experiences and situations. The current life sciences curriculum in South Africa resonates with the second view of Aoki, where teachers deposit knowledge in the “bank accounts” and extract from the account when they write examination. The aim of this study is not to evaluate the outcomes of implementation of the life sciences curriculum; instead, it is concerned with finding out about the concrete world in which life sciences teachers work as they implement the curriculum.

## **2.18 Conceptual framework for curriculum implementation**

The discourse that is being used for curriculum implementation is what is known as the pedagogical discourse (Parker & Adler, 2005). The approach to this subsection is informed by Rogan and Grayson’s (2003) conceptual understanding of curriculum implementation. It augured well for this study as it explores teachers’ experiences of implementing the life sciences curriculum. The

construct of profile implementation (Rogan & Grayson, 2003) is used in this study. Different levels of implementation are set out, each with a sub-construct (Rogan & Grayson, 2003). For the implementation of curriculum, this is an appropriate conceptual framework because it is relevant to science education in the context of a developing country like South Africa.

## 2.19 The constructs of profile implementation

Rogan and Graysons' (2003) theory of curriculum implementation began with innovation in schools consisting of three prominent aspects, also referred to as constructs. Curriculum implementation can be better understood through the following flow diagram (Figure 2.1).

The curriculum implementation thread that is displayed in Figure 2.1 is braided between three main constructs: (i) outside influences; (ii) capacity to innovate; and (iii) profile of implementation. It also shows the sub-constructs and their respective links. No curriculum stands aloof by itself. It is influenced by various sources and interested parties and/or stakeholders: learners who are to be taught, teachers whose responsibility is to implement it, the policy makers, curriculum planners, parents or guardians and the community at large. In the same vein, the capacity to innovate is influenced by various factors such as the physical resources, teachers, learners, the school management and indeed the overall ecology or context of the school. The next subsection will discuss the third construct namely, the profile of implementation that is relevant to the thrust of the study.

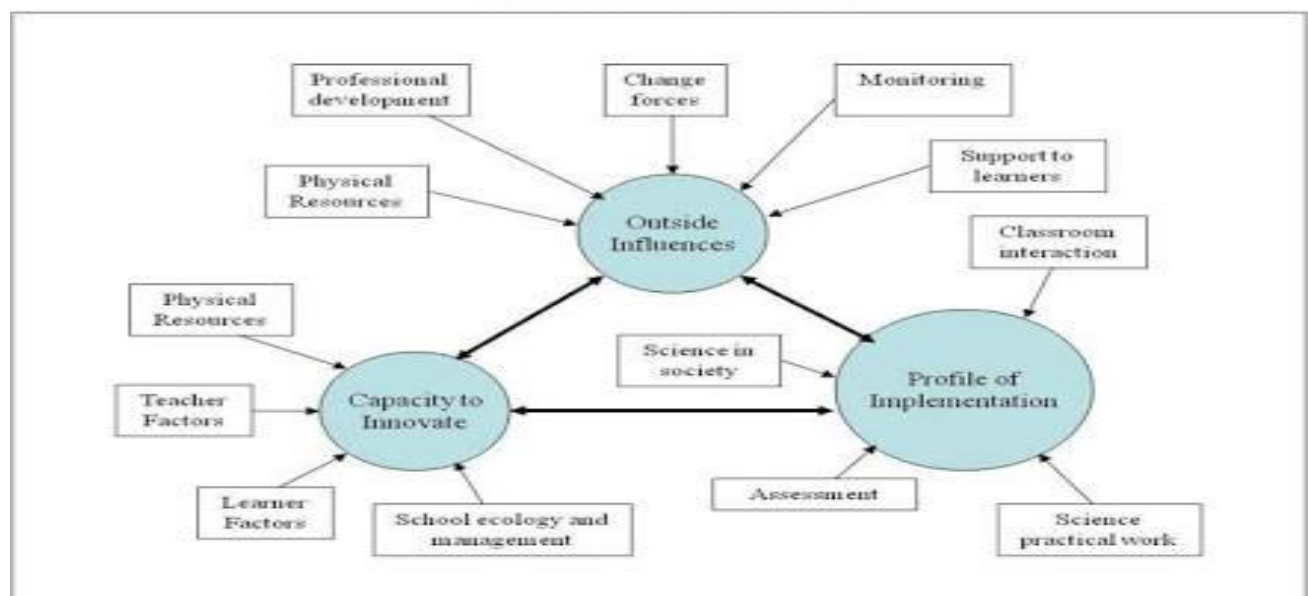


Figure 2.1: Curriculum implementation model of Rogan and Grayson (2003)

## 2.20 Profile implementation

The profile of implementation engages on a practical level the different forms and the degree to which the objectives of a curriculum are transmitted and digested in reality; in this case, the life sciences curriculum. The argument of the conceptual framework of Rogan and Grayson (2003) suggests that changes take place in three constructs, as shown in Figure 2.1. Identifying the profile of implementation is critical in this study, since it often provides insight into the classroom practice and introduces me to the interactions attuned to the learners, the kind of engagements and communicative discourse in line with the views of teaching and learning (Lave & Wenger, 1991; Scott & Mortimer, 2003).

According to Tawana (2009) science teachers have recently begun to explore numerous ways to enhance teaching and learning in class. This resonates well with Roth (1995) who points out that classroom practices must reproduce learners who possess relevant content knowledge and in a more original context. Cooperative learning argumentation and learner discussion are needed to influence meaningful learning according to Newton, Driver and Osborne (2000). The sub-constructs are characterised by what Rogan and Grayson call level of operation. Level 1 and 2 represent high levels of teacher activity and low levels of learner activity, while level 3 and 4 represent low levels of teacher activity and high levels of learner activity.

The levels represent teachers' repertoire of practices in which higher levels include lower levels of practice. The profile of implementation gives one the opportunity to identify the degree to which the curriculum is implemented in schools. A large and growing body of literature internationally pays particular attention to how the curriculum is implemented according to Barab and Luehmann (2003). Surprisingly, it is neglected in developing countries such as South Africa. Those that do focus on the developing countries do not specify an analysis model or suggest the model, which according to Rogan and Grayson (2003) endorses a deficit approach.

## **2.21 The curriculum and definitions of the curriculum**

### **2.21.1 *What is a curriculum?***

A curriculum can essentially be summarised as a rundown of topics to be taught. A more nuanced conceptualisation is that a curriculum incorporates what is taught and how it is taught and assessed. Obviously, the nature of the content knowledge and knowledge generation processes are fundamental when settling on choices about the determination about sequencing, pacing and assessment of knowledge in the curriculum. At the end of the day, the curriculum is not (really) guaranteed, and it is conceivable and important to assess relevant factors in building up the curriculum. It is plainly obvious that the curriculum is value-based and that teachers' convictions about discipline, the nature

of knowledge, the nature of teaching and learning and their comprehension of the reason for assessment will all have an impact on the curriculum decision-making (Vorster, 2016).

Van den Akker et al (2009) affirm that the term 'curriculum' is characterised in different ways. The word curriculum comes from the Latin action word *currere*, which implies the running of a race or course (Bantock, 2010; Connelly & Lantz, 1991; Egan, 2003). The emphasis is hence on what the individual encounters as he/she runs the race of life (Jacobs, 2016). Curriculum planners, teachers, government officials and others engaged in curriculum issues are always concerned about the nature of the attractive knowledge they want learners to learn.

### **2.21.2 Definitions of the curriculum**

When a certain concept is defined in many different ways, it is obvious that researchers do not agree on the meaning thereof (Carl, 2010). Along these lines, it is extremely hard to get an expert agreement on the definition of curriculum. Tanner and Tanner (1995) characterised curriculum as the arranged and guided learning encounters of intended learning, detailed through the orderly reconstruction of knowledge and encounters, under the support of the school, for the learner's ceaseless and wilful development in personal-social competence. Ashley (1989) states that curriculum alludes to the arranged and sorted out exercises that learners encounter in school, including the idea that incorporates the subject matter that learners are presented with as well as the methods of teaching and evaluation. As for Smith (2000), the idea of curriculum is not really new, yet, the manner in which we comprehend and hypothesise it has been modified throughout the years and there is a significant debate about the meaning. Accordingly, defining the word curriculum is no simple issue (Marsh & Wills, 2003). It comprises disjunctive and fragmentary parts. Ornstein and Huskins (1993) appropriately regard a curriculum as a field of study that is subtle and fragmented and what it should involve is available to a decent arrangement of discussion and in any event misconception. Lovat and Smith (2003) affirm that the word curriculum itself is utilised in various settings by principals in schools, teachers and curriculum planners in education systems and progressively by legislators. It can mean different things in every one of these unique circumstances. In other words, the word curriculum has many different meanings in the literature and in self-sufficient talks where key terms are used in complex and even conflicting ways (Pinar et al., 1995).

Marsh and Stafford (2004) feature three components of the curriculum concept. To start with, they unequivocally state that a curriculum not only incorporates syllabi or listing of contents but also a detailed analysis of other elements such as aims and objectives, learning experiences and evaluation as well as recommendations for interrelating them for optimal effect. Secondly, a curriculum contains arranged or intended learning. Thirdly, the curriculum and directions are inseparable. Lovat



and Smith (2003) rightly contend that curriculum is part of teaching, not disconnected from it. In this manner, the most agreed upon idea of a curriculum is that it provides an arrangement for learning (Lovat & Smith, 2003; Kuiper & Hameyer, 2003; Marsh & Stafford, 1998; Van den Akker,). Examining the curriculum concept, Marsh and Stafford (2003) contend that the curriculum is an interrelated arrangement of plans and encounters which a student finishes under the direction of the school. In addition, Marsh and Stafford (2004) explain the exhaustiveness of curriculum as follows:

The statement “interrelated set of plans and experiences” alludes to the point that the curriculum, which is executed in schools, is commonly arranged ahead of time but that impromptu activities also happen.

“Under the direction of the school” alludes to all people related to the school who may have had some contribution to arranging a curriculum and typically incorporates teachers, the school committees and external experts such as advisory teachers.

In this manner, curriculum may be looked at from various perspectives and points of views which need to be explained if the process of curriculum change is to be comprehended. As indicated by Van den Akker (2003), an essential investigation into curriculum improvement should involve their levels of perspectives, namely intended, implemented and attained curriculum. In fact, the three remarkable traits of curriculum, as expressed, will in general be balanced by the different perspectives. Nevertheless, it is clear that the extent of curriculum implementation cannot be considered without an account of the ‘intended’ as well as the ‘attained’ curriculum.

From the foregoing perspectives, it seems apposite to return to the three components suggested above as they structure a basic curriculum unit for implementation, which is the central concern of this study. The intended curriculum or planned curriculum includes the near exactitude or uniquely conceptual curriculum and the formal written curriculum (Goodlad, 1979; Marsh & Willis, 1999).

For decades, there has been an ongoing debate of what the term curriculum entails, e.g., an allusion to endorsed learning and teaching process has in turn taken on an extensive arrangement of implications. Curriculum is the arrangement of knowledge for the classroom. Despite the fact that the curriculum through advancement has always been consistently available in education, the curriculum has turned out to becoming a field of study (Bobbit, 1920). Dewey (1902) distinguished the crucial factors in the educational process as:

The learner (the youngster as juvenile, created being);

Society (certain social aims, implications and values manifested with the developed; understanding of the grown-up); and

Organised topics (the specialisation and divisions of the curriculum).

As stated before, the word curriculum has numerous definitions and portrayals. It is a challenging term in education, yet various attributes are acknowledged as innately part of the term. A curriculum includes all the opportunities for learning. It is consistent with the perspective of Stenhouse (1975) who states that a significant and increasingly comprehension of the curriculum is necessary. He contends further that curriculum study is concerned with the relationship between the curriculum as an aim and the real world. For Clarke (2000), a curriculum is everything that occurs in a school and what does not. As it were, curriculum is about how schools are overseen, what is learned and what is not.

According to Bantock (1980) schools are concerned with transmitting a review of grown-up intellectual culture (in the evaluative sense of the word). Hence, a curriculum refers to that part of the adult world considered important enough to be transmitted to the more youthful generation and that is within its grasp. For Barrow (1999), the crucial inquiry of educational matters is: What is it to be taught? From this question we can infer that appropriate curriculum, teaching strategies and research are taking place. Smit and Lovat (2006) characterise the curriculum as basic leadership activity that incorporates both intention and the manner in which the intention becomes operational in classroom reality. Curriculum starts as a plan; it only becomes reality when teachers implement it with real students in a real classroom. Careful arrangement and advancement are clearly significant, yet they mean nothing if teachers do not know about the product and have proper skills to implement the curriculum in their classroom. Carl (2010) says the implementation is the application phase of not only core syllabi but also the school's expansive curriculum plan, each subject curriculum and each unit/lesson. The investment of the instructional pioneers and teachers are considered to be fruitful, successful and viable for curriculum implementation.

## **2.22 Types of curricula**

As indicated by Bernstein (1975), there are two ways to deal with the curriculum, namely the competence model and the performance model. The competence model advocates a mix of subjects and making the association between reality and school learning. As indicated by the performance model, there is a detachment of subject disciplines. For Hoadly and Jansen (2009), the learners' capabilities, which they, as of now have, are integral to a competence model. The inspiration for this sort of model is for the learners to apply new information to their lives, where the accentuation is on them drawing upon ordinary knowledge and their encounters in the teaching and learning process. Since learners are enthusiastic about experiences, the contrast between what they realise in school

and genuinely experience is progressively confused, which results in the non-conventional points of view on areas of learning. As indicated by this view, the classroom is not fundamental as it advocates that the learning process can occur at any given place. Learning is theme based and depends on learners' encounters of authority over the determination (what content they learn), sequencing (when do they do learn) and (pacing) how they travel through the degrees of learning. Despite what might be expected, the performance model is characterised by the advancement of elevated levels of comprehension. There is an emphasis on formal school knowledge instead of ordinary knowledge and experiences.

**Table 2.5: Comparisons between the competence model and the performance model**

	<b>Competence model</b>	<b>Performance model</b>
<b>Learner</b>	All learners will achieve the envisaged outcome in their own way and at their own pace Overt role	Some learners do not achieve outcomes Covert role
<b>Teacher</b>	Act as a guide and facilitator Covert	Directly transmits knowledge Overt
<b>Pedagogy</b>	Learner-centred	Teacher-centred
<b>Knowledge</b>	Integrated subjects	Specific subject disciplines
<b>Assessment</b>	Determine what learners know	Determine what learners do not know
<b>Learning site</b>	Anywhere	Clearly defined

Adapted from Hoadley and Jansen (2009)

Learning is sorted into explicit subjects, and the teacher has a huge command over the determination, sequencing and pacing. Table 2.5 serves as a summary of the correlation between the two curriculum models regarding areas relevant to the curriculum models. When this is applied to a South African setting, one can see that the present curriculum lends itself more to the performance model. Proof of this can be found in the unmistakable partition of subjects' disciplines (life sciences, geography etc.). Each subject discipline in CAPS is quite certain with respect to content and the sequencing of the content, as there is predictability in the information as one move from one level to the next level. Since CAPS is based on performance and is teacher-centred and driven by content (DoE, 2011), the learning experience will usually happen in a particular place.

In recognising that the curriculum utilised by South Africa is emphatically adjusted to being a performance curriculum, one needs to address the remarks of Hoadley and Jansen (2009) who propose that a curriculum is often a crossover of the two models. In South Africa, a component of the

competence model can be found in one of the general aims of the curriculum, which guarantees that learners obtain and apply knowledge in an important manner to their own lives, which advances knowledge in local contexts. This point is stipulated in one of the principles of a competence model, where there is accentuation on drawing on learners' everyday knowledge and experiences in the process of teaching and learning.

### **2.23 The curriculum and subject curriculum**

To the extent that the idea of a subject curriculum is concerned, it will still be applicable in the context of current advancement, in which subject teaching still takes place. Where learning zones are already being implemented, the extensive meaning of the concept will likewise be appropriate to learning areas. With the implementation of the CAPS curriculum, educationists and teachers refers to subjects in the curriculum and no longer learning areas units as was the case with previous curriculums. A subject curriculum incorporates more than just the aims and selected core contents as described in the syllabus. The subject curriculum incorporates everything that aligns with the subject, which the teacher may need to teach the subject. According to Dijkstra (1997), individuals are sorted into groups, communities or organisations and have a need to pass on their insights, skills and ways of development to newcomers and members of their future generations. The fulfilment of this need gradually develops into systematic education and an educational system in the form of schools. It has been and will consistently be problematic to decide what should be chosen and taught in a curriculum. The generation of knowledge has expanded throughout the years and makes it humanly incomprehensible for people to acclimatise everything. Constructivists in education are of the view that these points of view on curriculum are flawed. To Holcomb (1995), the most significant assignment in a changing world is to teach children to become admirers of learning. In view on the foregoing, it is important at this juncture to refer to the qualities of a curriculum:

Schools are concerned with transmitting a condensation of adult scholarly culture (Bantock, 1980).

To Holcomb (1995), schools must be places where we pass on the amassed information of past ages so that we will not need to get the hang of everything through experimentation.

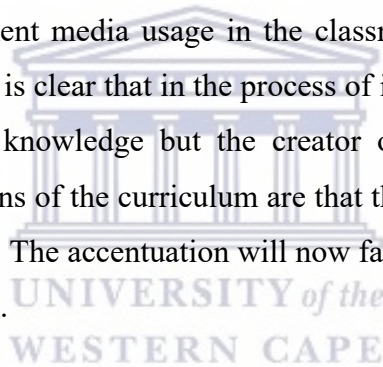
To Steyn (1993) all the meanings associated with the term curriculum are attempts to respond to the inquiry: What ought to be the question, what ought to be taught?

We live in an ever-evolving society. As indicated by Holcomb (1995), 66% of the employment depicted in the lexicon of Occupational Titles did not exist in the previous generation. A subject curriculum for a particular subject alludes to the entire information of one area, like life sciences. The subject curriculum for life sciences will contain all the content that need to be secured for a particular grade in the FET phase from Grade 10 to Grade 12. Life sciences as a subject is the

investigation of life at different levels of organisation and contain an assortment of sub-disciplines or areas of specialisation for example: biochemistry, biotechnology, microbiology, botany and zoology just to mention a few (DBE, 2011).

Carl (1997) is of the opinion that a subject curriculum may contain inter alia the relative place of the subject in more extensive educational and teaching goals, investigations, analyses and the gauging of needs in the particular subject. It has a bearing on a particular subject for the duration of that course; for example, the subject curriculum for mathematics covers all the work to be done from Grades 10 to 12. Where the subject curriculum is concerned, advancement should happen through circumstances and teaching-learning potential outcomes such as subject collections, subject bodies and study groups at teacher development centres and at the level of teacher unions.

Active involvement by the teacher in curriculum development matters can lead to a more effective teacher-learning situation as well enhance greater teaching competence in a subject matter. It is important to note that the implementation of a new curriculum cannot take place without activities like methodology, content, assessment media usage in the classroom, learner activities, contextual assessment and situation analysis. It is clear that in the process of implementation, the teacher will no longer simply be the provider of knowledge but the creator of opportunities and facilitator of learning. The immediate ramifications of the curriculum are that the nature of the teacher-curriculum function will now be the focal point. The accentuation will now fall on the significance of the teacher being the engineer of the curriculum.



## **2.24 Definition of curriculum implementation**

The need to comprehend curriculum implementation cannot be over-stressed. As Burgess, Robertson and Patterson (2010) point out, curriculum implementation begins with various decision-making points when the individual teacher chooses to place the curriculum in a useable condition through a practical procedure. Curriculum implementation proposes significant time and effort into making important decisions on topics and concepts or content deemed necessary and on methods and monitoring and evaluating teachers and the students' performances (Alonsabe, 2009; Lauridsen, 2003; Verspoor, 2006). Ndawi and Maravanyika (2011) see curriculum implementation as the procedure of the school encouraging the connection between the learner and the curriculum.

According to Ornstein and Huskins (2013) curriculum implementation is the comprehension of the connection between curriculum and the social-institutional contexts into which they are to be introduced. Lim (2007) views curriculum implementation as the integration of instructional content, arrangements, interventions, management and monitoring in the classroom. Implementation takes

place as the learner acquires the planned or intended experiences, knowledge, skills ideas and attitudes that are aimed at enabling the learner to function effectively in a society (Nkomo, 1995). Curriculum implementation practices in South Africa, as observed by Rampersad (2001), are effectively controlled within a small locus and with a hidden process of decision-making, despite the rhetoric of decentralisation. Curriculum implementation becomes solely the responsibility of teachers in schools. Curriculum practices in schools are unresponsive to the students and the needs of the community the schools are serving (Sternberg, 2000).

## **2.25 Curriculum implementation**

Ornstein and Hunkins (2009) maintain that the curriculum is a social product (construct), and the implementation process of the curriculum represents the application of the product. In Tabas' (1962) and Tylers' (1949) views, the curriculum implementation strategy is the final stage of the curriculum.

The immediate response to the implementation of any curriculum or revised curriculum is that all the stakeholders (teachers, learners, parents, teacher unions and school governing bodies) are consulted and informed about the curriculum. Community of Practices and teacher clinics are ideally placed for discussions, written representations and advice about the curriculum.

March and Wills (2007) acknowledge that there are several problems around the implementation of a curriculum for teachers, who are considered to be responsible for the implementation of the curriculum. It is important to note that the curriculum implementation plan is a complex process of transformation, fundamentally plagued with a variety of challenges that can impact on the implementation process.

Effective implementation of a curriculum is time-consuming, and therefore interactions with teachers on a personal level, effective in-service training and continued support are needed to realise it (Fullan & Pomfret, 1977). They added that effective support can decrease the anxiety levels of teachers and their resistance to change. In-service training is imperative as it provides teachers with the required skills and support for curriculum delivery. Killion and Kaylor (1991) contend that the provision of in-service teacher training only, without the necessary support, will not yield positive results.

To implement a curriculum, it is important to note that there are three elements that guide the implementation process, namely: utilising new resources, employing new practices and fusing it with new attitudes and principles. Therefore, the effectiveness of the implementation process does not only regard in-service training and a change in behaviour towards the new curriculum as essential, but also emphasises that there must be continued support for teachers in the implementation process.

## **2.26 The implementation of the life sciences curriculum**

Curriculum implementation is regarded as a very complex and unpredictable exercise. International curriculum specialists concur that those changes such as the introduction of CAPS and the new life sciences curriculum is user dominant (Sibanda & Blignaut, 2020). According to Hunkins and Ornstein (2016), teachers are the end-users of the curriculum and are central to the successful implementation, as teaching forms an integral part of curriculum implementation. It is standard practice for nations all over the world to develop a new curriculum from time to time as the occasion warrants. South Africa is no exception.

Curriculum change centres around what will be accomplished and what must be done (Rogan, 2004). Life sciences in the South African setting in the FET phase utilises three different facets of curriculum implementation. During the political-sanctioned and racial segregation era in South Africa, until 1995, it was the apartheid curriculum that was still in vogue in terms of teaching and learning in the schools. Between 1995 until 2006, the interim curriculum was used. In 2006, the NCS was introduced for grades 10–12, after which CAPS was introduced in 2011. During the apartheid years, the term biology was used instead of what we call today as the life sciences in the FET phase.

Houston et al. (2014) found that the curriculum content has been progressively reorganised in the progress from the NCS to the current life sciences CAPS and that both the extent and depth of its content have been decreased. As stated before, the Grade 12 life sciences curriculum comprises the following four content knowledge strands:

Life at molecular, cellular and tissue level;

Life processes in plants and animals;

Environmental studies; and

Diversity, change and continuity.

According to the DoE (2011), the knowledge strands and the themes within each knowledge strand should be studied separately or independently. The four knowledge areas for life sciences consist of the study of plants (botany) and the study of animals (zoology) and human sciences (DoE, 2003). Johnson (2009) affirms that great strides have been made towards putting the life sciences Curriculum into context. Pandor (2006) portrays the new curriculum as contemporary; it diverts our learners on a road to comprehend new scientific knowledge.

## **2.27 Contextualising the curriculum**

The social setting in which a curriculum is made is the second most significant aspect of a curriculum. One of the reactions to the CAPS curriculum has been that it accentuates the context in

which it is implemented. Cornbleth (1990) considers curriculum as a specific sort of procedure. Curriculum for her is what really happens in classrooms, that is, a progressive social procedure comprised of the cooperation of students, teachers, knowledge and milieu. Interestingly, Stenhouse (1975) characterises curriculum as the endeavour to depict what occurs in the classrooms instead of what really happens. Cornbleth (1990) further contends that the curriculum cannot be comprehended satisfactorily or changed significantly without considering context. It is for this reason that I concluded that the curriculum is a consequence of context and thus a contextualised social process. Curriculum change is a consequence of contextual change.

Curriculum change in South Africa ought not to be guided by swapping one curriculum with another. Instead, it ought to be guided by contextual change. The dismantling of apartheid in 1994 prompted the formation of a new political order and required the democratisation of the education framework in South Africa. The politically-sanctioned education system disadvantaged the majority of South Africans, especially the Black South Africans. There was agreement among partners in education that South Africa's education system had to change (Magashoa, 2013). As stated earlier, preceding 1994, the South African education system was sorted along racial lines in line with the Christian National Education's (CNE's) ideology of no blending of languages, societies, religions and races. It was within this setting of CNE policy that fundamental pedagogies developed.

Accordingly, fundamental pedagogies were instruments with which to justify the South African government's position with respect to racial segregation education. According to Enslin (1984), "Fundamental pedagogies are an ideology as opposed to being a science, because an act of principal of fundamental pedagogies is controlled by the interests which it serves" (p. 119). Post 1994 saw the implementation of C2005 underpinned by an outcome-based education approach. At the point when the ANC government came into control, the need for curriculum change was recognised.

For Chisholm (2003), curriculum change in South Africa was attempted in three stages. First, is the purifying of the curriculum of its bigot and chauvinist elements and the purging of the most disputable and obsolete aspect of its contents. Second, was the use of OBE through another curriculum plan, curriculum 2005 (C2005). The third was the the inclusion of the review and modification of C2005. Curriculum 2005 (C2005) and its underlying foundations and points of reference in the struggles of social movements around education and curriculum in the pre-apartheid period were part of the 'transformation' process conceived in a context of social change (Cross, Mngadi & Rouhani, 2002; Motala & Vally, 2002). The dealings between the then apartheid regime and civil society in the National Education and Training Forum in 1993 were trailed by a procedure of curriculum "purifying" following Sibusiso Bhengu's appointment as the Minister of Education.



According to Chisholm (2003), when C2005 was presented in 1997, it was founded on the following basic components: (1) the presentation of eight new learning areas suffused with estimations of democracy, non-racialism and non-sexism; (2) OBE and the provision of a foundation in general education up to and including Grade 9 (Kraak, 2002; Hindle, 1996; Seleti, 1997).

OBE as a philosophy has been deciphered in various ways by different writers. There are hardly any educationists in South Africa who have not taken a position either in support of OBE or antagonistic to it. Scholars such as Mohamed (1998), Malcolm (1999) and Odora-Hoppers (2002) have advocated OBE, while others, for example Kraak (2001), have been moderate in their critique. However, Jansen (1997; 1998; 1999; 2001a; 2001b), Jansen and Christie (1999), Muller (1998), Muller and Taylor (1995) and Unterhalter (1998) have questioned its foundations. In 1999, two major developments occurred which were to have a devastating effect on the arrangement of curriculum: the first was the appointment of Professor Kader Asmal as Minister of Education in 1999 and the second was the association made between South Africa's poor learner performances and the school curriculum. Evidence from the DBE suggests that the implementation was not going as planned (Chisholm, 2003). The most recent curriculum change involved the introduction of CAPS, Grade R–12, whose aims seem to be clearer than the previous NCS curriculum (Altinyelken, 2010). The DBE (2011) states that CAPS ought not to be considered as a total disparity from the NCS, but should rather be seen as an endeavour to change and as better than the NCS. It is within this educational setting that teachers find themselves with the challenge of implementing the CAPS for life sciences Curriculum.

## 2.28 Curriculum design

Curriculum design is a major part of teaching; however, it tends to be difficult to know precisely what it implies. According to Sedio (2013), curriculum configuration is not a special activity but rather a natural or regular process. Each design gives a premise on which to examine the curriculum on the basis of purpose, method organisation and evaluation (Bennet, 2005). As mentioned earlier, Van den Akker (2003) presents three levels of curriculum design: the intended curriculum; the implemented curriculum; and the attained curriculum. A clarification of these three levels is helpful when attempting to comprehend the problematic endeavours of curriculum change. Table 2.6 is a typology of curriculum representation.

**Table 2.6: Typology of curriculum representation**

<b>INTENDED</b>	Ideal	Vision (method or basic philosophy underpinning a curriculum)
	Formal/ written	Intentions as determined in curriculum documents and/or other potential materials

<b>IMPLEMENTED</b>	Perceived	Curriculum as actualised by its end-users
	Operational	Actual process of teaching and learning (also curriculum in action)
<b>ATTAINED</b>	Experimental	Learning experience as perceived by learners
	Learned	Resulting learning outcomes of learners

Source: Van den Akker (2003)

## 2.29 Different approaches to curriculum planning

For Carl (1997), curriculum design is the orderly and compelling arrangement activities during which components inter alia objectives and goals, situation analysis, selection and classification of content, selection and classification of teaching experiences, planning of teaching methods and teaching media, planning of the instructional learning situation, implementation and pupil evaluation feature emphatically. He further contends that the curriculum advancement process is an umbrella; a comprehensive and continuous process in which partners at all levels have a task to carry out.

The advancement of learning programmes is what Carl (1997) alludes to as curriculum development or instructional planning at a micro level. He sees the classroom situation as the curriculum at a micro level. The procedure of curriculum planning and configuration is a dynamic activity. As indicated by Priestley and Humes (2010), it is critical to recognise the significant planning model to which a curriculum is created. Killen (2003) posits that any choice of model comprises three points of views, namely the contribution to the system; the exercises in the system; and the yield from the system.

Priestley and Humes (2010) went on to say that those who focus on the inputs will inevitably pay attention to finances, resources and infrastructure. Those interested in the activities within the system will focus on the processes employed to organise, control and deliver education and training. Those who primarily focus on the outcomes will concentrate on the results or product of education and training. Quality education should not be judged with a tunnel-vision or from narrow perspectives but rather with a bigger lens and broad perspectives that focus on the outcomes and evaluate the return on the investment put into education. This approach to education is pivotal to making sure that there is coherence in the system. According to Priestley and Humes (2010), this approach gives greater conceptual clarity and clarity about the purposes of education.

## 2.30 The intended, implemented, perceived and achieved curriculum

### 2.30.1 *The intended curriculum*

The intended curriculum has a focus on the aims and content of what is to be taught. It is the curriculum, which is arranged and communicated through curriculum frameworks and other documents. Briefly, it can be described in terms of the syllabus, the textbooks, teaching and the nature of the academic work done by teachers. According to the Trends International Mathematics and Science Study (TIMSS), the intended curriculum comprises the mathematics and science that society accepts as the best intended to encourage learning and the education system that society believes is best designed to facilitate such learning. Cuban (1995) alludes to the intended curriculum as the official curriculum and depicts it as what the authorities set out in curriculum frameworks and courses of study. Kelly (1999) characterises the intended curriculum as the official planned curriculum and defines the planned curriculum as “what is set down in syllabuses and prospectuses”. In the South African context, the curriculum is planned by the Department of Basic Education after discussions with partners in education. This framework with regards to the intended, implemented, perceived and attained curriculum is pertinent to this study, as set out in the research questions.

### ***2.30.2 The implemented curriculum***

The implemented curriculum identifies what is really put in place for learners in the school context, which may represent local interpretations of what is required in the formal curriculum documents. It is likewise the curriculum that dictates what occurs in the classroom. In the literature (Robitaille, McKnight, Schmidt, Britton, Raison & Nicol, 1997), it is mentioned that the objectives and intentions at the level of the teacher and activities in the classroom are considered as the implemented curriculum. Taylor (2001) calls attention to the fact that schools are the vital organisations through which society can transmit its goals to the generation to come. Additionally, he asserts that much can turn out badly during the process of transmission. The author asserts further that:

As a result of the overall self-sufficiency of the schooling system from the legislature and of schools, the educational administration and teachers inside the school, there are a several purposes of potential slippage between expectations of the curriculum plan and their acknowledgement in the obtaining of social and cognitive skills by the learners in schools and classrooms. (p.344)

Kelly (1996) calls attention to the contrast between the intended curriculum and the implemented curriculum, which may be conscious or unconscious, the reason of any mismatch being either an intentional endeavour by teachers or others to make what they offer appear more alluring than it truly is.

### ***2.30.3 The perceived curriculum***

The perceived curriculum is what teachers accept they are offering learners. It may very well portray those things that learners really take from the classroom. It incorporates the ideas and content that are genuinely learned and recalled. For Goodlad (1979), it is the curriculum of the mind. What has been formally affirmed for teaching and learning is not really what different intrigued people perceived in the minds to be the curriculum. However, the most significant perceptions are typically those of teachers since they are in the best position to impact alterations. For example, if teachers see that the time spent by students on practical work in life sciences is pretty much nothing, they can make significant changes by expanding the time accessible in their lesson for practical work.

### ***2.30.4 The achieved curriculum***

The achieved curriculum alludes to a lot of goals set at the start of any curriculum plan. It builds up the objective, the particular purpose and the immediate objectives to be accomplished. The achieved curriculum refers to what most students actually learn in the classroom.

## **2.31 Challenges of caps in South African schools**

Various studies have been conducted on teachers' experiences of curriculum implementation, such as the implementation of OBE, C2005 and the RNCS (Carl, 2008). CAPS was presented in 2010 and actualised in 2012 to 2014. Most studies that were conducted on curriculum implementation indicate that a lack of resources, which is the unavailability of learner support materials, training and well-equipped laboratories and classroom shortages, had an impact on the implementation of the new curriculum. The implementation of CAPS was confronted by various difficulties that obstructed its successful implementation in schools. As was the case in South African schools, China experienced numerous challenges with the implementation of their new curriculum reform (Sargent, 2011). Similar experiences have been reported worldwide (Sparapani, et al., 2014; Zerafa, et al., 2014; Vasconcelos, et al., 2015). Researchers in South Africa have identified an absence of teacher training with respect to the issue of the implementation of the new curriculum, which is increasingly clear in townships and rural schools (Chisholm, 2005; Ogunniyi, 2004, 2007a).

Unions have additionally condemned the poor preparation of teachers to implement CAPS. There were no legitimate and adequate preparations for teachers (Mail & Guardian, 2012). Carol Bertram of the University of KwaZulu-Natal's school of education echoes a similar concern, stating she was not sure if the CAPS training workshops would have any impact on the nature of learning in classrooms. What numerous teachers need is to fabricate profound disciplinary and content

knowledge of how to successfully teach their subject to the learners in their class. Once-off workshops seldom lead to profound teacher learning and changed professional practices.

In the South African setting, the change of education is a dubious and combative issue (Lombard, 2010). For change to be executed effectively, the government must act with criticalness and impart the change successfully. Notwithstanding, my view, based on many years of teaching experience, is that teachers should be involved in the curriculum development process from the beginning to the end, otherwise the implementation would end up in a disaster, as has been the case in South Africa.

The contention here is that teachers, through their unions, should have been more involved as partners in the curriculum development process. In other words, they were mere consumers in the development of the new curriculum. Likewise, they were largely excluded during the review of the RNCS (Chisholm, 2005). The fact that teachers were not reasonably represented in curriculum reform processes indicates that they were not given a chance to claim the progression and transformation made in the curriculum, yet they were relied upon to drive the implementation process without adequate knowledge. Therefore, teachers felt that the new curriculum was forced upon them (Rogan, 2000). Contrary to all the positive aspects of CAPS, it is clear from the literature that the implementation of CAPS did not provide teachers with adequate training.

### ***2.31.1 Understanding curriculum implementation***

After the clients (teachers) of the curriculum are trained and prepared for the conceived change, the implementation process commences. Implementation involves the application not only of the school's expansive curriculum but also the curriculum of each subject (including the lesson units). The part played by the education officials is crucial to the successful and effective implementation of the curriculum. Opposition from teachers and other stakeholders also shows itself in various ways during the implementation phases, which is the reason why effective guidance is extremely important. Constant recognition of the sources of resistance and attempts to neutralise them are needed. The planning thereof should have been followed with continuous involvement, support and evaluation. Getting teachers involved in the implementation process is essential in obtaining buy-in from them and their unions and other teacher formations that play a significant role in the educational fraternity. A curriculum should address the needs of the learners. Pratt (1980) stresses the requirements of learners by expressing plainly that the curriculum design is futile without due consideration of the consumers. It is when this is factored in that the curriculum implementation process and goal is fulfilled.

Czajkowski and Patterson (1980) contend that for the curriculum to work successfully, it must make a noteworthy contribution in the school and the classroom. It is important, in the wake of explaining

the view of how curriculum is characterised and the manner in which the various sorts of curricula work in a classroom, to have a profound comprehension of the key components of curriculum implementation. Five fundamental segments have been recognised for effective and successful curriculum implementation by Hoover and Patton (2005). These segments are illustrated in Table 2.7 below include:

Evidence-based mediation is utilised to teach content/skills, oversee conduct and bolster separated instructional needs; Instructional arrangement and context in the classroom is used to execute the curriculum and manage teaching and learning in the classroom.

Overall classroom and instructional management, which incorporate tending to both scholastic and social aspects of teaching and learning (p, 174).

**Table 2.7: Components within effective implementation of the curriculum**

Component	Description
Content/skills	Subject zone knowledge, skills, ways of perspectives and outcomes associated with the mandated state or district curriculum, which are research based
Research-based	
Evidence-based	Research-tested and validated teaching interventions
Instructional arrangements	Use of different groupings, sets, or independent work to facilitate acquisition of content and skills
Class/instructional	Use of various groupings, pairs, or independent work to encourage acquisition of content and skills and aptitudes
	Classroom structures established to manage learning

### 2.32 Curriculum implementation models

Researchers in the field of curriculum implementation are acquainted with models for curriculum development (Bobbit, Freire, Dewey & Taba, 1962; Tyler, 1949), with some against and some for the short-sighted and scientific models of thought (Schwab, 1970; Walker, 1971). The field of curriculum implementation needs more extensive comprehension than usual. In this section, two curriculum models or types are discussed. The contributions of different curriculum theorists were essentially focused on curriculum advancement at school level, but educationists, non-educationists and curriculum planners at higher education institutions have utilised these models or their adjustments in curriculum planning. The study focuses on two theorists, namely Tyler and Freire and their theoretical implementation models.

### ***2.32.1 Ralph Tyler model***

Tyler's (1949) model or rationale is probably the most well-known model used in the planning, design and implementation of curriculum at both school level and at the level of higher education. This model is easy to use by experts and novices on a micro level. Tyler claims that content is essential to any curriculum. Curriculum comprises of five segments: a framework of assumptions about the learner and society; aims and objectives; content or subject matter with its selection, scope and sequence; modes of transaction for example methodology and learning environments and evaluation (Eash, 1991). This is Tyler's view of the dimensions of curriculum planning, specifically objectives, content or subject matter, methods and evaluation. His four questions centred on:

What instructional purpose should the school try to achieve?

What educational experiences can be given that is probable to accomplish these purposes?

How successfully can these educational experiences be organised?

How would we be able to decide if these purposes are being accomplished?

Tyler's (1949) model can be seen as the aims-objective model that is product-driven. It is a means-end model, where the end is first decided upon before the means to reach the end is determined. There is a linear view on means and end. In this model, content is integral to the curriculum and it concerns the compelling conveyance of the curriculum (content) (Kelly, 1999). These three parts are interwoven into the curriculum. Two ideas emerge from this rationale of Tyler (1949), namely the introduction of a fundamental standard against which accomplishment of the programme can be estimated and that assessment turns into a vital part of teaching and learning (Wolf, 1991).

Educational objectives are formulated with respect to explicit disciplines or by cutting across disciplines. Tyler (1949) recognises the role of subject specialists, who might have an opinion on how their subjects can enhance the education and training of young people who are not really going to be masters in their respective fields. It is essential to take note that once broad targets have been identified, the curriculum planners must think about the reasonableness of the goals in connection to the educational and social way of thinking of the school and in relation to the psychology of learning.

As supported by Tyler (1949), no single wellspring of data is sufficient to give a basis for wise and complete decisions about the goals of the school. The purpose of this methodology is to dispose irrelevant and conflicting goals, leaving those that are the most significant and feasible. Following the process, the general goals are changed into instructional objectives. The Tyler (1949) model comprises the accompanying elements: objectives, activities, organisation of activities and evaluation.

Correspondingly, this model is premised on a deductive approach to curriculum development. The Tyler model is known as the objective model or the linear model (Marsh & Wills, 2003). Many curriculum planners think that this model is the best model, with specific reference to the different phases of OBE (Lovat & Smith, 2003). Be that as it may, some educationists criticised it for being too simplistic and technocratic (Ornstein & Huskins, 1993).

### ***2.32.2 Paulo Freire's model***

Freire (1983) offers a basic point of view on curriculum implementation and planning with his pedagogy of the oppressed (Posner, 2009). He portrays the technical production viewpoint of curriculum planning as “banking education”, where the teacher directs the manner in which the student should see the world. In addition to these curriculum theories, I have also drawn on my own personal teaching experience and encounters with different types of curriculum reforms in South Africa during the last two decades. My view is that these reforms have benefited to some extent from Paulo Freire's (2004) theoretical model, especially in relation to the teaching of the life sciences curriculum in the previously disadvantaged schools of South Africa.

My view is that, to some degree, the context of life sciences teaching in South Africa shares some resemblance to the sociocultural context that Freire seeks to address. In such a context, teachers tend to impart knowledge on learners and expect them to give it back in the original form. As an alternative to conventional teaching, he introduces an approach that he describes as the emancipatory approach. According to this approach, one needs to be reproachful of one's own position, which is to discern, reflect and judge one's own naive consciousness and move to a more critical consciousness. Learners must understand that the truth is a process and not an inflexible given (Steinberg, 2010). With problem-posing as a method in this approach, teachers and learners are co-investigators by methods for discourse and dialogue.

Dialogue takes place by means of words that function in two dimensions, namely reflection and action (Freire, 2004). Freire accepts that the teacher and learner will be empowered to discriminate critically the way in which they view and live in the world. Students are co-operatively and by means of dialogue actively involved in planning of themes to be utilised in the curriculum. The curriculum planning and implementation processes are not a technical process but rather a political, ideological bottom-up process that serves the political order of the day. In this curriculum model, there is no end-product such as learning outcomes that a learner must demonstrate but rather a critical reflection and action upon reality (Posner, 2009).

## **2.33 Elements affecting curriculum implementation in South Africa**



The curriculum development happens at a macro level and is implemented by teachers at a micro level (Carl, 2009). For any curriculum to be actualised successfully, a few factors that impact the implementation procedure are needed. According to Chikumbu and Makamure (2000), these factors are: the learner, the teacher, subject content resources, pedagogical content knowledge, stakeholders, the DBE and the milieu of the school. The absence or lack of the above variables influences the effective implementation of the curriculum plan.

### **2.33.1 Resources**

According to Spaul (2012) school resources are regarded to be an important aspect when attempting to implement the curriculum and make the school environment conducive to learning. He further asserts that the presence or lack thereof could explain some variation in learner academic performance. For Spaul (2012) there are different measures of school resources, which direct or indirectly have an influence on learner performance. School resources vary across different schools, taking in account that schools and socioeconomic quintiles is by no means the same. One of the basic variables influencing curriculum implementation in South Africa is a shortage of resources. Van der Nest (2012) agrees that there is a lack of educational resources, namely human resources like teachers, cultural resources (language, time) and material resources (technologies, circulars and textbooks) in South African schools, which can have an adverse effect on the implementation of the curriculum. The tentative conclusion is that resourcing plays a very important role in how CAPS is implemented. Poor resourcing, means poor implementation. This would appear to be the general trend in many African countries on the continent.

### **2.33.2 Teachers**

The issue of untrained teachers is by far the biggest challenge. Teachers should be prepared to develop their own resources. In order for the curriculum to reach the learner, the teacher needs to implement it. The teacher ought to have few characteristics or certain attributes to implement the curriculum adequately. If a portion of the attributes is lacking in the teacher, the curriculum implementation will be affected in a negative way. Carl (2009) also contends that the applicable teachers' perspective on education in the broad sense, their view on learners, their subject knowledge, the extent of teachers' curriculum knowledge and skills, and their qualifications and teaching ability all play important roles in curriculum implementation.

Chaudhary (2015) asserts that teachers view their role in curriculum implementation as an autonomous one. They teach from the prescribed syllabus of the curriculum. Since implementation takes place through the interaction of the learner and the planned learning experience, the role and

influence of the teacher is indisputable. If the teachers play a role in the implementation process it is imperative that they play a role in the planning and design process of the curriculum so they can modify the curriculum for the benefit of their learners.

### **2.33.3 Learners**

Various studies have been conducted on the critical role learner's play in the curriculum implementation process. While teachers are the implementers of the classroom practice, it is the learners who are the key to what is transmitted and adopted from the official curriculum. The learner factor in the implementation process influences teachers in their teaching experiences in the classroom.

### **2.33.4 School management teams**

In the context of this study, the school management team (SMT) includes the school principal, the deputy principal and head(s) of departments and senior teachers. These people have important roles to play in the management of curriculum implementation at school level. With regards to curriculum implementation, it is essentially their duty to manage the implementation of plans in a coherent and systematic manner. In essence, the SMT needs to develop clear and identifiable implementation and management strategies. Members of the SMT had different views of their roles they had to play in the curriculum implementation process in the schools. The contradicting views of members of the SMT's (Mogashoa, 2013) indicate that they do not understand the role they ought to play in the implementation of the curriculum. Policy makers have to ensure that the members of the SMT understand the role that they have to play in terms of monitoring and supporting teachers.

### **2.33.5 Subject content**

For effective implementation of the curriculum, effective and extensive content knowledge is needed from the teacher to prepare the learners for a life beyond the classroom. The teacher who is well conversed in the content does not follow textbooks like a slave but arranges the content for the learners in a sequence that is suitable for the learners. Nkopodi and Sunday (2013), and Jacobs and Brand (2012), state that teachers with adequate content knowledge will be able to select activities that enhance the thinking skills of learners and help them to achieve the learning outcomes. It will also create a classroom that is conducive for learning that promotes active participation for learners.

### **2.33.6 Pedagogical content knowledge (PCK)**

In 1986, Lee Shulman presented the idea of PCK as an exceptional collection of knowledge for educating a "particular pedagogical content knowledge that typifies the parts of content generally

pertinent to its openness for instruction” (Shulman, 1986, p. 165). Shulman (1986) alludes to PCK as the procedure whereby teachers decipher subject content, presents it to learners in inventive unambiguous manner, actualises intervention strategies for those that battle with the topic and modifies the content to align it with each learner’s individual learning inclinations and requirements. Accordingly, PCK fixates on educating, learning and feedback of the subject matter. It additionally remembers ceaseless reflection on one’s praxis to not only alter one’s teaching strategies and techniques, but to acknowledge the blemishes in one’s methodology and misguided judgements with learners (Damons, 2017). Shulman (1986) distinguishes PCK from the subject knowledge and professional knowledge of teachers. This suggests that the teacher ought to not only possess academic knowledge, but should also be able to practically apply their PCK in a justifiable way. PCK training is needed for most life sciences teachers in South Africa, especially in previously disadvantage schools.

### **2.33.7 Stakeholders**

Partners in education include parents, teachers, learners, SGB’s, the DBE, churches, tribal authorities and local authorities. All stakeholders assume a very significant role in education. They should ensure that effective education takes place in schools. Some stakeholders may discover the education practice compromising and testing. Berkhout et al. (2010) express that effective implementation requires every one of the stakeholders to work together with teachers to achieve the goals and objectives of the curriculum since policy alone cannot succeed in altering ingrained convictions.

### **2.33.8 The Department of Basic Education (DBE)**

The purpose of the DBE is to support and monitor the implementation of the National Curriculum Policy. If the DBE does not help to strengthen policy implementation, the challenges faced by teachers will negatively impact on the quality of teaching in schools. The DBE must provide all the support needed by teachers so that they feel empowered and so that they can make the curriculum more accessible to all learners in the RSA.

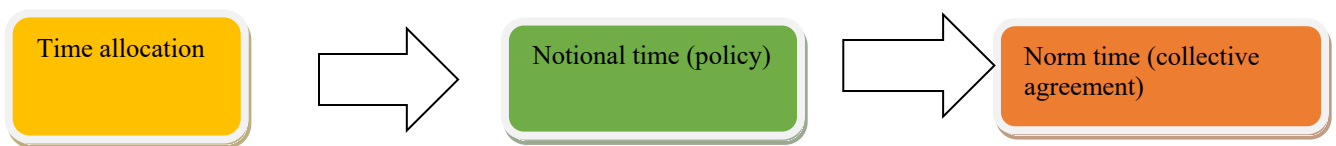
### **2.33.9 The environment of the school**

The conditions and environment of each school impact on the implementation of the curriculum. Schools situated in wealthy areas within a rich socio-economic environment that has satisfactory assets and other resources can implement the curriculum to an extent that would otherwise be difficult for schools in poor environments. Marsh (1997) accentuates that implementation strategies should be realistic and responsive to the extraordinary setting of a particular school. As such, a need analysis ought to be carried out to investigate the specific knowledge, skills and values relevant to a

school's unique situation. These identified needs should then be infused in the implementation plans and subsequent management of implementation. Constant monitoring and observing of the implementation process to determine the relevance of the plans are fundamental (Omstein & Hunkins, 2004). Inadequate facilities including classrooms, laboratories and playing grounds and poor conditions can influence the implementation of the new curriculum (Jansen & Taylor, 2003).

### 2.33.10 *Time management*

For curriculum delivery to be successful school leaders should organise and manage time, human and material resources, which would culminate in teaching and learning activities in the classroom (see Fig.2.2).



**Figure 2.2: Time management model**

It is the responsibility of the principal to ensure school effectiveness through educational leadership, specifically with regard to time management relative to curriculum implementation. Instructional time is set per subject per grade. Time is allocated for breaks, assemblies and so on. Extramural activities are generally excluded from the time allocation.

The DBE has identified poor time management and issues such as frequent teacher absenteeism, sick leave of teachers, late coming to school and to class and non-scheduled activities during school time as factors that have a negative effect on curriculum delivery. Principals must have an alternative plan to compensate for absent teachers so that policy prescriptions with regard to time allocations are complied with.

### 2.34 Curriculum implementation through the lens of the teacher

The NCS and CAPS have laid out plans of what should be accomplished in school time and what should happen in the classroom, but how does the implementation of the new curriculum materialise in practice? Do the expectations of curriculum planners really shape teaching, learning or society as planned? Teachers generally agree that there is a disjuncture between curriculum implementation and genuine classroom practices. In my experience as a teacher, there are factors that have influenced teachers' perceptions of the curriculum and thus made make it difficult to implement the aim of CAPS as was originally intended. The following challenges were faced by teachers in the implementation of CAPS:

Teachers' knowledge and experience; Teachers' knowledge of the subject or topic

Teachers' knowledge of learners and their backgrounds

Teaching resources and learning resources

The size of the class

In my exploratory talks with teachers and colleagues about the FET life sciences curriculum and the implementation thereof, it came to the fore that, although teachers are provided with the CAPS policy document, the choices they often make in implementing the curriculum may be quite far cry from what is intended. The common observation is that teachers tend to interpret the curriculum according to their own encounters, knowledge, individual inclination or specific talents, their personal politics and belief system. Teachers' choices in implementing the curriculum seem to depend on the resources at their disposal. They are concerned with learners' needs and might adapt the curriculum according to their perceptions of these needs.

At times, teachers' own preferences as to how and what they teach might not correspond to the needs of the learners. Teachers often complain about the enormity of the task involved in implementing the new curriculum and, as a result, they might resist such additional responsibility to their current overload of work. Teachers tend to interpret the curriculum consciously and unconsciously in line with their perceptions. They might, for instance, consciously decide that the curriculum is not designed in a sound manner and adapt it in the classroom. They might also consciously resist implementing the new curriculum because they feel demoralised by their perception of a lack of support by the education department, the school administration, School Management Teams (SMT's) or the School Governing Body (SGB).

Often, the curriculum is reinterpreted and revised unconsciously. Teachers relate how they feel uncomfortable with new approaches and so they carry on using the old, familiar approaches, but call these by new terminology. Experience and knowledge of the subject matter also influences how teachers use the official curriculum document. Novice and inexperienced teachers who do not constantly update their knowledge may not be able to effectively implement the new CAPS curriculum because they simply do not know how to do so.

### **2.35 The demographic factors of teachers**

In Mayer's (1999) deliberations about curriculum development and curriculum implementation it is noted that the implemented curriculum, as set out by instructional curriculum delivery, has interested researchers because it highlights the link between educational inputs and learner performance (outcomes). Mayer (1999) argues that this area of research has the potential to investigate the disconnect that exists between the intended curriculum and the implemented curriculum.

As part of examining teachers' experience of implementing the FET phase life sciences curriculum, this study examines factors that hinder the successful implementation of the FET phase life sciences curriculum as intended by curriculum developers. The following section discusses the literature on the factors that hinder the implementation of the life sciences curriculum in schools.

Drawing on the extant literature on educational reform and curriculum development, researchers have made the point that, although the implemented curriculum involves some changes, these changes seem to fail during their initial implementation phase because of certain factors at the school level. These factors include teachers' unpreparedness to make necessary changes in their instructional practices. They seem to lack adequate understanding of how to harness curriculum goals, school environment, sociocultural circumstances, material resources, teaching and assessment skills to attain the desired goal of the curriculum. Findings from earlier studies (e.g. Avramidis, Bayliss, & Burden, 2000; Cornoldi, Terreni, Scruggs & Mastropieri, 1998; Harvey, 1985; Heiman, 2001; Stoler, 1992; Whiting & Young, 1995) indicate that teachers' gender, age, professional qualifications, subject teaching experience, current post qualifications and the type of school they teach at may impact on the successful implementation of a 'new' curriculum at school and classroom levels (Bandura, 1997; Blignaut, 2006; Boyd-Dimock, 2009; Fullan, 1991; Hall & Hord, 2001; Kennedy & Kennedy, 1996; Spillane et al., 2002; Rogan & Grayson, 2003; Welch, 1995).

Fullan (2001) clarifies implementation as putting new ideas in practice. It includes a progression period in which implementers at a school become progressively skilful, predictable and committed in their use of innovation. According to Rondinelli et al. (1990), implementing change has been demonstrated to be difficult, even in developed nations like America, with profoundly talented, motivated and committed teachers who likewise get ceaseless expert continuous professional development backing. Implementing change is probably going to become increasingly difficult in developing nations, which lack physical infrastructure. Change is a phenomenon that affects all parts of a person's life and adjustments in both personal and employment spheres. According to Bertels (2003), change can be portrayed as a way in which the past is dissected to evoke present actions required for the future. It includes moving from the present state, through a transitional state, to a

future wanted state. The focal point of progression is to present an advancement that produces something better, and subsequently ensure successful implementation of a new curriculum.

A few factors have been identified that could clarify why implementing a new curriculum have not been as successful as government officials would like to believe. Curriculum implementation could be hindered by a lack of positive factors. Moreover, the many factors (which have been referred to in the preceding sections) tend to have a negative impact on curriculum change. These factors will be outlined in the following sections. For the purpose of this study, teachers' demographic information includes the following: age, gender, and experience as life sciences teachers, professional qualifications, current post level and the type of schools they are teaching in. Research suggests that teachers stand central to the implementation of any curriculum (Haskell, 2000).

Interestingly enough, factors such as age, gender and teaching experience are directly linked to teachers' perceptions with regard to curriculum change (Huberman, 1989; Datnow, 1998). In other studies, (Avramidis, Bayliss, & Burden, 2000; Cornoldi et al., 1998; Harvey, 1985; Heiman, 2001; Stoler, 1992; Whiting & Young, 1995) it was found that there is a direct link between age, years of experience and gender on the one hand and the successful implementation of a curriculum on the other. Furthermore, these studies indicate that older and experienced teachers were less positive than less experienced and younger teachers (Cornoldi et al., 1998; Lampropoulou & Padelliadu, 1997). This shows that younger teachers are more open and susceptible to education reforms and the implementation of a new curriculum (Cornoldi et al., 1998; Harvey, 1985). It is also reported by a number of scholars (e.g., Douglas, & Hattie, 1996; Forlin, Knight, 1999) that teachers with more experience are less open and receptive for change. The foregoing issue is what Whiting and Young (1995) term as the comfort zones among the more experienced and older teachers, meaning that they do not easily accept change or that they become anxious about it.

Having experienced several curriculum reforms, experienced teachers tend to see a new curriculum as no more than the proverbial *Emperor's New Clothes*. Some would even argue that the new curriculum conflict with their belief and teaching experience. Others would even use the success rate of their learners as evidence to back their claims. Heiman (2001) and Kuester (2000) are of the opinion that the qualifications of teachers does not impact on teachers' willingness to implement a curriculum. Rivikin, Hanushek and Kain (2005) found that where a teacher comes from, their initial teacher training and their teaching experience are crucial factors that influence how he/she implements a new school curriculum. These findings corroborate what the DoE (2003) envisaged i.e.; life sciences teachers need to improve their qualifications. This comes not only as a response to the shortage of qualified teachers for life sciences teachers, but the government also gave a clear

mandate that seeks to instruct schools that only qualified teachers should teach science-related subjects.

### ***2.35.1 Phenomenology studies relevant to science education***

This section examines other research studies that relate to phenomenology and science education. From my perspective – and since this study is deemed to be a phenomenological study, located in the sphere of phenomenology and science education and exploring the experiences of teachers in implementing the life sciences curriculum – it is imperative to locate the study in relation to previous studies done in this field. Phenomenology has been chosen as a research tradition extending to domains such as psychology, sociology and health care (Rieman, 1986). As mentioned earlier, there had been very few phenomenological studies that have been done in South Africa in the field of science education. Most of the studies done in the area have been confined to physical science education (Lucas & Boutonné, 1997; Roth & Bowen, 1999, 2000; Roth, McRobbie, Volkmann & Zgagacz, 2004). Phenomenology of science education are studies permeated with certain academic elements of science teaching, namely (1) teachers' lived experience; (2) students experience; and (3) the teaching and learning process through a phenomenological lens, made an adherence to understand the meaning and worldview of the phenomenon, are categorised under this category (Østergaard et al., 2008).

In scanning the literature, I came across studies that focus on phenomenology and the implementation of the biology curriculum, physical sciences curriculum and other subjects such as the social sciences, chemistry, accounting, as well as the implementation of the natural science curriculum in primary schools (Aloovi, 2012; Dare et al., 2018; Dahlin et al., 2009; Koopman, 2013; Koopman, 2018; Mabodoko, 2017; Mpanza, 2013; Mthembu, 2013; Negumbo, 2018; Tawana, 2009). However, I did not find a single phenomenological study that focusses on life sciences. The theory of phenomenology is the study of structures of consciousness, as experienced from the perspective of an individual (Smith et al., 2005). Smit et al. (2005) add that the centrality of a person's experience is its intentionality that it is being directed towards something or about something and to allow the experience to come forward through data. Schumacher (2010) states that phenomenology does not attempt to provide solutions to real world problems, but instead illuminates what distinguishes one experience from another and divulges the real world through language and communication. In my literature search it was evident that there is adequate literature that focusses on the phenomenology and the implementation of a science-related curriculum. It was furthermore clear that there is adequate evidence of studies that focus on the phenomenological experiences of teachers in science-related curricula both nationally and internationally, as highlighted in this section.



The studies assisted me in finding a place for this present study and provided useful information on how I should go about conducting a phenomenological study. Phenomenological research consists of a wide-angle lens through which I could observe and understand the meaning people assign to their lived experience of a phenomenon. It is particularly relevant and useful in developing countries like South Africa where curriculum change and implementation take place on a regular basis. Teachers and students are among the main agents in bridging the scientific world and science education, and in studies that focus on either one of them, researchers should keep those teachers and students, unique as individuals, in mind. Therefore, each phenomenological study regarding a sociocultural phenomenon such as science and education would be inherently unique and different from each other (Çiçek, Dilek, Bakanay & Mustafa Çakır, 2016).

### **2.36 Chapter summary**

In this chapter, the context for this study and a review of literature were provided. The chapter started with definitions and discussions about certain key terms related to the study, e.g., phenomenology, education system in South Africa, curriculum and curriculum reforms. The curriculum and subject curriculum were also discussed. The research study was placed in a social context, followed by an outline of the curriculum design used in this study. This was followed by a discussion of the existing body of literature. Throughout the review, teachers were presented as critical to the success of a given curriculum. One of the difficulties of curriculum implementation is that curriculum involves the introduction of a new discourse about education. It will take even longer for teachers to understand and come to accept new ways of thinking about education. In this regard I have given a documented account of the reform of curriculum in South Africa. The next chapter describes the methodology (design and method) employed to answer the research questions and achieve the objectives of the study.

## CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

### 3.1 Introduction

This study aimed at investigating the experiences of five life sciences teachers in the Northern Cape Province. This was done to provide insight into the daily realities of life sciences teachers regarding the implementation of the curriculum (Koopman, 2013). In chapters 1 and 2 the interplay between phenomenological theories proposed by Husserl, Schön and Heidegger has been discussed within the tradition of a phenomenological inquiry. In this study, the explication process is focused on the participants' world (experiences) as life sciences teachers. The first phase of the data construction process involved the completion of a questionnaire based on the implementation of the life sciences curriculum, and the second phase of the data construction process involved interviews, document analysis, observation and result analysis. During each interview, I captured the response to each question as relayed by the participants and asked questions to determine if there is any misunderstanding of the question. By so doing, I made sure each participant's response of what they experienced during the implementation of the life sciences curriculum was documented.

The study employed a mixed-methods phenomenological research approach. Phenomenological research is characterised by a vivid description of the experiences of individuals in such a way that its essence and constituent elements are fully revealed as they really are. Through a careful, systematic observation, the phenomenologist is able to unravel what otherwise would have remained hidden or incomprehensible to a casual observer. This implies that the phenomenologist investigates a given subject matter with an open mind, while at the same time being conscious of any clues that might arise in the course of an investigation that corroborate his/her hypothesis about the nature of the phenomenon in question. In the same vein, a phenomenological approach is utilised to come to a clearer and in-depth understanding of the lived experiences of teachers, in this case, Grade 12 life sciences teachers. Their lived experiences are explored to determine how successful they have been to implement the life sciences curriculum.

In identifying the appropriate methodology (design and method) for a given research study, Ritchie and Lewis (2003) contend that the choice of methodology is informed by the aims of that research and the research questions to be answered. In the same vein, Creswell (1998) and Van Manen (1990) add that phenomenological research describes the meaning drawn by the interested party from the lived experiences of the person (s) in question. To achieve the aim of the study, a mixed-methods research design was adopted to capture the quantitative and qualitative aspects of the study. In this

regard, a number of instruments were developed and subjected to the rigour of validity and reliability to ensure the credibility of the findings.

The instruments used in the study included a questionnaire, document analysis, interview schedule, results analysis and a classroom observation scheme. A combination of these instruments helped in the collection of quantitative and qualitative data from the Grade 12 life sciences teachers henceforth called participants regarding their experiences while attempting to implement the life sciences curriculum in their classrooms. As stated earlier, the use of a mixed-methods research design, based on phenomenology and narrative inquiry, provided me with the necessary manoeuvrability to obtain an in-depth understanding of the participants' experiences regarding the research problem. Besides, the use of a mixed-methods design and multiple instruments increase the chances of triangulation, which in turn strengthens the validity of findings. Moreover, this approach allowed me to merge quantitative and qualitative data and provide a more comprehensive picture of the phenomenon under study.

Using interviews and classroom observations helped me to further have insight into the participants' experiences with the new life sciences curriculum. In other words, using a phenomenological approach consisting of interviews, document analysis, questionnaires, results of analysis, and classroom observations allowed me to collect both quantitatively and qualitatively data for the study. Great care was taken to collect relevant data on the participants' experiences as they attempted to implement an inclusive life sciences curriculum within a multicultural South African classroom context.

### **3.2 Ontology and epistemology**

Ontology can be described as the philosophical study of being, and is in alignment with Punch (1998) who describes things that exist in the world in relation to the nature of reality. Ontology is the starting point of all research, after which one's epistemological and methodological positions follow (Grix, 2004). According to Grix (2004) the researcher's ontological position is his/her answer to the question of the nature of the reality (to be investigated). In defending my ontological position, I describe the lived experiences of five teachers in order to understand their experiences as they were engaging in implementing a new curriculum.

According to Grix (2004) epistemology is one of the core branches of philosophy concerned with the theory of knowledge, especially in regard to its methods, validation and the possible ways of gaining knowledge of social reality, whatever it is understood to be. Given (2008) avers that the most commonly used example of epistemological positions is positivism versus interpretivism.

Epistemology is the philosophical field connected to the ontology assumption and is concerned with the study of knowledge, and how we arrive at it, or differently framed by Davies (1991), “the theory of knowledge” and what Grix (2001) theorises as a methodological way of coming to an understanding of our “social reality.”

The ontological and epistemological point of departure of phenomenology are consistent with the foundation of teaching; that is, the complete development of a learner. This is underpinned by the philosophy of the curriculum that proposes a learner-centred approach. It is for this reason that this study aims to sway teachers to view learners in a complete and humanistic way. Phenomenology enables teachers to better understand the life-world of teaching and allows them to discover the learners’ hidden inner worlds. Tembo (2016) declares that what goes on in the mind is invisible and unseen to the scientific world. In this study, I employed the interpretivist stance to describe the lived experiences of five life sciences teachers related to their roles in implementing a new curriculum.

### **3.3 Research worldview**

According to Patton (1990), a research paradigm combines different worldviews and general views, and focuses on ways in which to break down the complexity of the real world. Yin (1989) explains that a research paradigm is the logic that links the data to be collected to the research questions of a study. For De Vos et al (2011c), a paradigm is a way to view and make assumptions about the world. This study is guided by an interpretivist worldview as postulated by Dworkin (Hunter, 2005). Dworkin was a fierce critic of positivism. He is of the opinion that interpretivists are sensitive to human values (Hunter, 2005).

Researchers in the interpretivist worldview are of the view that reality is an after effect of people’s subjective elucidations i.e., what people assign to their experiences. It is accordingly their understanding that the truth is socially developed and dependent on their intersubjective epistemology and ontological conviction. Terre Blance and Durrheim (1999) construe the research worldview as knowledge and practice that are connected together to distinguish the research process according to: ontology, epistemology and methodology. Ontological and epistemological measurements are alluded to as the worldviews, which majorly affect the parts of the real world, how one views the world and how one’s comprehension of how things are interconnected (Cohen, Manion & Morrison, 2007). In epistemological interpretivism, the thought is enforced that knowledge is socially developed and it is comprehended such that there is an assortment of elucidations of the real world and meaning (Bunnies & Kelly, 2010).

This study does not construe life sciences teachers as objects of study but rather as conscious participants. This is consistent with the views of a number of scholars in the field (e.g., Gray, 2011; De Vos et al., 2012; Corbin & Strauss, 2008). To these scholars, research within the interpretivist domain appreciates reality as complex. In the same vein, the interpretive worldview chosen for this study addresses the essential research question namely: “What were the lived experiences of Grade 12 life sciences teachers while implementing CAPS?” Likewise, the interpretive worldview adopted for the study explored as much as possible the subjects’ experiences and viewpoints to gain further insight into the nuances and the contextual realities within which such experiences were socially embedded.

Abes (2009) is of the view that qualitative researchers consider that subjects deliberately comprehend how they experience the world. This justifies the worldview position in this study as it is the lens through which life sciences teachers involved in the study view their world. At this juncture, it is apposite to state that interpretivism as a worldview is unequivocally impacted by phenomenology, and for that reason, Nieuwenhuis (2007) has suggested the need to think about the abstract elucidations of individuals and their experiences of their life-worlds as a beginning stage in comprehending social phenomena. Consequently, Hesse-Biber and Leavy (2011) have contended that in an interpretivist worldview, the truth is not dispassionately decided: rather, it is socially built.

According to Terre Blance and Kelly (2004), the interpretive worldview seeks to comprehend peoples’ sentiments and experiences in human terms as opposed to measuring it quantitatively. For the same reason, I explored the experiences of Grade 12 life sciences teachers’ to make sense how such experiences play out in reality. Denzin and Lincoln (2005) have noted the challenges that researchers experience within the interpretive worldview face while attempting to interpret other people’s experiences. When they explore such experiences, they are equally conscious of the dangers of interpreting their own experiences rather than the actual experiences of their subjects. In other words, there is a thin line between their personal perceptions and those they are trying to study.

The challenges are the questions I need to ask and the meaning assigned to these experiences. The interpretive worldview is used as guide to answer the research questions in this study. For Gerdes and Mallinckrodt (1994), the degree to which a given account of the life-worlds or self is kept over some unidentified time frame is not informed by the objective validity of the account but on the changes of the social procedure. It is clear that interpretivist researchers, during the process of social interchange, in building knowledge, considered the ideas utilised in producing new knowledge.

In conclusion, the interpretive worldview prefers the descriptive research that focuses on the in-depth interpretive interest of the social setting of the phenomenon under investigation. It is for the same reason that Reeves and Hedberg (2003) have suggested that the interpretivist worldview needs to place analysis in context.

### **3.4 Research methodology**

Grix (2004) claims that the concept of methodology refers to the choice of research strategy employed by a particular scholar, which can be either quantitative research (which is concerned with quantity and quantifying) or qualitative research (which is concerned with interpreting subjective experiences) or mixed- methods (qualitative and quantitative).

In this section the research methodology and the research design that were considered suitable for the study are outlined. For Williams (2012), research methodology gives definite direction in the research process. It lays a solid foundation for me conducting and organising the research process and giving coherence to it. Furthermore, the relevant methodology ultimately encourages me to employ the correct kind of research, approach, philosophy, time frames and analysis, followed by correct procedures and representations aligned to the research. The choice of methodology for this study was motivated by the research problem and research question/s (Williams & Perumal, 2018). A couple of methodological assumptions were made before a research procedure was selected. One expectation was that the information would be produced through lived experiences of Grade 12 life science teachers. A mixed-methods phenomenological research approach was considered to be the best choice.

### **3.5 Justification for the use of mix-methods phenomenological research**

Although the study may have taken any of a number of different approaches, but a mix-methods phenomenology approach was selected in this case as the most suitable. Most phenomenological studies often focus on a specific point in time, while this study focused on the experiences of teachers implementing the life sciences curriculum. Johnson, Onwuegbuzie and Turner (2007) suggested three types of mixed-methods researches. 1) *equal status mix research*, in this research both methods enjoy equal status; 2) *qualitative dominant research* wherein the qualitative part of the research enjoy superior status (in this case phenomenology); and 3) *quantitative dominant research* wherein much attention is given to the quantitative phase of the research. This study makes use of the *qualitative dominant research*.

My justification of using a mixed-methods phenomenological research approach was that it would enable me to collect, analyse and interpret quantitative and qualitative data in the same study that

investigates one problem (Onwuegbuzie & Leech, 2006). Johnson and Onwuegbuzie (2004) noted that the rationale one can use to justify the mixed-methods approach is its logical appeal and that it provides one with a connection between quantitative and qualitative data. Additionally, my choice of the mixed-methods approach was informed by the work of various authors (e.g., Baxter, Creswell & Clark, 2007; Jack & Ploeg, 2014; Johnson & Christensen, 2010; Johnson & Onwuegbuzie, 2004; Pfaff, Teddlie & Tashkkori, 2009).

When choosing a methodology, the main consideration is to establish which approach will best respond to the research questions (De Loo & Lowe, 2011). In line with this, many researchers in many fields of study are using a mixed-methods approach because of its value and advantages. This approach is becoming increasingly popular with researchers as it provides quality data (Creswell & Garret, 2008). It furthermore strengthens the research and ultimately provides quality research (Tubaundule, 2014). He further argued that a mixed-methods approach advocates for the use of multiple paradigms rather than the use of a mono paradigm for quantitative and qualitative research. The overarching reason for adopting a mixed-methods approach in this study is because it reinforces the research and corroborates the findings by utilising various methods (Bryman, 2006). In essence a single (quantitative) method would have been unable to achieve and capture the experiences of the teachers, hence it warranted the inclusion of another data collection (qualitative) method to help clarify and explain the quantitative data. By so doing, I justify how the deficiency of the quantitative data was remedied and how the qualitative data support the quantitative data.

### **3.6 Research design**

Once the research questions and the objective of the study have been formulated, the next step is to select a suitable research design (Creswell, 2013). Literature, however, reflects differing views of what a research design is. Depending on the research questions informing a study, qualitative empirical materials may be obtained through the utilisation of qualitative designs or approaches, such as the case study (situated knowledge), historical research (knowledge of history), grounded theory (knowledge of process and outcome), ethnography (knowledge of culture), content analysis (knowledge of content), phenomenology (knowledge of lived experience), action research (knowledge of process, outcome and change), hermeneutics (knowledge and interpretation of scriptures or text) and discourse analysis (knowledge of discourse) (Creswell, 2013; Mills & Birks, 2014).

My justification for choosing a mixed-methods approach was that it enabled me to collect, analyse and interpret both quantitative and qualitative data derived from the study. According to Johnson and

Onwuegbuzie (2004) and Onwuegbuzie and Leech (2006), the rationale one can use to justify the mixed-methods approach is based on its logical appeal and the fact that it provides the necessary platform to consider the connection between quantitative and qualitative data as well as various works done in the area (e.g., Creswell & Clark, 2007; Johnson & Christensen, 2010; Johnson & Onwuegbuzie, 2004; Pfaff, Baxter, Jack & Ploeg, 2014; Teddlie & Tashakkori, 2009).

Tashakkori and Teddlie (2003) define mixed-methods research as a type of research design in which qualitative and quantitative approaches are used in types of questions, research methods, data collection and analysis procedures, or inferences. The quantitative phase of the research was conducted first, followed by a qualitative phase to supplement the findings of the initial phase (Plano Clark & Creswell, 2008; Plano Clark & Ivankova, 2016). This was done to validate the argument of Creswell and Clark (2011) that the qualitative data must inform the quantitative results.

In this study, I decided to first collect the quantitative data before collecting the qualitative data. The quantitative phase, which consisted of a Likert-scale questionnaire, was developed to confirm the data drawn from the qualitative phase (e.g., see Plano Clark & Ivankova, 2016). In agreement with Creswell and Plano Clark (2007) who assert that a mixed-methods design reveals a wholesome picture of the problem, the qualitative phase of this research was extended to document analysis, interviews, observations and result analysis. For Leedy (1997) a research design can be viewed as a plan for research, offering the overarching plan for data collection. Trochim (2002) states that the design of a study ventures, together with the research project, and the methodology are the devices needed to gather information.

Creswell and Clark (2011) contend that infusing multiple research strategies will reinforce the research design. The research configuration guarantees that the proof obtained will empower me to give clear responses to the research question (De Vaus, 2001). Yin (2003) views the research design as an arrangement which one plans to direct research. In phenomenological studies, the arrangement has a particular strategy to provide in-depth understanding into one's consciousness (Husserl, 1970). For Creswell (2007), a phenomenological study depicts the meaning of several individuals and their lived experiences of a phenomenon. Huberman and Miles (1994) add that a mixed-methods approach creates a comprehensive picture of the phenomenon under scrutiny. By utilising this mixed-methods approach, I was able to gain additional information through my connection with composed text (document analysis), interviews, observations, a self-designed questionnaire and result analysis. As stated in the introduction of this chapter, phenomenological research is descriptive and qualitative, yet it is not the same as other qualitative methods since it focuses on the experienced meaning of the phenomenon under investigation (Polkinghorne, 1989). Phenomenological research focuses on



human experience and does not assume or predict meanings. Through a procedure of phenomenological reduction, individual thoughts and convictions must be suspended and held in suppression; in this manner making it is feasible for me to become responsive and open to seeing the phenomenon as it existed in its unique circumstances.

Husserl (1970) sees all this as the initial stage of phenomenological *epoché* (Polkinghorne, 1989; Kruger, 1988; Sherman, 1987). Whatever the case, it is impossible to delve into the experiences of others without becoming somehow part of the data. This suggests that phenomenology does move between the observer and the person being observed. This notwithstanding, I tried as much as possible to maintain some level of significant social distance between my own emotions and sense of self and those of the life sciences teachers that were observed, interviewed or asked to complete the questionnaire.

### ***3.6.1 The quantitative strategy of inquiry***

For the purpose of the data collection process in the quantitative phase of this mixed-methods study, a questionnaire was designed and administered to 25 life sciences teachers. Data collection of this nature empowered me to reach a group of participants and to describe and quantify their perceptions and experiences of implementing the Grade 12 life sciences curriculum in their classrooms (McMillan & Schumacher, 2001).

### ***3.6.2 The qualitative strategy of inquiry***

The purpose of qualitative research is to gain a better understanding of the phenomena under study. Certain factors, such as attitudes, perceptions, values, nuances and contextual realities associated with the Grade 12 teachers' experiences while implementing the new life sciences curriculum, though important, are not easily quantifiable. Furthermore, I conducted interviews with five teachers, observed their lessons as well as carried out document analysis of the CAPS document. The essential focal point of the interviews and document analysis of CAPS was to get a comprehensive view of what the life sciences teachers understood about the intention of the curriculum. The lesson observation was done to gain insight into how teachers implemented the curriculum, while the result analysis was done to get a sense of the outcomes of the curriculum. Table 3.1 below provides a framework which guided me in collecting the quantitative and qualitative data for the study.

**Table 3.1: Characteristics of quantitative and qualitative studies**

Quantitative research	Qualitative research
The aim is to highlight features, tally them and develop statistical models that clarify what is observed.	The aim is finished, detailed depictions.
The researcher knows what he/she is looking for.	The researcher may just know in general what he/she is searching for.
All aspects of this study are deliberately structured before data are collected.	The configuration emerges as this study unfolds.
The researcher utilises devices such as a questionnaire or equipment to gather numerical data.	The researcher is the data gathering instrument.
Data are in the form of numbers and statistics.	Data are words, pictures and objects.
Quantitative data are more progressively effective, ready to test hypotheses, but may miss logical detail.	Qualitative data are increasingly rich, tedious and less ready to be summed up.

Source: Neill (2007)

### **3.7 The selection of participants**

In most cases and for various reasons (e.g., time, cost, human and material resources and so on) it is not always easy to collect information from the whole population. In light of this, it is preferable to select a sample which is believed to represent or reflect a population. The way in which I selected the participants allowed me to choose participants who would provide information that would be meaningful in investigating the research problem.

#### **3.7.1 The data collection plan**

The data collection involved administering the questionnaire, conducting interviews, do classroom observations, analyse documents and examinations scores. While the data obtained from a questionnaire could provide a broad idea about a population the interview allows for a deeper and indepth understanding of that population. These two procedures were followed to add depth to the findings (Ivankova et al, 2016).

#### **3.7.2 The quantitative sampling method**

To measure the participants' experience of the implementation of the life sciences curriculum, a non-experimental design was adopted. According to Maree and Pietersen (2016), a non-experimental design is used in descriptive studies in which the units that have been selected to take part in the

research are measured on all the relevant variables at a specific time and no manipulation takes place. Most non-experimental research designs include surveys where data were collected by means of questionnaires (Delpont & Roestenburg, 2018; Maree & Pietersen, 2016).

According to Babbie (2007) a questionnaire is a document containing questions and or other types of items designed to solicit information appropriate for analysis. The basic objective is to acquire facts and opinions about the phenomenon from the people involved (Delpont & Roestenburg, 2018). The questionnaire was sent for proofreading to an academic editor and a data analyst at a South African University. The questionnaire was also sent to an expert reviewer for validation. Recommended changes to the questionnaire were done and then it was administered to the participants. The questionnaire that was utilised in this study was adapted from various studies on curriculum implementation (e.g. Hendricks, 2010, Koopman, 2013, Mabusela, 2017; Tabaundule, 2014 & Wolf, 2015).

A pilot study was conducted with five teachers in the school where I taught. These teachers did not form part of the main study. Prior to that, I communicated with the participants who declared their preparedness to participate in the study. Data for the quantitative phase of the study was collected and sent to an experienced data analyst for further critical analysis and interpretation. The sample consisted of 25 Further Education and Training (FET) life sciences teachers in the Pixley ka Seme District. The teachers were identified to complete the questionnaire in order to obtain a broader view of teachers in the district.

### ***3.7.3 The qualitative sampling method***

In a qualitative study, the term ‘reflective’ is often preferred over the term ‘representative’, the term usually used in a quantitative study. Hence, the research participants used in this qualitative part of the study for the interview consisted of only five Grade 12 life sciences teachers from selected schools in the Pixley ka Seme District, Northern Cape Province. Although the Northern Cape is geographically a very large Province, it is sparsely populated compared to the other Provinces, hence the necessity for me to select a sample that I could easily reach and spend considerable time with to conduct interviews.

As stated earlier, a phenomenological research study is ordinarily conducted according to some purpose in mind. In this case the purpose was to develop greater insight into a given subject matter, namely the participants’ experiences while implementing the new life sciences curriculum. According to Zint and Montgomery (2007), purposive sampling is a technique where data-rich cases are chosen for a study. Sampling is important in any research study in that it helps a researcher to

have a fair idea about the larger group (Onwuegbuzie & Collins, 2007). In a phenomenological research convention, I utilised the participants as my essential well of information and not necessarily as a representation, as would have been the case in a quantitative study.

As a pre-requisite for taking part in this phenomenological study, I ensured that the participants were Grade 12 life sciences teachers. Five Grade 12 life sciences teachers who taught Grade 12 life sciences were assumed to have sufficient experience in CAPS and were purposefully identified to form part of this study. In selecting teachers, I did not consider any criteria like race, sex, sexual orientation or age. Teachers' experiences and accessibility were the only criteria that were considered for their inclusion in the study. Participants were purposively chosen as they were expected to provide the necessary data to lead this research.

Purposive sampling is a non-probability sampling technique according to which certain participants are selected for a particular purpose instead of randomly (Teddlie & Yu, 2007). For Datallo (2010), the following accompanying objectives can be utilised by me in purposive sampling: (1) to choose a test size of a populace (e.g., teachers); and (2) to collect data. To obtain data one teacher per selected school who taught Grade 12 life sciences was selected for the interview. I assumed that this sort of method was suitable to obtain inexpensive, quick data (McMillan & Schumacher, 2001). These teachers were chosen because they had sufficient experience in implementing the life sciences curriculum. I also believed that their experiences with the realities of implementing the curriculum were sufficient to enable them to share their personal experiences as well as provide valuable information for other stakeholders in the area.

According to Taylor (2001), a key requirement in phenomenology research is that subjects in the study should be allowed to air their perspectives, so that the data could come to the fore. For the same reason, Geanellos (1999) has proposed that teachers should be afforded the opportunity to recount their own experiences and to share these special lived experiences with others. More details about this are provided in the next chapters. A purposive sampling method was used to select the research participants. Groenewald (2004) posits that purposive sampling is based on the researcher's judgement, the purpose of the research and involving those who "have had experiences relating to the phenomenon to be researched". This method was chosen in order to make the sample representative of Grade 12 life sciences teachers. This method is more likely to give rich data on the phenomenon under study (Miles & Huberman, 1994).

In identifying the sample, I made use of the selection criteria suggested by Curtis, Gesler, Smith and Washerburn (2000). According to them, sampling should be in line with the conceptual framework

and research questions of a given study. Similarly, the sample should give a credible description of the phenomenon. A key determinant for the sample was that teachers had to be teaching life sciences in Grade 12 in a high school or combined school in 2017 in the Pixley ka Seme district and had to have at least two years of teaching experience in the subject. No restrictions were placed on gender, post level or the level of qualifications.

As stated above, only participants with at least two years of Grade 12 life sciences teaching experience were selected. According to Kemper et al. (2003), a purposive sample is intentionally selected to provide the most critically needed information for the question under study. Purposive sampling allows me to select participants based on particular key features or characteristics. In the context of this study, a key feature was the implementation of the Grade 12 life sciences curriculum. I was convinced that those selected would provide me the rich information that would enable me to have an in-depth study as well as deepen my understanding of the success or otherwise of the implementation process.

### **3.8 Site selection and description of the research location**

As postulated by McMillan and Schumacher (2006), site determination refers to a procedure of identifying the site from which this study will be directed. They went further by asserting that, in choosing the research site, one should recognise what is requested from the site. The site should also be fitting for the research problem. The research was carried out in four secondary schools in the Northern Cape Province of South Africa through purposeful sampling. The following criteria were considered in selecting the sample of schools: i) the selected schools had to be public high schools; ii) all the four schools had to be quintile 1 schools and located in previously disadvantaged communities; and iii) the schools had to be in close vicinity to me.

### **3.9 The role of the researcher in phenomenology research**

In this study I was a participant, which basically means that I became part of the data (Wimmer & Dominick, 2000). In other words, I became an instrument for the data gathering process. In light of this, I, as a researcher, explored the lived experiences of the Grade 12 life sciences teachers. This of course might suggest the possibility of some bias and personal interest in the research topic and process (Creswell, 2003), but my role in a phenomenological research context compelled me to be as objective as possible.

### **3.10 The qualitative data collection plan**

In order to gather relevant data, both qualitative and quantitative data gathering strategies were utilised to gather data. Henning, Van Rosenberg and Smit (2004) assert that qualitative studies require the use of qualitative data gathering methods and quantitative studies require the utilisation of quantitative data gathering methods. Since this was a phenomenological study, I was conscious of the need to gather valid data and to maintain the necessary habit of mind and attitude compatible with the phenomenological paradigm (Fry, 2016).

In the qualitative phase of the data collection plan, I developed an interview schedule. I compiled an observation schedule and the observations were carried out according to the schedule. Results analysis of examination scores took place throughout the study. To analyse the examination results, I made use of the data obtained from the Northern Cape DoE from 2011 to 2018, a period of eight years that characterised the period prior to the implementation of CAPS, and from 2014 to 2018, the period after the implementation of CAPS. Furthermore, I collected data such as the overall pass percentages of the respective schools. It is also worth noting that data collection was conducted simultaneously. In other words, I administered a questionnaire and concurrently conducted the interviews with the participants and then afterwards compared what I learned from each method. This approach was deployed to triangulate the instruments as well as develop a deeper and richer understanding of the phenomenon in question.

### **3.11 Data collection methods**

Data collection can be described as a fixed plan for collecting information and the capturing thereof in such a way that it can be conserved and analysed by researchers (Creswell, 2003). In a mixed-methods context, data can be collected concurrently or sequentially from various sources using different instruments. Multiple sources of data were used in this study: i) the collection of the quantitative data with a self-designed questionnaire (Appendix G); ii) the collection of the qualitative data through interviews (Appendix K); and iii) document analysis of the official life sciences CAPS document (Appendix J). Thereafter, I undertook classroom observations and finally carried out data analysis using appropriate quantitative and qualitative procedures (Creswell, 1999; Greene & Caracelli, 1997; Yin, 1994).

To further explicate the data found in the document analysis protocol and the interview schedule and to address the third secondary research question, a questionnaire was administered. The various sources of data collection available for this research include: interviews, document analysis, observations, and result analysis (Yin, 1994). True to the phenomenological approach I used different methods to construct the data. Quantitative data were collected before the qualitative data.

The quantitative data collection method used in this study comprised a self-designed Likert-scale questionnaire, which was administered to 25 life sciences teachers who implemented the Grade 12 life sciences curriculum. The questionnaire consisted of closed and open-ended questions. The use of the Likert scale confines the respondent to a choice of strongly agree, agree, disagree and strongly disagree, with no option of being neutral or just answering “yes” or “no”. It was hoped that this approach would limit the uncertain middle point of a Likert Scale (Ogunniyi, 1993).

### ***3.11.1 Quantitative data collection method***

A questionnaire was administered for the quantitative phase of this phenomenological mixed-method design. This is phenomenological research utilising a mixed-methods research, which is more qualitative dominant mixed research, wherein the qualitative element is dominant.

### ***3.11.2 The questionnaire***

For Patton (2002), the responses of the participants to questionnaires are a form of a document that required examination. He is of the opinion that the data contained and derived from questionnaires provide context. Questionnaires can have both open-ended and closed questions with predetermined response categories. According to Cohen et al. (2007), categories in a questionnaire indicate sequence and coherence and assist respondents to navigate through the questionnaire. Open-ended and closed questions provide respondents with an opportunity to communicate vital information and to give personal comments that could be lost through closed questions.

Both open-ended and closed questions were used in this questionnaire, as open-ended questionnaires elicit honest comments from respondents. It was my expectation that the use of open-ended questions would reveal vital information from the respondents that otherwise may be lost in the process. The open-ended questions gave the respondents a form of ownership of the data, as they are the crafters of the responses to the questions on the questionnaire. The questionnaire aimed at capturing the perceptions of life sciences teachers regarding the implementation of the Grade 12 life sciences curriculum introduced in 2014. All the 25 questionnaires from teachers were collected and only 24 were analysed at the end due to non-completion of one of the questionnaires. The data that I collected through the questionnaire had a self-explanatory covering letter.

According to Babbie (2011), when researchers use this approach, they are likely to receive a higher return rate than is normally the case. Maree and Pietersen (2016b) point out both the advantages and the challenges associated with a questionnaire. Some of the advantages include the fact that: it is inexpensive; it is relatively easy to gather a vast amount of data; and the respondents can complete it

at their own time. The disadvantages include: the poor return rate; and the fact that there are no controlled conditions under which the questionnaires are administered.

The questionnaire designed for the study comprises eight sections:

Section A (questions 1–6) deals with the biographical information of the participants (gender, age, teaching experience, their current post level, their professional qualifications and the type of schools they teach in);

Section B (questions 1–10) is concerned with issues relating to teachers' experiences as they implemented the life sciences curriculum, their understanding of CAPS and the life sciences curriculum;

Section C (11–18) deals with teachers' understanding of CAPS and the FET life sciences curriculum;

Section D (19–28) provides information about the implementation of the curriculum; Section E (29–40) gives information regarding the policies needed for the implementation; Section F (41–47) provides information about implementation at school level;

Section G (48–52) provides information about planning for the implementation for the curriculum; and

Section H (53–58) provides information about teachers' perceptions about the curriculum. The participant's responses to the statements were scored according to a scale of 1–4, where 1 = strongly disagree; 2 = disagree; 3 = agree; and 4 = strongly agree (questions 1–54). Questions 55 to 58 require the participants to respond according to the scales: (1) yes or (2) no.

### ***3.11.3 The pilot study***

A pilot study was conducted with five teachers who did not form part of the main study. The trial run was done to identify any challenges that may exist within the instrument and to set the stage for the actual research (Teddlie & Tashakkori 2009). Afterwards, I had a frank discussion about the clarity of the questionnaire and whether or not the instrument and the items adequately captured the important information relating to the particular research question. Based on this conversation, I was convinced that the questionnaire was suitable for the intended purpose. Also, based on this positive feedback from the pilot group and expert comments and recommendations, I made necessary changes wherever necessary. In other words, the positive feedback from teachers indicated that the questions were fair, clear, unambiguous and easy to comprehend and that, as teachers, they had a clear understanding of what was expected of them.

### ***3.11.4 Qualitative data collection methods***

A phenomenological strategy of inquiry guided the qualitative phase of data collection.



### **3.11.5 Interviews**

The interviews focused on the experiences of teachers. The most appropriate way to extract such information is to make use of interviews. According to Le Grange (2000) interviews allow one to get inside the minds of people in order to understand and interpret their views on different matters. Items of the interviews were similarly subjected to a rigorous development process until it was considered by one research expert to be suitable for the intended purpose. The interview section took a minimum of 30 minutes. The interview comprised of open-ended questions aimed at soliciting answers and making it easy for the participants to take part in the interview. In line with the funnelling technique, the questions were more general in the beginning and then gradually built up to more specific issues (De Vos et al., 2011b; Pooley, Breen, Pike, Cohen & Drew, 2008).

For Onwuegbuzie, Leech and Colins (2010), interviews are concerned with gathering data about a certain phenomenon from individuals in a safe space and within a time limit. Further, interviews can be viewed as a type of discussion with individuals. They are carried out with the purpose of collecting in-depth data (Case, 2012; Chowdhury & Chowdhury, 2011, Wang, 1999). Interviews can take place anywhere for a variety of purposes, e.g., for examining requirements, perceptions and other issues. They can also be conducted to: establish priorities; analyse competition; and explicate patterns (Chowdhury & Chowdhury, 2011). Nieuwenhuis (2016) argues that interviews give information that is rich in detail that could not be collected with other types of research methods. Bloor et al. (2001) also add that interviews are ideal for exploratory use, especially in cases where the subjects might feel threatened of the consequences of their participation, e.g., the officials of the DoE. For instance, the life sciences teachers, despite my assurances, were very cautious of what they said about the curriculum, Nevertheless, I considered the interviews as ideal for establishing teachers' views about the newly implemented CAPS curriculum. The interviews also provided an additional source of information as well buttress the triangulation of the instruments, and consequently, the validity of the data collected for the purpose. According to Chowdhury and Chowdhury (2011), there are specific advantages and disadvantages in using interviews. They are as follows:

#### **Advantages:**

Speed: It can be done rapidly with instant outcomes;

Transparency: The participants are aware of what happens;

Flexibility: Questions can be modified as required by the circumstances; and

### **Disadvantages:**

It should happen in a safe natural setting;

It is a challenge to get individuals to participate.

With regard to the pre-interview interventions, I had to attend to many logistical and administrative arrangements to ensure that everything was in place. The interviews were recorded with the consent of the participants to later transcribe the interview in a written format. Patton (1990) is of the view that the use of an audio recorder in qualitative interviewing is indispensable. Audio recordings enabled me to pay more attention to the interview discussions, rather than concentrating on note taking. According to Nieuwenhuis (2016), writing notes, recording the interview, recording the event accurately, recording non-verbal signals and the series of activities during the interview are all of utmost importance. Furthermore, I was able to transcribe the interviews verbatim (Huberman & Miles, 1994).

In this sub-section I discussed how the data collected set was analysed and interpreted. It is important to analyse the data collected in order to bring order, structure and understanding to the study (Bryman & Bell, 2003; Bryman, 2012). Moreover, interpreting the data will enable me to bring meaning and insight to the narratives of the participants in the study. This mix-methods phenomenological research involved the collection and analysing of data which mutually inform one another. That is, as the data was analysed, themes emerged. The participant's responses were linked to their pseudonyms. This was done in order to ensure the anonymity of participants. While other legitimate qualitative data analysis techniques exist, Smith's (2004) interpretative phenomenological analysis (IPA), which focuses on participants' interpretations of their lived experiences, is an excellent choice for this research.

Smith's (2004) interpretative phenomenological analysis (IPA) offered a systematic approach to analysing and interpreting interview transcripts. Since interpretation results from pre-understanding and a dialectical movement in interview process, an IPA approach suggested that the interpretative method cannot have a fixed structure (Van Manen, 2007). As a result, an IPA approach recognizes the critical role played by researchers (Smith, 2004). The aim was to understand the sense that five participants attached to a phenomenon or lived experience, rather than calculating their frequency, using the IPA method (Smith, 2004). IPA studies are conducted on small sample sizes like this study where only five participants were used (Abayomi 2017). According to (Smith, 2004) logic dictates that it is better to interview five to six participants, (homogeneous) and therefore it is helpful go the IPA route of purposive sampling, that concerns a small group for whom the research questions will

be meaningful. Data analysis follow the transcription of the interview where I make use of Smith's (2004) IPA iterative steps as shown in Table 3.2 below.

**Table 3.2: Overview of the data analyses and interpretation processes based on Smith's IPA model**

Step	Description of Activities	Researcher's approach
1	First identify themes	The researcher read the transcripts in order to identify emergent themes. Some emergent themes identified.
2	Connect the themes (clustering of themes)	After identifying the emergent themes, the researcher started analysing and looking for theoretical links which addressed the research questions. Some themes emerged as closely aligned forming clusters while others were less so. The researcher checked the transcripts to ensure that the actual words of the participants were preserved as the emerging themes were clustered.
3	Tabulate themes in a summary table	Once the themes had been clustered, the researcher then arranged the themes so that they addressed the research questions.
4	Continuing the analyses with other cases	The interview with the themes identified in the literature review generated the key themes and shaped the cluster themes.
5	Write up	Once the IPA steps have been concluded, the researcher write up the participants' lived experience.

Source: Smith's (2004)

Table 3.2 illustrates how I used Smith's (2004) IPA iterative steps to analyse and interpret the interview transcripts and notes taken during the interview process. During the data analysis, I used reflective notes to record aspects of the interview and personal reflections (Schurink, 2003; Creswell, 2007; Chenail, 2011). Thus, the reflective notes contributed to the reliability and validity of the research (Smith, 2004; Bryman, 2012). According to Smith et al. (2009), the most prominent criteria for assessing a social research study, and in particular IPA, are reliability and validity. Hence, a discussion is necessary on the issues surrounding reliability and validity in a phenomenological study and this has been presented in section 3.15.2

### **3.11.6 Document analysis**

Document analysis is a structured way of examining and reviewing documents (Bowen, 2009). According to Corbin and Strauss (2008), document analysis requires information (data) to be examined and interpreted in an attempt to extract a meaningful understanding of the analysed document and to develop factual meaning. The reason for using document analysis is consistent with the explanation given by Nieuwenhuis (2007) who states that document analysis critically interrogates secondary data sources to expand one's own understanding of concepts which on the long run would contribute to one's understanding and knowledge base. It therefore became imperative for me to select documents that could provide the necessary data about the life sciences curriculum and to be clear about its educational meaning.

Nieuwenhuis (2016) suggests the following important criterion for selecting documents to do document analysis: the type of document (primary, secondary, official or unofficial document); the methodology used in generating the document; and the line of argument and its relevancy to the current study. Document analysis emerged as part of the qualitative data collection methods. In the same vein, I analysed the documents that in my view, relate to a better understanding of the intention of the Grade 12 life sciences curriculum (Nieuwenhuis, 2007). For the purpose of this study, CAPS for Grade 12 life sciences was used.

### **3.11.7 Observations**

Observations provides insight into teachers' knowledge of the context and subject matter they are teaching in reality and helps me to explore things that they are not themselves aware of, or they are not willing to talk about (Hoepfl, 1997). The reason for using observation is that while interviews provide detailed information about teachers' knowledge, the observations provide direct evidence or data of their action. This serves as triangulation of data (Guion, Diehl, & McDonald, 2002). McNiff (1996) suggested that researchers should check with the principals of schools before undertaking research that involved their schools in order to reach a consensus about what they may and may not do. In compliance with the foregoing, I sought permission from the principals and teachers before the commencement of the classroom observations.

I informed school principals about the aim of the study and the purpose of the observation relative to the implementation of the Grade 12 life sciences curriculum. Observation is a commonly used logical data collection process. Researchers use all their senses to observe people in natural settings (Robin Wood Johnson Foundation, 2012). For Bottof (2004), non-participant observation is a situation where researchers attend to the task of observation, while participation on their part is minimal. In this study, I was a non-participant observer. The Dictionary of Sociology (1998) describes non-

participant observations as a research technique whereby you watch the subjects in the study, without being involved in the situation under scrutiny. Schensul and Schensul (1999) define observations as an activity to learn about participants' daily routine activities in a research setting. As a qualitative research method, observations enabled me to gain a deeper understanding of and insight into the phenomenon under study.

The classroom observations started when the teacher received the class outside and my notes focused on the introduction, the current situation, classroom organisation and setting, features of CAPS, class size, and teachers' competencies in lesson preparation and PCK. Table 3.3 below provides a summary of the visits to the research sites.

**Table 3.3: The observation schedule**

Teacher observed	School	Date
Vuyo	School A	14 August 2017
Carol	School A	14 August 2017
Bradly	School B	15 August 2017
Neill	School C	16 August 2017
Dawid	School D	16 August 2017

### 3.11.8 Result analysis

Data analysis is perhaps the most crucial process for collecting, collating and modelling of data to extract insights and meanings that support decision-making in a given study. It is a process that brings order, depth and meaning or insight to a body of data; otherwise, the data would remain only as mere bits and pieces of information items. It is the process that ultimately yields the results which in turn is then used to provide the researcher and other stakeholders-teachers, subject advisers and curriculum planners with a bird's-eye view of learner performances in the subjects (DBE, 2015). This diagnostic tool provided me with the much-needed comparative data on the performance trends of the learners. For the purposes of analysing learner results, the diagnostic reports and data from the Northern Cape DoE provided me the background and the context for the study. By analysing the results, I was able to establish the trends and to give an overview of learner performance in the Pixley ka Seme District.

### **3.12 Data explication**

In phenomenological studies there is a shift from making use of the subheading 'data analyses to data explication. It is not used because of what Groenewald (2004) describes as its ambivalent agenda. The latter is preferred in phenomenological, philosophical and literary criticism for a close analysis of a given text and associated nuances. Of concern to Groenewald (2004) is that the term data analysis refers to dividing data into little units, and it demonstrates that there is a loss of the phenomenon under investigation. Explication is a more suitable term as it makes the point that the phenomenon can be explored, investigated and studied as well as maintained in its context.

Data explication is not interested in the frequency of life sciences teachers but rather in how teachers understood the intention of the curriculum, perceived the implemented curriculum, what their experiences thereof were and what the outcomes of the implemented curriculum were. Also important is the meaning the participants assign to a particular phenomenon. For me to relate to the process of data explication, Giorgi (1975) reminds me that the four-step data explication process should comprise of: (1) reading the transcribed text and then rereading it; (2) identifying themes and labelling each part of the text; (3) categorising themes; and (4) providing a table which shows the themes and the responses of the participants.

#### ***3.12.1 Quantitative data explication***

Statistical analyses were done using the data analysis Statistical Process for Social Sciences (SPSS) programme. For the preparation, analysis and interpretation of the quantitative data, an experienced data analyst from Statistical Consultation Services of a South African University was consulted. The raw data collected from the questionnaires was captured in the SPSS programme to analyse the quantitative data with the use of the descriptive and inferential analytic procedures. As the qualitative data have numerical values for each and every question, it enabled me to draw some conclusions and to make certain predictions. To ensure the internal reliability of a data collection instrument, it should be based on the inter-item correlations and should have a value of  $p > 0.05$ .

#### ***3.12.2 Qualitative data explication***

Data explication for the qualitative data was done after data collection. To ensure high quality and accessible data, data management, which forms part of data analysis, was applied. It is for this reason that the data that were collected and stored in a file on the computer and retrieved for analysis purposes. Soon after the interviews, the data were transcribed and analysed for themes or patterns. For the interviews, data were sorted and grouped according to research questions and analysed using the inductive data analysis technique.

The data were then transcribed word for word from the recorder and the emerging themes were identified. During the content analysis of the CAPS document to establish what the intention of the implementation of the Grade 12 life sciences curriculum was, I made use of the deductive analysis technique and triangulated the data obtained from the interviews.

### ***3.12.3 Mixing of quantitative and qualitative data***

Many authors (Creswell & Plano Clark, 2011; Greene et al., 1989; Teddie & Tashakkori, 2009) believe that the mixing of quantitative and qualitative data forms an important part of mixed-methods research. Phenomenology provides a good starting for mixing qualitative and quantitative data (Martiny, Toro & Høffding (2021)). The first part is to establish one's phenomenological frame as a point of departure, i.e., commitments, theories, analyses, concepts, and distinctions. Then, secondly it is important to know how you will generate the qualitative and quantitative data. Finally, the last part will inform the analysis and interpretation of the qualitative and quantitative data. Mixing different data sets can take place at any time in research – whether at the data collection or data analysis process (Ivankova, Creswell & Plano Clark, 2016). For the purpose of this study, the data collected were critically analysed and interpreted. The quantitative and qualitative phases of the study involved identifying the participants for the interviews and designing interview questions based on the quantitative results. All the qualitative data, i.e., responses from teachers, observational notes and the transcriptions of the interviews from audio-digital recordings, was included to form an integrated data set.

## **3.13 Instrumentation design and quality assurance of instruments**

The instruments for this study were designed to collect data.

### ***3.13.1 Instrumentation design***

As indicated earlier, I used different instruments for the purpose of data collection to address the research questions, namely: (1) interviews; (2) document analysis; (3) classroom observations; and (4) a questionnaire, and (5) result analysis. The interview schedule (Appendix K) was developed to check the extent to which the conclusions found in the document analysis, observations and result analysis indeed are supported by the quantitative data (the questionnaire). The interview schedule was used to gain insight into teachers' basic understanding of the intention of the implemented Grade 12 life sciences curriculum. During the interview process, I probed for more answers, particularly in cases where uncertainty prevailed (Nieuwenhuis, 2016). In addition, I carried out documentary analysis (Appendix J) to corroborate the findings of interviews. The analytical framework that was used in the document analysis was the strategic competence and adoptive reasoning framework. A

table was drawn up with the dispositional category, followed by the statement section that relates to the category section. The statements include the Grade 12 life sciences content and a section to indicate how frequent a statement appeared in the CAPS for life sciences policy document.

The observation schedule (Appendix H) was designed to observe how teachers implemented the Grade 12 life sciences curriculum. This observation protocol is linked to the second research question, which has to do with how teachers implemented the Grade 12 life sciences curriculum. The observation protocol enabled me to gather data on teachers' experiences while implementing the Grade 12 life sciences curriculum. Nieuwenhuis (2016) warned researchers that observations can be very subjective. Therefore, I assumed the role of an observer participant, which Nieuwenhuis (2016) described as an individual who enters the research setting (classroom) but in the main focuses on his/her role as an observer in the setting. He further noted that the observer may look for behavioural trends in order to comprehend the values and beliefs of the participants and to make sense of the social dynamics of the research context. The aim of the teacher questionnaire (Appendix G), an adopted version of the existing questionnaires, was to address the third research question by adapting and modifying the already existing instruments to meet the research design of this study (Johnson, 2009). The questionnaire consists of eight sections (Section A, B, C, D, E, F, G and H), with a total of 55 open-ended and closed questions. Also, the use of a Likert-scale questionnaire allows the descriptive analysis of the data to emerge freely so that the data can be reported graphically (Pietersen & Maree, 2016).

The questionnaire focuses on the third research question, which relates to the perceptions of life sciences teachers while implementing the Grade 12 life sciences curriculum. The validity and reliability of the questionnaire are dealt with under Section 3.15.2. The validation of the research instruments increased the trustworthiness of the results. The rigour involved in the development of each instrument, coupled with the use of a variety of strategies such the critical appraisal by experts in the field, pilot study and the use of a multitude of data collection methods, helped to improve the trustworthiness of the findings. The quality assurance process of the research instruments is discussed in the next section.

### **3.14 Quality assurance of instruments**

Drost (2011) has suggested that, for a research instrument to provide direction and measure what it is supposed to measure, it must be validated. For the same reason, all the instruments used in the study went through the necessary validation processes before they were administered to the participants. These processes – which included among others the use of experts to carry out the face, content and



construct validity of each instrument; revisions of each instrument based on the criticisms and comments made by research and subject experts; and pilot testing – were carried out until each instrument was considered appropriate and suitable for the intended purpose (i.e., to adequately address the research questions). Additionally, my analysis of each data set was sent to expert data analysts who validated my interpretations of the various sets of data relative to the aim of the study. All their recommendations were taken into consideration in my final interpretation and explanations of the findings.

### **3.15 Triangulation**

For the corroboration of the research findings, triangulation can be used. This is normally done by using various methods of data collection (Creswell, 2012). Stake (2000) also points out that the process of triangulation is widely considered as using various perceptions to explain meaning and verify the reoccurrence of observation or interpretation. Triangulation was applied in this study by using multiple data collection methods. Various data collection methods were used to achieve valid results. According to Patton (2001), triangulation in the form of using a variety of data sources in an investigation enhances the validity of the results and facilitates one's understanding of the issue at stake. Denzin (1978) refers to methodological triangulation, which involves the use of different methods in the same research project. Making use of four data collection methods and undertaking a rigorous analytic procedure were additional measures taken to enhance the validity of the findings. For Cohen and Manion (1994), triangulation tries to set out, or explain in a broader sense how rich and complex the behaviour of humans can be by studying it from different perspectives. Triangulation also helps guard against researcher biasness.

The term triangulation as used by Cohen and Manion (1994, p 120) refers to data generation whereby two or more methods are used in the same study of human behaviour". Employing a single method results in a limited perspective and sometimes inaccurateness of the data collected. Triangulation demonstrates rigour (Lacey & Luff, 2001) as it enables me to uncover complexity and obtain different views. For instance, in this study, document analysis was used in combination with the interviews to verify, validate and corroborate the findings of the interviews.

### **3.16 Trustworthiness and validity in phenomenology research**

With regard to the validity the research instruments it strengthens the instrument so it could measure what it is supposed to measure (Drost, 2011).

#### ***3.16.1 Trustworthiness in phenomenology***

As stated earlier, whenever applying a mixed-methods research approach in a phenomenological research study, the trustworthiness of data should encompass the various topics discussed during the stages of that research. According to Lincoln and Guba (as cited by Johnson & Turner, 2003), the broad use of the term trustworthiness is equated to the manner in which I was able to promote the findings of the study as being worthy and that the research was of a particular quality. In order to ensure that the data are trustworthy I had to embrace Gibson and Brown's (2009) view and to apply Husserl's (1975, 1970) as well as Van Manen's (1990) principle of the epoché in the field during the data-construction process. Epoché is the freedom from supposition and means "to stay away from", in order for the rich descriptions of teachers and the context within which they teach to flow naturally from their point of view. This meant I had to distance my personal beliefs and understanding of being a life sciences teacher. Gibson and Brown (2009), is of the view that 'trustworthiness' rather focus on the context of the data-construction process than on the inherent trustfulness. Several ways exist to enhance the trustworthiness of a phenomenological research study e.g., peer critique, structure resonance, peer verification and triangulation.

Peer critique is one of the ways deployed to increase the validity of this study. Its main purpose is ensuring that a given study meets the requirements of a high-quality inquiry. It is also to check the descriptive validity of a study, but, more so, it is to give a tenable account of the interpretation of the data. For the same reason, my colleagues served as critical readers of this study. The validity of a study is enhanced if people with different perspectives are given the opportunity to appraise the different aspects of the study, including such things as: initial design; sampling procedures; the methods used for gathering data; instrumentation development; the appropriateness or otherwise of the analytical procedures; and, finally, the steps taken to attain ethical clearance for the study. All of these steps were taken before the University's Ethical Clearance Committee and DoE allowed me to undertake the study. By using multiple methods of data collection and different researcher perspectives, I was able to increase triangulation and the validity of the whole study.

### ***3.16.2 Validity and reliability of data***

Mohajan (2017) regards validity and reliability as crucial elements when testing a measurement tool in research. He further suggests that reliability is concerned with the truthfulness of the data obtained from the instrument and the capacity of the instrument to yield the same measurement value when repeated. Validity, on the other hand, is concerned with what the instrument is supposed to measure and how consistent it does so. According to Ntshaba (2012), validity is the complement to reliability and refers to the extent to which our measurement tool reflects what it is expected to measure. Irrespective of the methods, approach and technique used in collecting data, the research results

ought to be reliable, valid and trustworthy. It is for this reason that Kimberlin and Winterstein (2008) report that, in order to increase and ensure the integrity and quality of a measurement instrument, there should be evidence of validity and reliability.

As noted by Cohen et al. (2007), validity is a crucial key to effective research. In this study, a non-experimental pre-post one group design was used in generating the quantitative data. Although this would generally be considered a weak design in a quantitative research context (Ogunniyi, 1993; 2003), I considered it adequate enough for a largely qualitative study considering the small size of the sample. Furthermore, the purpose was not to generalise the findings as would have been the case for a quantitative study. Rather, the focus was to get an in-depth knowledge of the experiences of a small cohort of life sciences teachers in a small community in the Northern Cape Province.

The questionnaires were sent out to 25 life sciences teachers. According to Maree and Pietersen (2016), a non-experimental design, “is used in descriptive studies in which the units that have been selected to take part in the research are measured on all the relevant variables at a specific time and no manipulation takes place” (p. 171). The reliability of the data was determined by the Cronbach alpha coefficient. Issues of validity and reliability normally weigh heavily on researchers. They are important in the sense that they ensure that a study is meaningful, reliable, valid and accurate (Case, 2012; Leedy & Ormrod, 2013; Pickard, 2013).

A study can be viewed as reliable if the methods used in that study can be replicated to a different study or in a different setting with the same results (Case, 2012; Pickard, 2013). Bernard (2013) added that validity forms an integral part of a research study. Suskie (1996) likewise views validity as crucial since the assumption is that measures made from a valid instrument will be valid. Bernard (2013) posits that validity purports that an instrument must measure what it is supposed to measure. In essence, validity has to do with the extent to which conclusions are drawn from the data in a logical way (Sapsford, 1999). Therefore, to determine if a study is valid, one has to question the extent to which it is valid and the validity of the evidence.

Various types of validity were found in the literature, e.g., content validity, face validity and construct validity (Creswell, 2014). To ensure content validity of this study, I only selected items that were suitable for the questionnaire. The content validity of this questionnaire in terms of which items related to each of the categories was ensured by having it reviewed by an expert in life sciences at a South African university. To ensure face validity, the questionnaire was sent to an expert in the field of life sciences to make sure that the questions in the questionnaire measure what they are supposed to measure. Construct validity according to Creswell (2012) is concerned with adequacy and

conceptual quality. It also concerns standardisation purposes as well as a way to ensure that the construct(s) contained in the instrument are measured in terms of different groupings of related items (Booyesen, 2018). In other words, construct validity refers to the standardisation of the questionnaire and how well the constructs covered by the questionnaire is covered by related items (Maree & Pietersen, 2016a) or how appropriate the questionnaire is to the study. The Statistical Consultation Service helped me with the item and factor analysis by grouping the items that belong together as well as identifying items in the questionnaire that were not be suitable to the study or had shortcomings. I took great care to ensure a high internal reliability for the instruments.

Maree and Petersen (2016a) regard the questionnaire as internally reliable when there is a high degree of similarity among various items of a certain construct that were supposed to be measured. A high degree of similarity indicates that the questionnaire is internally consistent. Maree and Pietersen (2016a) suggest that the coefficient that is responsible for the internal reliability of the questionnaire is called the Cronbach's alpha coefficient, which is a function of the number of items in a test; the average covariance between item-pairs; and the variance of the total score (Barnard, 2017). The Cronbach's alpha coefficient will generally increase as the inter-correlations among test items increase, and is thus known as an internal consistency estimate of reliability of test scores. The higher the coefficient score, the higher the validity of the test (Barnard, 2017).

The reliability coefficients suggest the extent to which the results obtained from a measurement method are repeatable (Nunnally, 1978). In this study, the total Cronbach's alpha score for all the items in the questionnaire was 0.68, which indicates a low consistency. Because the value is 0.68 it is deemed as low. Whereas the the minimum acceptable value for Cronbach's alpha is 0.70; below this value the internal consistency of the common range is low. Although the value was low the questionnaire was deemed suitable for data collection. I was careful in ensuring that the data analyst considered all the questions measured and all the items in their totality.

To further enhance the validity of the study, two colleagues were asked to read through the questionnaire and make recommendations as they deemed necessary. Attention was also paid to the structure and language of questionnaire so as to ensure that the data collected was appropriate to the aim of the study. To enhance the reliability of the questionnaire, the Cronbach alpha coefficient was determined for each question. Item relatedness was checked, and Pearson's correlation was used to establish the statistical significance of the relationships between the questions. Petersen and Maree (2017) make us aware of some of the challenges that researchers should guard against when doing research. I therefore considered these challenges and came up with precautionary measures to avoid these pitfalls.

In quantitative research, validity refers to the degree to which a measurement instrument measures what it is supposed to measure (Thatcher, 2010). Maree and Petersen (2016a) consider three types of validity to ensure the trustworthiness of a questionnaire, namely content validity, face validity and construct validity. Content validity ensures that the questionnaire covers the content of the research question, which in this case is: What is the life sciences teachers' perceptions regarding the implementation of the Grade12 life sciences curriculum? According to Maree and Pietersen (2016a), face validity refers to the extent to which the questionnaire looks valid, that is: Does the questionnaire measure what it is supposed to measure? For the purpose of face validity, the questionnaire was developed by me, where after it was sent to a statistician to ensure its face validity and that I would indeed obtain data relevant to this study.

### **3.17 Ethical issues of the research**

In this section, ethical issues that are relevant to the research are briefly discussed. According to Punch (2005) every research has an ethical dimension to it. Ethics forms an integral part of any research. It is therefore necessary that I was particularly careful to protect the identities of the participants and obtain the necessary consent. According to Fabbriciani (2010), not everyone can carry out research at any given place. Aluwihare-Samaranayake's (2012) view on ethics is that ethics forms an integral part of any research project and therefore has an impact on the both me and the participant. Most significantly, it has an effect on the research design. Researchers must at all times be sensitive and adhere to ethical issues (Koopman, 2013). Institutions involved in this study were the University of the Western Cape and the Northern Cape DoE. Before data collection could commence, a letter was sent to both the University of the Western Cape and the Northern Cape DoE to seek consent to conduct research in the selected schools.

I made a concerted effort to comply with the ethical requirements as laid down by the Humanities and Social Sciences Research Ethics Committee (HSSREC) of the University of the Western Cape. In order to deal with ethical issues, I sought permission for ethical clearance from the University of the Western Cape. Ethical clearance was granted on the 09 December 2016 by the Senate Higher Degree Committee. Permission by the Northern Cape Department of Education was granted on the 27<sup>th</sup> February 2017. Other ethical considerations relevant to this study which I paid close attention to include what Resnik (2010) suggests namely: ensuring the integrity, legality, confidentiality and the protection of participants.

#### **3.17.1 Gatekeepers**

Gatekeepers are people with authority who approve access to the research site, lay down basic ground rules and conditions of the intended visit, assist with identifying possible participants and locate the research site (McMillan & Schumacher, 2014; Patton, 2015). By the powers vested in them, they determine who enters the research site and when. The District Director (Addendum A) was approached for permission to conduct research in the selected schools in the district. Principals, teachers and SGB's of selected schools should also be asked for permission to conduct research in the schools. The principals at the selected schools act as gate keepers and liaise with teachers in the school. The participants' will be informed by a gatekeeper about the aim and objectives of this study and will obtain informed consent for administering the questionnaire and the interviews. Getting consent means that all possible or adequate information and the aim of the research, the procedures of the research, the advantages, disadvantages and possible dangers to which participants may be exposed to, as well as the credibility of me be made known to participants (De Vos., Strydom, Fouché, & Delpont 2005).

### **3.17.2 Bracketing**

Husserl's (1970) account of bracketing is that it has three levels within the hierarchy of simplifying and comprehending the phenomena under study. It starts with one's conceptualisation of the phenomenon, this is then followed by examining certain parts and lastly a comprehension of the phenomenon is formed. In the spirit of the phenomenological research tradition, I utilised bracketing by: putting aside my own convictions; not being judgemental about what I observed; being open to data as they emerged in the process of this inquiry. Many who do not subscribe to the notion of phenomenology view bracketing of personal views with objections (Nel, 1984). Such people wrongly presumed that I am prepared to set aside my personal views and ultimately negate them during the research process. Bracketing of personal views and prejudices, however, does not imply that my personal views and prejudices are totally excluded from the research enterprise. This practically means that the researcher temporarily suspends his/her views and prejudices from influencing research findings. Strieber (2003) contends that this activity takes place at the beginning of the research process, with a repeat during the data collection process and data explication process of a research study.

Bracketing can be described as an approach where one sets aside his/her own judgement as a different view of data becomes known (Holloway, 2005; Kalfe, 2013). This protocol is necessary to eliminate all forms of possible data contamination. Bracketing, also called epoché in phenomenological study, must be allowed to emerge on its own while one suspends one's own belief to prevent any bias. According to Husserl (1970), epoché is the freedom from supposition. In this

study, it meant that I refrained from any tendency to prevent teachers from freely expressing their viewpoints. Therefore, before collecting data, I explored my own preconceived notions about the implementation of the life sciences curriculum and then made a concerted effort to set these preconceptions aside during data collection and data explication process. This enabled me to remain neutral as much as possible regarding the phenomena under investigation.

### ***3.17.3 Negotiating access to the research space***

Permission for access was initially sought from the Northern Cape Department of Education (DoE), school governing bodies (SGBs), principals and teachers. The research aimed to investigate the experience of a selected group of Grade 12 life sciences teachers' task with implementing the life sciences curriculum. Empirical data were gathered from selected schools in the Pixley ka Seme District.

According to Le Grange (2001), entry to the research sites is one of the most fundamental steps to the data generation process. Planning a research venture, entering a research site and finding participants who are prepared to participate is definitely not a straightforward process (Kondwe & Booyens, 2014). Researchers are often confronted with situations they did not predict or foresee. In order to deal with these practical realities and unexpected circumstances, a researcher has to apply a range of research skills. It is of utmost importance to gain entry to a research site as the success of data collection and data construction depend on how easy or difficult it is to access the site and how well I can maintain good relationships with the research participants (De Vos, Strydom, Schilze & Patel, 2011a).

The ability to get easy access to the research site can be beneficial to the entire research process (Kondwe & Booyens, 2014). The person(s) who grant access to the research site are called gate keepers (Bailey, 1996). For me to gain entry to the research sites and commence with data collection and the data construction process, written consent was sought from the following gate keepers: The Northern Cape DoE – District Director of Pixley ka Seme; The University of the Western Cape; principals of selected schools and teachers of selected schools. Johl and Renganathan (2010) cautions that gaining access to a research site is a process filled with potential pitfalls. This study was no exception, since I only received permission from the different gatekeepers to conduct research at a very late stage. Each of the above entities furthermore expect me to observe the code of ethics that has to do with research in schools. I utilised informed consent from teachers and principals. Le Grange (2001, p. 94) outlines consent as follows:

“It is critical to have the willing consent of the human subject. This basically implies that the volunteer must be a juristic individual to give consent; should be able to exercise free choices, without being forced, fraud, deceit, overreaching or any other unconventional form of constraint or coercion and pursuance; and should have sufficient information and appreciation of the procedures involved as to empower him [sic] to make an educated decision.”

The challenge that I experienced during the entire process was that it was a long and tiring procedure. Hence, my contention that it is better for researchers and particularly teacher researchers to choose research sites carefully. In my opinion researchers should select sites that are familiar to them to guarantee easy access. It is fitting that researchers should design their research carefully to avoid any pitfalls in the data collection process or when applying for consent. My account is certainly not a blue print for accessing research sites, but each research has its own challenges that present themselves at the various stages of the research process.

### **3.18 Chapter summary**

In this chapter, I have described and discussed the research methodology and the phenomenological worldview underpinning the study. More specifically, I presented a detailed account of the research methodology and the procedures I adopted to establish the validity and reliability of the instruments. I also outlined the collection and analysis procedures of the data, including the steps I took to achieve quality assurance of the research instruments. Next, I described the nature and location of the study (Northern Cape Province, South Africa). I then provided a detailed account of how I selected a purposive sample for the study. I briefly examined issues relating to ethical considerations and the phenomena of gate keeping and bracketing as they are being used in phenomenological research. I also attempted to bring to the fore my methodological choice that was derived from the epistemological and ontological view asserting that knowledge and reality are best sought from those who experience it. Lastly, I presented an explication of the preliminary data for a detailed analysis in the next chapter.



## CHAPTER 4: EXPLICATION OF THE DATA

### 4.1 Introduction

As has been pointed out in the last three chapters, the study was based on experiences of a group of Grade 12 life sciences teachers' experiences while implementing the Curriculum and Assessment Policy Statements (CAPS) in Pixley ka Seme education district of the Northern Cape Province, South Africa. The contention here is gathering data about their experiences with the new curriculum without interpreting it would be of little value to the stakeholders. In other words, a mass of data set would be meaningless unless one draws some tangible meaning from it by making what is hidden or implicit more explicit for all to see. In the same vein, the sort of data derived from the experiences of these life sciences teachers involved in the study would only warrant the attention of the interested parties if only it is explicated and its implications for policy, curriculum development and instructional practices are well articulated. The aim of this chapter therefore, is to analyze the data or better still explicate the data as well as point out the essence of the findings in terms of the aim, objectives and the research questions.

This first part of this chapter focuses on the data generated from the questionnaire, interviews, observations and document analysis using Schön's model of reflection in action. According to Husserl a person's experience does not need interpretation because it reflects the things-in-themselves, the data is interpreted "as is," with no prejudice or interpretation (Koopman, 2018). Of course, this is not the same as leaving data as being self-evident but rather presenting the data in a more explicit manner than would have been the case if one assumes that the data set speaks for itself. In reality, a data set does not speak for itself. Rather researchers make concerted effort to draw meaning or make some sense of what it suggests.

In light of the above, I have presented a descriptive narrative based on Schön's reflective model (Schön, 1991). Schön emphasizes the importance of intuition in clinical practice, and thus views reflection as a realistic way of synthesizing tacit knowledge and ability (Kinsella, 2010). Indeed, the phrases "reflection on action" and "reflection in action" are often used to describe Schon's theory. Reflection in action occurs during the event, while reflection on action as the phrase suggests occurs afterward about what transpired. According to him both types of reflection can be informative, useful and efficient if clearly understood (Schön (1991). Reflection-in-action, on the other hand, aids the practitioner in being more dynamic and responsive. Reflection-on-action allows the practitioner to take time out and reflect on the situation, considering various interpretations, and thinking about how he/she could have responded differently in the future (Hebert, 2015).

There are many and varied definitions of reflective practice in the literature (e.g. Ghaye & Ghaye, 1998; Loughran, 1996; Reiman, 1999; Schon, 1991) but in the spirit of a phenomenological study, the focus of the study to encapsulate the deep reflection involved in exploring the life sciences teachers' experiences as they attempted to enact the new curriculum in their classrooms. However, I acknowledge my subjectivity and my difficulties upon reflecting on the phenomenon under study. Following this, my recollection of engaging in this research project made me self-aware in a time of intense reflection. According to Conklin (2008, p.38), "Who we are in the context of these conversations invites not only the participant into new awareness of self, but also introduces the researcher to him/herself as well." Capturing the experiences of teachers provides me with a lens to look into the world and understand what it means to be a life sciences teacher and what teachers experience when implementing a new curriculum.

## **4.2 Results of the quantitative data construction process**

As indicated earlier, this study is based on a typical mix-methods model since it correlates with the characteristics of qualitative and quantitative research (Creswell, 2013, Merriam, 2009 & Willis, 2007) though it is more qualitative than quantitative in nature. In this sub-section, results of the quantitative data analysis are presented. Descriptive data analyses are presented first. Findings of descriptive data include demographic characteristics of the teachers.

It is worth mentioning that in line with the phenomenological tradition, I am not concerned with the issue of how many or how frequently participants have had a particular lived experience, although such information was captured in the questionnaire (Giorgi, 1997) but for ease of reference, I have restated the research questions again. The quantitative data are collected to answer the first research question and in order to cross-validate and confirm findings. The quantitative data in the study is used to feed into the qualitative data (interviews, document analysis and result analysis) by providing orientation and assisting participants with information-rich and thick descriptions of their experiences (Baker, Johnson, & Kay-Lambkin, 2011; Dean, Hudson, Hay-Smith, & Milosavljevic, 2011; Hamdan-Mansour et al., 2011; Mayoh et al., 2012; Thornton,). For ease of reference, the findings were organized around the research question.

*Question 1: What were their perceptions of, and experiences with CAPS?*

In light of the research design, the first data collection instrument was a questionnaire, which was used to gain a generalized understanding of the phenomenon under investigation. A questionnaire was used to obtain data on the teachers' perceptions of the implemented Grade 12 life sciences

curriculum (Appendix G). In analysing the questionnaires, the research question pertaining to this data generating method needs to be reiterated in order to guide the analysis and discussions.

The purpose of the questionnaire was to explore the experiences of the life sciences teachers in implementing the life sciences curriculum. As the extant literature suggests, teachers' experiences in implementing the life sciences curriculum are pertinent to the study because such experiences impact on their effectiveness or otherwise in implementing curriculum. Ogunniyi (1986, 2004) and Jensen & Christie (1998) are of the opinion that no educational system is more important than its teachers. But as the literature has revealed, the curriculum implementation has encountered diverse problems precisely because the curriculum planners have continued to implement a series of curricular revisions without considering the general unpreparedness of most teachers (e.g., DBE, 2011; DOE, 2002; Jensen & Christie, 1998; Ogunniyi, 2004, 2007a & b).

### **4.3 Analysis of questionnaires**

#### ***4.3.1 The setting for the preliminary data analysis***

To prevent clustering the explication of data with procedural reporting of near raw data, I decided to present only a brief account of the quantitative aspect of the study. This is because although the number of personnel or quantity of resource materials are useful indicators of a functioning education system, they are not sufficient in describing the lived experiences of the life sciences teachers attempting to enact the new life sciences curriculum known as CAPS in their classrooms. My view is that it is effective deployment of human and material resources in an education system or the implementation of a curriculum that counts rather than their quantity per se. In light of this and the purpose of the study, the central focus of the chapter is the explication of the quantitative data.

#### ***4.3.2 The research participants***

To meet the demands of ethical clearance, pseudonyms have been used to identify the participants in the study. Tolich (2014:86) claims that researchers provide pseudonyms so that participants are not easily identified in research reports. The participating schools were labeled A to D and the participants (teachers) were pseudo-named as Vuyo, Carol, Brady, Neill and Dawid respectively. All of them came from previously disadvantaged schools. Although all the participants taught in the same district in the Northern Cape Province their perceptions as expected varied depending on their personal circumstances, experiences, interpretations, understandings and how they valued and viewed their role in the education process. As a result, the information gathered was specific to each participant. In the following section I have provided a summary of the utterance of each participant to provide insight into what they personally experienced in their attempts to implement CAPS in

their classrooms. The introduction of the participants seeks to demonstrate and echo the claim by Bor, Miller and Goldman (1993) that “lived experiences cannot be talked about without considering the multiple identities that “inform social experiences”

#### *4.3.2.1 Vuyo*

Vuyo is the principal and one of the most experienced teachers in school A and teaches life sciences and isiXhosa for Grade 12. He is a very articulate and well-read person. Vuyo holds a Bachelor of Arts, BA Hons and a Higher Diploma in Education (HDE) specialising in Biology from the University of the Western Cape as well as a Master’s degree in Education from the University of the Free-State. At the time of the study, he was 50 years old and taught the English medium classes. In his class he had 42 learners. The two official languages of instruction in the school are English and Afrikaans.

At the time of the study Vuyo had 24 years of teaching experience and is also a writer of various isiXhosa literatures for the GET phase. He has been at the school for more than 17 years. Vuyo’s and Carol’s school has a quintile 1 ranking, which means that the learners do not pay any school fees and is part of the group of schools in the Northern Cape Province catering for the most disadvantaged and poor learners. The National Norms and Standards for School Funding (NNSSF) (Republic of South Africa, 2012) aimed at improving the equity in the funding of education by ranking each school into five quintiles. This ranking is based on the unemployment rate and literacy rate of the community in which the school is located. According to (Van Dyk & White, 2019) a lower quintile ranking and funding of the school is associated with education of poor quality.

According to Xaba (2012) the current funding model contribute to the inequality and challenge experienced by schools. This implies that a school with a quintile index rating of 1-3, does not charge any school fees. Generally, such a school lacks adequate instructional resources and sporting facilities for learners. Often such a school does not generate funding outside the allocation received from the Department of Education. All these inadequacies tend to have a detrimental effect on teaching and learning. For the same reason Vuyo’s school was unable to employ additional teachers in critical subjects such as life sciences and mathematics.

#### *4.3.2.2 Carol*

Carol is a single female teacher. She is also a novice teacher with just over two years of experience. She is responsible for teaching the Afrikaans stream of the Grade 12 life sciences class at school A. She has two years’ experience and furthermore teaches the Afrikaans Grade 10 to 12 life sciences classes, and Creative Arts and life orientation in the GET phase. Carol held a B.Ed. (Life Sciences,

FET phase) degree from the North West University specialising in life sciences. She is Afrikaans and was 23 years old when this study was conducted. Carol, by her own confession, was not confident in teaching the Grade 12 learners. Carol was involved in extra mural activities at the school. Much research has been conducted on the relationship between years of teaching experience and the ability of teachers to implement a new curriculum such as the Curriculum and Assessment Policy Statement (CAPS) (e.g., DuFour & Eaker, 1998; Elmore, 2004; Guskey, 2002; Stein & Wang, 1988). DuFour (2002) has emphasized that teachers struggle to focus on and implement a new curriculum for various reasons outside their personal control. Curriculum implementation is a transformative process with innovation and change, as the overarching objective is geared towards the improvement of teaching and learning.

#### *4.3.2.3 Brady*

Brady is from Phillipstown and a seasoned life sciences teacher who held a B.Ed. (Life Sciences, FET phase) degree from the Cape Peninsula University of Technology. He taught at school B. He was 34 years old at the time of the study. He had nine years of teaching experience. He is the Departmental Head for the Sciences and mathematics department. The medium of instruction is Afrikaans and English at Brady's school. Brady's school has a quintile 3 ranking, which means the school is a non-fee-paying school and receives more funding per learner from the government (Ogbonnaya & Awuah, 2019).

#### *4.3.2.4 Neill*

Neill teaches life sciences across all grades in school C. He has been doing so for the past 26 years. Neill is very familiar with the community where the school is located. The class size varies from 38 to 43. He is from De Aar and holds a Diploma in Education (Biology) from the Southern Cape Teachers College. He is a seasoned marker for life sciences in the Northern Cape DoE. He was 48 years old when this study was conducted. He serves on provincial and national structures of the South African Football Association (SAFA). He is also a licensed SAFA soccer (football) coach. Neill's school has a quintile 1 ranking, which means that the learners do not pay any school fees and is part of the group of schools in the Northern Cape Province catering for the most disadvantage and poor learners.

#### *4.3.2.5 Dawid*

Dawid teaches grades 10–12 life sciences in School D. Dawid taught for the past 26 years at this school and is familiar with the school community and surroundings. He is a marker during the NSC examinations for the Northern Cape DoE. He holds a Diploma in Education (Biology) Dawid's

school's medium of instruction is Afrikaans like Brady and Neill's schools. The number of learners across the grades varies from 40 to 45. He has 26 years of experience. He was 50 years old at the time of the study. Dawid's school has a quintile 1 ranking, which means that the learners do not pay any school fees. In 2014 the participating teachers described above were part of a group of life sciences teachers in the Pixley ka Seme District who received in service training from the **Science Learning Centre for Africa (SLCA)** at the University of the Western Cape (UWC). Table 4.1 below provides a summary of the biographies of the participating teachers involved in the study.

**Table 4.1: Biographical data of the five life sciences teachers involved in the study**

Name	Ethnicity and gender	Qualifications	Teaching experience
Vuyo	African Male	BA (Hons), HDE (Biology), and M Ed	24 years
Carol	Coloured Female	B Ed (Life Sciences)	2 years
Brady	Coloured Male	B Ed (Life Sciences)	9 years
Neill	Coloured Male	Diploma (Biology)	26 years
Dawid	Coloured Male	Diploma and ACE (Life Sciences)	26 years

#### 4.4 Description of the research sites

This study endeavoured to describe the lived experiences of five life sciences teachers. The descriptions of teachers' experiences emanated from the data captured in the spirit of phenomenological tradition (Koopman, 2013). In other words, I focused on the experience of teachers' sense of self and others through their narratives. The following sub-section describes the school within which each of the participants teaches.

##### 4.4.1 School A

The school is located in a small town in the Karoo region of South Africa, approximately 200 km south of Kimberley. School A is a public secondary school with 557 registered learners and 16 teachers. The school is a double medium school (Afrikaans and English). Most of the people in this town are Afrikaans speaking. The high school came into existence after the community identified the need for a high school in the early 1990s. The former white school was dissolved and a new school was established after the community activists pressurised the government to establish a school to cater for the requirements of the learners of Petrusville. At that time there was no high school in the town and learners had to travel and stay in hostels in adjacent towns. The school is situated in the Renosterberg Municipality in the Northern Cape Province, which has primarily a mix-agricultural economy. The school population is consisted mainly isiXhosa and Coloured learners. School A attempts as much as possible to advance social integration and social cohesion in line with the

demands of the new South Africa. Learners are mainly from the town and farms in the area. Parents of the school are mainly dependent on social grants. Booysen (2015) states that no-fee schools in poor communities are part of quintile index 1-3 schools and are in a poor state that negatively impacts the teaching and learning process. For example, there is hardly any support from the parents due to their low educational and financial background. Despite the foregoing, the school managed to deliver excellent results and attracted a considerable number of learners from cities around the country. The school's lack of laboratory resources meant that often teachers had to improvise. The persistence of unemployment in the community implies a high level of poverty such that majority of the residents in the town is dependent on social grants provided by the government. My contention is that a school which serves as a beacon of hope and as an emancipatory apparatus offer an alternative approach that could respond to challenging issues that affect the community.

### **Resources**

School A being an old school, consisted of old structures and a block of new buildings and toilet blocks that were built by the Northern Cape DoE after the school was partially burnt down by unknown persons when it was taken over from the House of Assembly (White administration). A large percentage of the learners came from poor families with poor financial backgrounds. The parents generally lack technical skills and are semi or illiterate. Ninety-five per cent (95%) of the learners receive social grants from government. Most of the learners come to school not having a proper breakfast at home. All the learners in the school depend on the National School Nutrition Programme (NSNP) that is operative and well managed in the school. The school management reported that the school did not experience any serious cases of misconduct and absenteeism amongst learners and teachers.

### **Learners**

A large percentage of the learners came from poor families with poor financial backgrounds. The parents generally lack technical skills and are semi or illiterate. Ninety-five per cent (95%) of the learners receive social grants from government. Also, most of the learners come to school not having a proper breakfast at home. In other words, the school becomes a second home for them.



**Figure 4.1: School A**

All the learners in the school depend on the National School Nutrition Programme (NSNP) that is operative and well managed in the school. The school management reported that the school did not experience any serious cases of misconduct and absenteeism amongst learners and teachers.

Further, School A has a history of producing excellent results and has a sound management team in place, together with a School Governing Body (SGB) that is fully functional. Collaboration and cooperation are apparent in the school. The management team consists of five permanent senior staff members on the school management team (SMT) and a staff complement of 11 teachers. The SMT of the school adopted vision 2030, whereby they want to see at least 10 matric learners of each year's cohort to attend higher learning institutions.

**Table 4.2: Management structure and profile of school A**

	2015	2016	2017
<b>Principals</b>	1	1	1
<b>Deputy Principals</b>	1	1	1
<b>Departmental Heads</b>	3	3	3
<b>Teachers</b>	11	11	11
<b>Staff Establishment: Total</b>	15	15	15
<b>Number of Learners</b>	540	560	557



#### 4.4.2 School B

Like School A, School B is located within the borders of the Renosterberg Municipality and was managed by the former Department of Education in the former House of Assembly (responsible for managing white schools), which existed prior to formation of the Northern Cape Department of Education Department (NCDoE) in 1994. Before the first democratic elections in South Africa in 1994, the different population groups were represented by three distinctive 'Houses' in Parliament. The House of Assembly represented the Whites, the House of Representatives the Coloureds, and the House of Delegates for the the Indians, forming a Tricameral Parliament. Blacks, however, were excluded from this tricameral parliament.

The school is located in small town in the Karoo. It falls within the Pixley ka Seme education district and is approximately 50 km north from De Aar, the nearest town. The school is a public secondary school. Like School A, it came into existence after the number of the white learners in the town decreased dramatically and the school eventually closed down. The initiative by the parents saw to the establishment of the school. Just like any rural school, school B is faced with adverse socio-economic challenges. The Northern Cape DoE opened the school in 2010 specifically to accommodate the learners who had to travel to the nearest town to attend high school. The total enrolment for 2017 was 305 learners with the principal, two departmental heads and 10 teachers. The school is not well resourced. Although School B's results have been fluctuating in the last five years, there has been a steady improvement in its pass rate (i.e., pass rate of 88.9% or an increase of 30%) from the previous year (City Press, 2020).



**Figure 4.2: School B**

## Resources

School B is an old school dating back to the apartheid period. Buildings are dilapidated with 12 classrooms and an administration block. The exterior of the school needs paint and repairs. There is no library or a science laboratory at the time of the study. The ablution facilities are falling apart. There are no signs of sports fields or a school hall. The school has a low learner enrolment.

## Learners

The vast majority of the learners' hailed from families with poor socio-economic backgrounds and as such depend on social grant from the state. Most of the learners come to school not having a proper breakfast at home. It is reported that the school does not usually experience any serious cases of misconduct and absenteeism is very low amongst learners and teachers. The school produces average results each year. The management creates an enabling environment for the learners, with the School Governing Body (SGB), principal and teachers contributing towards improved learner performance. The principal explains that the school is able to maintain discipline because it exerts discipline on the learners by making them aware the school's code of conduct. For the better part, learners in this town live their daily lives as some racial minorities: Afrikaans language served as the only mode of communication in schools and government institutions (Modiri, 2017).

**Table 4.3: Management structure and profile of school B**

	2015	2016	2017
Principals	1	1	1
Deputy Principals	0	0	0
Departmental Heads	2	2	2
Teachers	10	10	10
Staff Establishment: Total	13	13	13
Number of Learners	245	253	238

### 4.4.3 School C

School C is situated in the Entamjeni Municipality. School C, found in 1980, is located in a former Coloured township in De Aar. Over the years the school has experienced a gradual change in the learners' racial profile from a predominantly Coloured school to a well-integrated multicultural school. The school played a significant role in educating learners from surrounding towns and farms in the 1980s. The school was built during the apartheid era mainly for the Coloured community. The medium of instruction is mainly Afrikaans. School C contributed to the struggle against apartheid.



**Figure 4.3: School C**

### **Resources**

School C is not well resourced and is a recipient of the laboratories and microscopes donated by Science Learning Centre for Africa (SCLA) located in the Faculty of Education, University of the Western Cape. The school consists of 30 classrooms. It lacks basic resources and teachers work under difficult conditions. There is a laboratory but it is poorly resourced and there is no sports ground. The school previously had a functional hostel to accommodate learners from surrounding areas and farms as it was the only high school for Coloured learners in the Bo-Karoo area.

### **Learners**

Most of the learners come from poor families and socio-economic backgrounds, with the majority of them receiving social grants from the government. Like other learners from poor communities most of the learners come to school with empty stomachs. The majority of the learners in the school are on the NSNP, which is operative and well managed in the school. It is said that a quarter of the learners are in a high-risk category. It is further reported that the school did not usually experience any serious cases of misconduct and that absenteeism was very low amongst both learners and teachers. The school had a history of achieving top results, and good management and coordination was in place, with the school governing body (SGB), principal and teachers being keen to see the performance of learners improve. Team work and cooperation were evident in the school, and the school was known for its excellent discipline. The management team of the school consisted of five members. It seemed that the school management team (SMT) was dedicated to transforming the

school into one of the best in the district. The principal and his team displayed a sense of efficiency and control. Also, the management team seemed youthful and energetic.

**Table 4.4: Management structure and profile of school C**

	2015	2016	2017
Principals	1	1	1
Deputy principals	2	2	2
Departmental heads	4	4	4
Teachers	29	29	29
Staff establishment: Total	36	36	36
Number of learners	810	843	850

#### 4.4.4 School D

Similarly, to School C, School D are also situated in the Entamjeni Municipality in the Northern Cape Province, which is primarily an agricultural economy. Sheep farming is the main employer in the region. This school, established in 1989, under the auspices of the House of Representatives during the apartheid accommodate Coloured learners from De Aar district that wanting to venture into the technical field. School D has 938 learners and a staff of 37 teachers. The medium of instruction is mainly Afrikaans. The school offers admission to grades 8 to 12 learners. The infrastructure of the school is well maintained and in a very good condition. School D is the only school in the district that caters for vocational training and maintained a high pass rate.

The principal of the school reported that according to an independent survey undertaken by the school in 2016, 44,0% of people were unemployed, while 34,7% earned between R0 and R120 000 per annum. In terms of the provisioning under the national norms and standards for school funding (ELRC, 2003: B52), the school is classified as a 'no-fee' (quintile 1) school, which places it in the poorest of the poor group of schools. This means that learners are exempted from paying school fees. The aforementioned factor may have a negative influence on the provisioning of teacher posts. Thus, it is not possible for the SGB to appoint additional teachers to lessen the responsibilities of other teachers. The upshot of this was that teachers did not have sufficient time to attend to their other duties. This situation is likely to have a negative impact on implementing a new curriculum and provide quality teaching and learning to the learners coming from this poor communities.



**Figure 4.4: School D**

### **Resources**

School D is a double storey building consisting of 25 classrooms. There is a fully equipped laboratory, but it is poorly resourced. In previous years, the school had a functional hostel to accommodate learners from surrounding areas and farms as it was the only technical school for Coloured learners in the Bo-Karoo area.

### **Learners**

Most of the learners come from poor socio-economic backgrounds. According to records from the school, 80% of the learners receive social grant from government. Most of the learners come to school not having had a proper breakfast at home. Like School C, the majority of the learners in the school are on the NSNP with about a quarter of the learners in the high-risk category. It is further reported that the school did not experience any serious cases of misconduct and that absenteeism is very low. The school has an inspiring female principal who works hard to keep the academic standards of the school high. Good management and coordination are in place, with all stakeholders being keen to see the performance of learners improve and stabilise. Sound management and cooperation are evident in the school. There is a good collaboration between the school management and stakeholders. The collaboration seeks to promote improved learning towards achieving the goals of the National Development Plan (NDP). The collaboration owes its genesis to a visionary management team and a demand from stakeholders in the teaching fraternity for assistance and

involvement. This collaboration is a direct response to demand-driven interventions from teachers, parents, learners and the SMT.

**Table 4.5: Management structure and profile of School D**

	2015	2016	2017
Principals	1	1	1
Deputy principals	2	2	2
Departmental heads	4	4	4
Educators	30	30	30
Staff establishment: Total	37	37	37
Number of learners	958	942	938

#### 4.5 Interpretive summary

So far, I have provided a detailed description of each school as well as highlighted the similarities and the disparities existing among the four schools based on their socio-political history. A common feature of most South African schools, particularly the previously disadvantaged schools is lack of adequate human and material resources which have direct and indirect bearing on learners' performance in life sciences. For example, I have pointed out that the funding model (quintile index ranking) system for schools was a major deciding factor for distinguishing the previously White schools compared to others in the non-white communities.

When determining the quintile status of a school, the DBE normally uses three indicators: income of parents, the unemployment rate; and the level of education of the community in which the schools are located. The quintile index ranking is used to address the issue of funding, socioeconomic status and the disparity in accessing education in South Africa (Ogbonnaya & Awuah, 2019).

Finally, in an attempt to illustrate the disparities existing among the schools, I presented a detailed description of the environment within which the implementation of the Grade 12 life sciences curriculum took place since the inception of the democratic dispensation in 1994 (Cross, Mungadi & Rouhani, 2002).

In addition to the above discussion, the narrative progressed to the next section which provided an interpretive narrative of how the teachers' qualifications and experiences might have influenced the way they implemented the new life sciences curriculum. Likewise, the narrative helped me to explain how the contextual differences between the schools could have affected their success or otherwise of curriculum implementation. In this section I have drew on Heidegger's (1927/1967) notion of Dasein

and how it could be used to illuminate the essence captured by the participants' narratives. This interpretive narrative was premised on the experience of the participants identified in the chapter. To this end, I first chronicled their professional journeys with reference to their qualifications and their lives as life sciences teachers, followed by a discussion on the challenges, concerns and the frustrations they experienced in implementing the curriculum. Further gave an explanation of how the contextual differences between the schools affected the success or otherwise of their curriculum implementation. Heidegger believes that in order for us to understand the world in which we live and work, we must understand the broader context expose the unexamined assumptions that shape our understanding of the world we live in.

Teachers in this study received their initial training as teachers at various institutions around the country. All of them are suitably qualified as life sciences teachers. As qualified teachers the effective teacher training that they had experienced as a pre-service teacher laid a solid foundation for them in teaching life sciences. Teacher academic qualification is repository of competencies, knowledge and skills acquired through a learning process at an institution of higher learning. In the realm of the life sciences as a subject, teacher academic qualification is an indicator of the level of competency, skills and knowledge which a teacher is known to have acquired at an institution of higher learning (Wandera, JumbaAkala & KhitieyiImonje, 2019).

Drawing on Husserl's (1970) 'lifeworld theory', the above statement underscores the impact and influence of teachers' academic qualifications, on their teaching practice and performance. Therefore, it can be assumed that good and effective teacher training coupled with suitable qualifications tend to enhance the teachers' confidence and the potential to implement the new curriculum. In terms of teaching experience, the teachers (with the exception of one) had sufficient years of teaching experience. This places them in a good position to implement the new curriculum. Teachers teaching experience has become a target of several curricula's implementation projects not only in South Africa but globally. According to Clarke (2003) teaching experience of teachers, are a key for any curriculum implementation process. It influences the quality of curriculum implementation and learner academic performance. However, researchers have different opinions on specific teacher factors that influence learners' academic performance (Rivkin, 2005). Some studies have found that a teacher's experience significantly influences students' performance (Njeru and Orodho, 2003, Asikhia 2010; Yala and Wanjohi, 2011).

From the foregoing, it is fair for me to assume that Carol, due to her limited years of teaching experience, might have produced better results that were the case. An experienced teacher might attain better matric results than another teacher less experienced for various reasons e.g., familiarity

with the format of the examination, confidence in the teaching process, familiarity of the context where the learners come from and so on. Concerning administrative support to for the teachers, it is equally the case that teachers who receive little or no support might not be able to produce good matric results as those with such support. On the contrary it is true that teachers who receive adequate administrative support is likely produce better matric results. Benz, Lindstrom and Yovanoff (2000) and Gersten, Keating, Yovanoff and Harniss (2001) support this view by stating that administrative support enhances learner performance.

At this juncture it is important to note that the training the teachers (with the exception of one) received, took place at a time when education was still under the apartheid system of education. That era was based largely on the White supremacist ideology. So, in a way politics of the day infiltrated into the way teachers thought about education. The most common pedagogy during the apartheid era was the teacher-centred traditional instruction which neglected the lived-world experiences of teachers (Koopman, 2018). For this reason, their training as pre-service teachers was more about the transmission of factual knowledge void of critical thinking. In other words, the focus of teaching was more on teaching the prescribed content as opposed to ensuring that learners are able to think critically and rationally about what to do or what to believe. This approach had to change however, in the face of the new curriculum demanding critical thinking and logical arguments from learners rather than the regurgitation of scientific facts for examination purposes.

Despite all the glaring anomalies observed in the study as a result of the apartheid system of education, however, some of the schools still performed relatively well. Most of them still achieved relatively good matric results due to a number of factors such as: (1) the strict disciplinary measures enacted by the school administration; (2) the supportive role of the School Governing Board (SGB); (3) the input of the School Management Team (SMT) consisting a number of hardworking teachers; (4) the input by subject advisers; (5) the teachers' determination to retain their tenures; and so on (Jensen & Christie, 1998; Ogunniyi, 2004, 2007a & b). There is a body of literature highlighting the difficulty teachers in South Africa experience in implementing the curriculum because of a lack of resources, inadequate professional development programmes and other related factors (Jansen, 1999; Matoti, 2010).

#### **4.6 Biographical data**

The biographical data of the respondents are shown in Table 4.1 (Appendix M). This sub-section of the questionnaire reports on the biographical variables (gender, age, teaching experience of teachers, teachers' highest professional qualifications, current post level and school type) of the research



respondents. This was done to give context to the research participants. The figures in the appendices indicate the teaching experience in general and life sciences in particular. The details about their professional qualifications and the schools where they taught are depicted in Figures Figures 4.1-4.4. Teachers vary in age and teaching experience. However, other than speculating there was no way where one could determine, based on the available post-data, how these demographic differences affected their performance.

#### **4.6.1 Gender**

Of the 24 respondents, seven (29.2%) were female teachers and 17 (70.8%) were male teachers. All the participants in the study were from the Pixley ka Seme Education District in the Northern Cape Province, South Africa. This means that the research findings cannot be extrapolated to all life sciences teachers in the Northern Cape Province.

#### **4.6.2 Age groups**

This section of the questionnaire covers the ages of the respondents. The age group of the respondents ranged from the youngest participants (aged 20–25) to the oldest participants (aged 51 and above). As observed from the data (Figure 5.2), a total of two (8.3%) participants fell in the 20–25-year age group, followed by 11 (45.8%) in the 31–35 age group, one (4.1%) in the 36–40 age group and two (8.3%) in the 41–45 age group. The older teachers in this study accounted for four (16.6%) in the 46–52 age group.

From the above data, it is clear that about 11 (45.8%) of the participants are middle-aged. Interestingly enough, the data show that more than half (17) of teachers are male teachers. That is 70.8% of the participants of the sampled schools for this study. With the analysis of the data, an attempt was made to answer the third research question: What are their perceptions of, and experiences with the CAPS curriculum? By comparing the responses of different teachers, the analysis of the data assisted me to identify their lived experiences as they attempted to implement the curriculum. I sought to expose the challenges that teachers experience in implementing the life sciences curriculum and to develop an understanding their perceptions of it as it occurred to me that I should examine more critically some of the following issues:

#### **4.6.3 Teaching experience**

As indicated earlier, 8.3% of the teachers had 2–3 years of teaching experience, 16.6% had 4–5 years of teaching experience, 41.6% had 6–10 years of teaching experience, and 20.8% had 11–15 years of teaching experience while 4.1% had 16–20 years of teaching experience. Only 8.3% of teachers had 26 or more years of teaching experience. These results seem to suggest that the majority of teachers

in this study had between 6–10 years of teaching experience. If this is combined with those who had 11-15 years of teaching experience, then 62.40% or nearly two-thirds had between 10 and 15 years of teaching experience. Although years of teaching experience does matter as far as the success of implementing a new curriculum is concerned, it is by no means the only important variable. Other variables such as administrative support, role of the School Management Team (SMT), nature of discipline in force at a given school (e.g., School A, C and D) and the resourcefulness of teachers themselves do count as well. In other words, the contextual realities of each school do have a direct impact on the success or otherwise in implementing a given curriculum.

In a study conducted by (Kanokman, Yelkenand & Cesur, 2012) it is revealed that although teaching experience is not a factor to consider on teachers' perception regarding curriculum implementation and development, it is important to observe that teachers with experience between 6-10 years have a higher perception of curriculum implementation than teachers with teaching experience that range between 1-5 years of experience; teachers with 6-10 years of experience have lower perception of curriculum implementation than the ones experienced between 11-15 years teaching experience. Therefore, teachers with teaching experience between 1-5 years seemed to have more knowledge on the recent curriculum because they were trained on the most recent curriculum.

Teachers are regarded as central to the curriculum implementation process (Oliver, 1965). However, experienced teachers tend to have higher perception of the curriculum because of their lots of experiences in adapting to various curricula. In this study the results show that there is no difference between the perceptions of teachers about curriculum implementation on account of years of teaching experience. In other words, teachers' familiarity with the content and purpose of a new curriculum might turn out to be more important than years of teaching experience per se. At times, the old habits, attitudes and teaching experience might in fact constitute a barrier for older and more experienced teachers from being more positively oriented towards a new curriculum than might be for younger or less experienced teachers.

#### **4.6.4 Professional qualifications**

From this figure, it is clear that a fraction (4.1%) of the participants in this study possess a three-year teacher training diploma, three quarters (75%) have an initial teacher training qualification (B.Ed.) degree, 8.3% have a B.Ed. (Hons) qualification, the same percentage (8.3%) have a professional degree together with a postgraduate certificate in education and only 4.1% of respondents have a master's degree. The findings indicate that the majority (75%) of the teachers in this study had a B.Ed (life sciences). teacher training degree. The Initial Teacher Education strategy (DBE, 2019) states that, in order to become a FET phase life sciences teacher, individuals must follow a four-year

Bachelor of Education (B.Ed.) degree with specialisation in a field of study that includes mathematics, life sciences or sciences technology.

#### **4.7 Results of the quantitative data**

##### *Teachers' experiences and perceptions regarding the implementation of CAPS*

The body concerned with Minimum Norms and Standards for Educators (DoE, 2014), views teachers as the enablers of the implemented life sciences curriculum. Policy makers formulate policy in the form of the Curriculum and Assessment Standards (CAPS) and teachers at classroom level are expected to implement the curriculum. Teachers are supposed to have an in-depth understanding of the curriculum as they deal with the implementation of the curriculum on a daily basis as a point of reference when teaching. For the same reason, teachers' perceptions concerning the implementation of the life sciences curriculum is considered very important in this study. Since this study focused on the experience of life sciences teachers when implementing the life sciences curriculum, it is therefore important to incorporate the knowledge of all the 24 teachers who completed the questionnaire in terms of the way they articulated and demonstrated their own experiences in relation to their personal philosophies (Koopman, 2013).

##### **4.7.1 Descriptive data**

As indicated in chapter 3, the data from the questionnaire involved six sections with a total of 58 questions. I grouped together the different response categories of the variable with the frequency distribution (number) of respondents. The different variables are: experiences of implementing the CAPS Grade 12 life sciences curriculum; knowledge and understanding of the curriculum; implementation of the curriculum; the policy documents in support of implementation; implementation at school level; planning for the implementation of CAPS; and perceptions about the curriculum. The responses to the items are: Strongly Agree (SA); Agree (A); Disagree (D); and Strongly Disagree (SD).

##### **4.7.2 Section B: Implementation of the life sciences curriculum**

As shown in Table 4.2 (see Appendix M), this section is concerned with B1–B8. The respondents agreed that CAPS for life sciences assists them to design their own lesson plans. All of the respondents (100%) were also of the opinion that the curriculum was helpful in developing classroom activities, whereas 95.8% of the respondents indicated that the curriculum assisted teachers with their general planning and preparation. For item B4, 20.8% teachers were of the opinion that they found the simplified concepts of the CAPS curriculum easy to understand and comprehend. The majority of respondents (75%) indicated that the simplified concepts were easier to

understand. A small fraction of the respondents (4.2%) strongly agreed that the concepts were easier to understand. They attributed their agreement to the clarity and simplicity of the contents. Further, they indicated that the professional training and the curriculum guides assisted them to plan classroom activities. The respondents reacted to item B5, which deals with the impact on planning, as follows: 75% disagreed that CAPS had a negative influence on their planning, whereas 25% of the respondents agreed that CAPS had a negative impact on their planning. For item B6, 58.3% of the respondents disagreed that they had difficulty with achieving the specific aims of life sciences, whereas 41.7% of the respondents agreed that they had difficulty in actualising the specific aims of life sciences.

Item (B7) deals with specific aim 3 (indigenous knowledge), where 20.8% of the respondents disagreed that they had difficulty in exposing learners to Specific Aim 3, while 79.2% of the respondents agreed that they could not expose learners to Specific Aim 3. Very few (4.2%) respondents strongly disagreed that they could not develop the necessary scientific skills in learners (Item B8), whereas 91.7%, the majority of the respondents, disagreed that they were unable to develop scientific skills in learners. Only a meagre 4.2% of the respondents agreed with the statement and indicated that they had difficulty in developing the necessary scientific skills in learners. The life sciences CAPS policy document explicitly stated that teachers should develop learners with “scientific skills and ways of thinking scientifically” (DBE, 2011, p. 8).

Consequently, the education system needs science teachers who produce learners with knowledge of science with the necessary scientific skills. By implication it places the onus on higher education institutions to adapt their training programs in such a way to produce teachers that will be able to produce the knowledge and skills envisaged by the curriculum. As Riffel (2020, p. 123) puts it, “Higher education programs must be aimed at training science teachers needed to be changed in order to produce teachers with a knowledge of the nature of science).

#### **4.7.3 Section C: knowledge and understanding of the curriculum**

This subsection reports on the data (C9–C11) and is based on teachers’ knowledge and understanding of the curriculum. From the responses to this question (C9), it is clear that all the respondents (100%) facilitated inclusivity, as encapsulated by the curriculum. “Inclusivity should become a central part of the organisation, planning and teaching at each school” (DBE, 2011, p.3). Responses to question C10 (100%) indicate that all teachers (24) in this study addressed social justice issues in the classroom. Participants’ responses to question C11 (87.5%) indicate that they were aware of the general aims of the curriculum, while 12.5% strongly agreed that they were aware of these aims. Answers to question C12 show that 83.8% of the respondents were aware of the three

subject-specific aims for life sciences while 16.7% strongly agreed that they were aware of such aims. Responses to questions C13 indicate that 79.2% of the respondents agreed that the curriculum should be completed in a specific time, while 20.8% strongly agreed that they were aware of this provision.

Question C14 illustrates that the majority (87.5%) agreed that resources were needed to complete the curriculum, with 12.5% strongly agreeing with the statement. Around 83.3% agreed with the question C15 that the teaching of concepts formed an integral part of the life sciences curriculum, followed by 16.7% who strongly agreed with the statement. The results above illustrate that majority of participants (79.2%) were comfortable with the content of the Grade 12 life sciences curriculum, while (20.8%) were over confident with the content.

Many participants in this study (75%) stated that they were aware of the content progression framework of the curriculum in question C17, while 25% of the respondents stated that they were strongly aware of the content framework of the curriculum. In question C18, the majority of the participants (79.2%) indicated that they were aware of the four knowledge strands that comprise the life sciences curriculum, followed by (20.8%) who indicated that they were strongly aware of the four knowledge strands of the curriculum.

#### **4.7.4 Section D: Implementation of the curriculum**

This subsection (D19–D28) reports on the results of teachers' experiences of implementing the Grade 12 life sciences curriculum. The participants' responses to question D19 indicate that 8.3% of them strongly disagreed that they received adequate training for the implementation of the curriculum. Likewise, the majority (91.7%) disagreed with the suggestion that they received adequate training. For question D20, 79.2% indicated that they needed more support to effectively implement the curriculum while 20.8% indicated that they strongly agreed that they needed more support to implement the curriculum. From the results of question D21, it is clear that 79.2% of the respondents thought there was a need for more professional development, supported by 20.8% who strongly supported the notion of more professional development. Also, 20.8% of the respondents disagreed with question D22 suggesting that that they improved their knowledge on the implementation of the curriculum compared to 79.2% who indicated that they improved their knowledge on the implementation process of the curriculum.

Questions D24 and D25 are concerned with the provision of support material by the Northern Cape Department of Education (DoE). The majority of the respondents (79.2%) disagreed that they received learning material from DoE, whereas only 20.8% acknowledged that they indeed received

learning material from the Northern Cape DoE. The responses to question D26 indicate that 100% of respondents were able to design their own material. A total of 62.5% of the respondents were of the opinion that the implementation process of the curriculum (D27) had stabilised, while 37.5% felt that the implementation process had not yet stabilised. According the respondents indicated they would support the introduction of a new curriculum.

#### ***4.7.5 Section E: Policy documents in support of implementation***

The subsection (E29–E40) below outlines the results of respondents' opinion on the availability of the policy documents in support of implementing the Grade 12 life sciences curriculum. The analysis of question E29 revealed that the majority of the respondents (91.7%) agreed that the policy documents support the implementation of the curriculum, while 18.3% strongly agreed that they found the CAPS for life sciences policy document to be clear and unambiguous. The answers to questions E30–E32, grouped together, show that the respondents agreed that the CAPS policy document was more streamlined and easier to use. They also asserted that the life sciences curriculum was less loaded with content and was appropriate for Grade 12.

Building on the previous questions, it can be reported that 87.5% of the respondents agreed that the content volume was adequate, 8.3% strongly agreed, while 4.2% strongly disagreed that the content in the curriculum was adequate. For question E34, the majority of the respondents indicated that they agreed that a lack of resources caused hindrance to the successful implementation of the curriculum. An analysis of question E35 shows that they agreed (agreed and strongly agreed) that they had all four policy documents necessary for the successful implementation of the curriculum as hard copies in their possession. About 81% indicated that the school had the policy documents in electronic format available in the office, while 4.2% supported the statement. Only 25% of the participants disagreed that the policy documents were also available in electronic format at the school. Answers to questions E37–E40 indicate that 91.7% unanimously agree, and 8.3% strongly agree that they had a teacher's file containing a CAPS-aligned timetable, an Annual Teaching Plan (ATP), a subject and teachers file in their possession.

#### ***4.7.6 Section F: Curriculum implementation at school level***

This subsection pertains to questions F41–F47 below and shows the extent to which educators experience the implementation of the life sciences curriculum at school level. The results to question F41 suggest that there is a considerable difference between how the participants responded to the question pertaining to subject meetings. The number of participants who disagreed was 79.2%, combined with those who strongly disagreed (16.7%). Question F42 specifically deals with the

monitoring of the implementation of the curriculum. It was found that 75% disagreed and 12.5% strongly disagreed that the departmental heads did not monitor the implementation of the curriculum. Only 4.2% agreed that they actually monitored the curriculum implementation process. Results for question F43 indicate that the majority of respondents (87.5%) were satisfied with how the curriculum was implemented, while 12.5% of the respondents felt that they were not satisfied with the way in which the curriculum was implemented.

Findings for question F44 revealed that 79.2% of the participants agreed that they attended all subject meetings, followed by 16.7% and 4.2% of the respondents who disagreed, respectively, that they attended all the subject meetings organised by the school. In terms of question F45 about two-thirds (66.7%) of the participants attended workshops and community of practice meetings organised by the Northern Cape DoE while only 33.3% did not attend those workshops. With regards to question F46, 62.3% were markers of the NSC examination, while 29.2% and 8.3% disagreed and strongly disagreed respectively. Question F46 shows the extent to which marking assisted teachers with the implementation of the curriculum. From the respondents surveyed, 58.3% agreed that marking assisted with the implementation of the life sciences curriculum, while 8.3% of the respondents were of the opinion that marking would assist with the implementation of the curriculum.

#### ***4.7.7 Section G: Planning for the implementation of the curriculum***

This subsection (G48–G52) reports on planning for the implementation of the curriculum. The findings of question G48 show that all the participants (79.2% and 26.8%) disagreed that the school had a structured time for planning. Responses to question G49 indicate that the majority of participants (87.5%) indicated that they agreed that teachers plan alone, followed by 8.3% of the participants who disagreed and 4.2% who strongly disagreed with the statement. Results for question G50 indicate that 79.2% disagreed that teachers planned as part of the life sciences teachers, while 4.2% of strongly disagreed that they planned as a subject group. 16.7% agreed that they planned as a subject group. In response to the question if teachers planned according to the prescripts of CAPS, the majority of respondents i.e., 8.3% strongly agreed and 91.7% agreed.

The results for question G52 indicate that all the participants surveyed in this study were of the opinion that planning assisted with the implementation of the curriculum. In terms of planning for the successful implementation of the curriculum it can be described as a plan that facilitates the execution of an, idea, design, specification, or policy by presenting clear implementation guidelines that need to be followed. Thus, planning is a documented plan for teachers they need to successfully

achieve their curriculum implementation pursuits. Teachers' world of planning is influenced by role players such as other teachers in the same subject which, similar to strategic plans in business, represent a guide that would steer the business into the right direction.

From the foregoing, it appears there is some disengagement among teachers when coming to plan for the successful implementation of the curriculum. Merleau-Ponty (1968) describes this disconnect as a sort of crypto-mechanical dialect in which certain teachers hide themselves from the others. For example, teachers relegate planning to individuals instead of collaborative planning. Furthermore, schools do not provide the opportunity to teachers to plan as a unit in order to accomplish a common goal, which is the successful implementation of the curriculum.

#### **4.7.8 Section H: Teachers' perceptions of the curriculum**

This subsection (H53–H58), reports on the perceptions of teachers about the curriculum. The results of teachers' perceptions about the implemented Grade 12 life sciences curriculum (H53) revealed that there is a considerable difference between participants who were positive (79.2%) about the curriculum and those who were fairly negative (4.2%) about it. The results further reveal that 16.7% of the participants were unsure of their experience about the implemented life sciences curriculum. Responses to questions H54–H58 are grouped together for the sake of brevity and results reveal that the teachers (100%) were satisfied with the curriculum. In the same vein, 100% of the respondents felt that life sciences could contribute to learner performance.

An analysis of question H56 suggests that all the respondents (100%) agreed that the curriculum was loaded. Further analysis of questions H57 and H58 suggests that 100% of the participants knew how to implement the curriculum and that they were committed to the implementation of the Grade 12 life sciences curriculum. The present research examined teachers' experiences of implementing the life sciences curriculum. The findings revealed in this study are in line with the purpose of the study. In order to explain the perceptions of teachers about the curriculum in a broader perspective, it is important to note that teachers have seen several curriculum reforms before this study took place. In the study, as stated teachers were negative towards the curriculum, confirming the findings of previous research (Akinoglu, 2017; Gulkekin, 2017; Ozdemir, 2012).

What seemed obvious from the responses of the respondents was that although they were generally in agreement with the emphasis of CAPS, they were generally under-prepared to implement the new curriculum. Apart from inadequate resources, poor planning and communication between the curriculum planners on the one hand and the teachers on the other, the majority of the respondents claimed that they did not receive adequate training, administrative support and professional



development efforts that could have enabled them enact new curriculum in their classrooms. These teachers' view has been well reported in the extant literature (e.g. Koopman, 2013, 2018; Mtembu, 2013; Mpanza, 2013; Negumbo, 2018; Ogunniyi, 2004, 2007a & b, 2011; Rogan & Grayson, 2003; Tawana, 2009).

#### **4.8 Interpretive summary**

The quantitative data analyzed in the foregoing section shows that despite the general public outcry against curriculum reforms in South Africa, most of the life teachers involved in this study had been making concerted efforts to harmonize their instructional practices with the mandates of the latest revised curriculum known as CAPS. With a few exceptions, most of them felt that were capable of implementing CAPS in their classrooms if given necessary support. This is certainly a new insight that warrants a closer consideration by researchers working in the area of curriculum reforms in South Africa. What has been reported in the extant literature about the new curriculum has been largely negative.

In the spirit of Schön's (1991) reflection-in-action and in light of what has been garnered in the study so far, it is imperative for science educators training the teachers, curriculum planners and DoE to hearken and rally around the teachers at the coal face of curriculum in their onerous task of enacting the curriculum in their classrooms. Unless we do this the teachers are not likely to be motivated to overcome the obstacles they face. For instance, teachers are exposed to the results of poor planning. They are hardly consulted with the various phases of the curriculum planning process. They are exposed to crash courses and irregular professional workshops and so on. Yet we want them to perform wonders despite all these obstacles.

However, in terms of Schön's (1991) reflection-on-action paradigm, as we would see later in the qualitative section, the teachers as practitioners should be afforded the opportunity and the time to reflect on what they are being confronted with, digest it and consider various interpretations they have had or received. They should have the intellectual space to consider what transpired during the try-out space to determine the feasibility of a given curriculum in their classroom context. Also, they should have ample opportunities to think about how they could be part of the solution to the problems surrounding CAPS. Their involvement in all the phases of curriculum development process is likely to change their position and role from being at the consumer end of the curriculum development process to that of knowledge producers and knowledge brokers in both future reflection-in-action as well as reflection-on-action protocols.

Nevertheless, the literature has also revealed that usually, there are teachers who for various reasons may not support a new curriculum while there may be others who would do so (e.g., Aykac & Celik, 2014; Tasdemir & Tasdemir, 2011). Also, teachers, who participated in the research, appeared to have a clear understanding of how to use the policy documents in order to implement the curriculum. The understanding of the curriculum by teachers were conceptualised because of their commitment to the curriculum. This may mean that teachers consider the curriculum as a document that is workable if implemented properly (Akinoglu, 2017; Gogebakan-Yildiz, Gultekin, 2013; 2017; Izalan & Gogebakan-Yildiz, 2018; Orten & Erginer, 2016; Yurdakul, 2015). Teachers, who are generally positive, tend to display a more positive attitude towards the curriculum; since a positive attitude towards the curriculum is regarded as essential (Shriner, Schlee, & Libler, 2010). With a few exceptions, it can be assumed most of the respondents were favourably disposed to implementing life sciences CAPS in their classrooms.

#### **4.9 Results of the qualitative data**

The aim of this section is to present an analysis of the data collected in the fieldwork in order to address the first research question below. To gain a deeper understanding of this, interviews were conducted with five teachers (see Appendix J):

*To what extent did the life sciences teachers understand the basic intention of CAPS?*

As the themes emerged, a textual explanation of the teachers' experiences followed. This included supporting data collected from the interviews. As discussed in Chapter 3, the research participants provided a saturated sample for a phenomenological study. According to Groenewald (2004) five participants are sufficient to saturate a phenomenological study.

#### **4.10 The interview process**

To participate in the interview the participants had to meet such criteria as: (1) being an employee of the Northern Cape Department of Education teaching in the Pixley Ka Seme District; (2) being a qualified life sciences teacher (i.e., an employee with at least a degree from a university); and (3) having teaching experience in South African schools. To assist me in the fieldwork, I prepared an interview schedule around teachers' lived experiences as well as their experiences while implementing the life sciences curriculum in their classrooms (Appendix K).

The open-ended question format of the interview schedule was intended to stimulate in-depth participants' responses as well as encourage the conversation to proceed in as natural manner as possible. It was also hoped that such an atmosphere would yield rich and realistic insights into the

participants' lived experiences. The interview schedule had five open-ended questions. The interview was scheduled to last up to 30 minutes, which was considered to be a suitable duration for a phenomenological semi-structured interview (Giorgi, 1997; Englander, 2012).

At the beginning of the interview, I introduced the topic and the aim of the study. The interview was then recorded using a digital voice recorder. Consent to participate in an audio-recorded interview was obtained in this case (Appendix E). In addition, to the audio recording, notes were taken to augment the audio recordings. Throughout the interview process, I was mindful to reflect on the process in order to ensure the consistency and suitability of the questions. Participants were also given enough time to answer the interview questions without any interjection on my part. After the interview process, I thanked the participants for their participation in the interview. All the issues and themes that emerged from the interview process formed part of the total data collected for analysis.

#### **4.11 Data analysis and interpretation**

In analysing the interview questions, it is important to emphasise the research question pertaining to this data collection method in order to guide the analysis process and the discussion of the findings. This data generating method sought to answer the first research question stated earlier as well as guide the research to meet the objectives of the study.

#### **4.12 Teachers' responses**

The teachers' responses were analysed based on the emerging themes along the line suggested by Silverman (2001) namely, text analysis of categories and instances of their occurrence in each item. This section is to set the scene by introducing the participants and to gain an insight into their views and experiences during the implementation of the curriculum. According to Moustakas (1994), "The essences of an experience are never totally exhausted. In agreement with Moustakas' view, I was well aware that the interview data that I attempted to capture was only part of the story and hence I took field notes to supplement what I had collected. The following section is representative of the excerpts taking from the interviews with the five participants:

##### **4.12.1 Interview with Vuyo**

Question 1: Please tell me more about yourself...2). At which institution did you study? Explain why you chose that institution...3) What are your major subjects for your qualification... 4) What was your experience as learner in life sciences/biology?... 5). How many years have you been teaching Grade 12 life sciences? 6) What were your personal experiences (difficulties, challenges) while implementing the Grade 12 life sciences? Vuyo replied as follows:

*My name is Vuyo, principal of this high school. I am 50 years of age with 24 years teaching experience. For the past 17 years, I have been the principal of this school. I grew up in Gugulethu, in the Western Cape, and attended the University of the Western Cape where I obtained my BA and an HDE. Posts were scarce then when I finished my training, and therefore I came to the Northern Cape Province. I also hold a Master's degree in Education and majored in biology and IsiXhosa. Teaching was what I always want to do when I grew up. My experience as a learner was that biology, as it was called then, was fun to learn and I could relate to the content that was taught. I started my career some 24 years back. My aim was to help learners grasp the content and see some of them going to university. Teaching now is very different to what it was during the apartheid era.*

Question 2: What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are you on the right track in terms of the implementation process? What was your preparation for the curriculum?

*I think the curriculum was implemented fairly well. For me, the transition was OK! I think teachers adjust to the Grade 12 life sciences curriculum quite well, and, yes, I think they are on the right track with the implementation of the curriculum. Continuous support and training are needed to ensure effective implementation of the life sciences curriculum.*

Question 3: What are your perceptions regarding curriculum reform? Given that we come from OBE, to NCS and RNCS and now CAPS?

*Please no curriculum changes in the near future. I am not against curriculum change per se, but if it happens so soon and regular, teachers become resistant to change. Sometimes it is necessary to revisit the curriculum, but this curriculum is still in its early stages of implementation. "I am of the opinion that the government is using education to transform our society, but there were too many changes in the past decade. Once you get used to the curriculum, the government affect changes to the curriculum. Sometimes it will be small changes like altering or shifting content. But to bring about wholesale changes, I think it is not good for education at all.*

Question 4: What do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?

*In my view, as I see it, the curriculum was intended to bring about transformation and social reform and expand our curriculum knowledge. Also, to teach our learners about where we come from and the knowledge that we as Africans have – indigenous knowledge. It is not easy*

*to achieve social cohesion in social transformation in schools, but we have a progressive constitution that promoted social justice and put human rights high on the agenda. In life sciences, under Specific Aim 3, we can further enhance social cohesion through studying science. Life sciences exposed us to the history of IKS and other cultures and other cultural groups in South Africa.*

Question 5: In your view, as a life sciences teacher, do you think the Grade 12 life sciences curriculum addresses the intentions of the CAPS curriculum?

*I definitely think so. If you read your CAPS document, you will come across the issues we just mentioned*

#### **4.12.2 Vuyo's understanding of the intention of the curriculum**

The representation of Vuyo's views and experiences of how he understood the intention of the curriculum is revealed in the above excerpts. Vuyo used his intersubjectivity to express his view of the intention of the Grade 12 life sciences curriculum. Thus, an analysis of the textural descriptions of his view as a participant suggests to some extent the essence of what it means to understand the intention of the curriculum and being a life sciences teacher. Vuyo's reflection on where he grew up, how he chose to become a teacher, (including its rich social and historical traditions and conditions in which he was raised) must have impacted his conceptualization of the curriculum and how he went about implementing it. Further, Vuyo's comment suggests that the transition from OBE to CAPS was relatively smooth for him in practice. However, he was of the opinion that teachers needed more support and time to implement the curriculum as expected by the curriculum planners. It seems that Vuyo perceived some coherence between the aim and the intention of the curriculum at the policy idealization level but could not perceive the same sort of coherence or feasibility at the implementation level.

Vuyo's comment: *"Please no curriculum changes in the near future"* suggests that the policy makers did not seem to be aware that the connection between curriculum design, a theoretical matter, and curriculum implementation, a practical issue, is not necessarily linear. The contextual realities of the classroom are of such nature that frequent changes of the curriculum tend to compound things for the teachers and their learners. His view, like other South African life sciences teachers, is that the policy makers should stay away from further curricular reviews at least for the foreseeable future. This is in line with Koopman's (2018) assertion that several curricular changes that took place in South Africa over the past two decades had drastically changed the educational landscape of South Africa. According to Vuyo, the intention of the curriculum was to enhance transformation. To him the new

curriculum aims at *achieving “social cohesion in social transformation in schools, but we have a progressive constitution that promoted social justice and put human rights high on the agenda of the new curriculum.”*

Vuyo’s contention is that while the current CAPS curriculum aims at addressing the social ills that characterised the South African society, especially during the apartheid period, any attempt to correct the legacies through the instrumentation of the curriculum should be done cautiously rather than rapidly. This can be read in his answer to the last interview question where he states that: *“reading through the CAPS policy document, you will come across the issues such as transformation and social justice.”* His plea is that for transformation and social justice to take place, deliberate effort and time are needed otherwise the intended goal would become elusive.

#### **4.12.3 Interview with Carol**

Question 1: Please tell me more about yourself...2). At which institution did you study? Explain why you chose that institution....3). What are your major subjects for your qualification...? 4). What was your experience as learner in life sciences/biology? 5) How many years have you been teaching Grade 12 life sciences? 6) What was your personal experience (difficulties, challenges) while implementing the Grade 12 life sciences? Carol replied:

*My name is Carol. I grew up in a small town in the Northern Cape Province. My age is my secret, sorry sir! I am a novice teacher and hold a B. Ed from the University of North West. I only have two years of teaching experience and still grapple with the Grade 12 life sciences curriculum and content. My majors at university were life sciences and mathematical literacy. My experience of life sciences is that it was practical and a lot of content to comprehend. I studied life sciences during the implementation of the NCS. I don’t really know the subject biology, because when I was in the FET phase, we referred to it as a learning area. I start my career as a life sciences teacher in 2014, and my aim is to impart the knowledge of life sciences on my learners and have a good pass percentage in Grade 12 because this is how the DoE measures if a school is functional or not. There is too much pressure on us to perform.*

Question 2. What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are you on the right track in terms of the implementation process? What was your preparation for the curriculum?

*I still experience some problems in terms of the implementation of the Grade 12 life sciences curriculum. I think more experienced teachers understand what is expected from them. I think*

*most teachers cope, but new teachers like me need mentoring and guidance in terms of the implementation of the Grade 12 life sciences curriculum.*

Question 3. What are your perceptions regarding curriculum reform? Given that we come from OBE, to NCS and RNCS and now CAPS?

*No curriculum changes for now. I am careful optimistic about changes to the curriculum in the foreseeable future. But too much changes in the curriculum bring resistance. The more things change the more they stay the same. The curriculum for now is just fine as it is, thank you. "I am still new in teaching but we must be involved. At the end of the day, curriculum reforms affect us as teachers.*

Question 4. What do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?

*To promote social justice and to send out a learner that is responsive and sensitive to the needs of others. I think it is to teach difficult and complex life sciences concepts to the learners and transfer content knowledge to the learners.*

Question 5. In your view, as a life sciences teacher, do you think the Grade 12 life sciences curriculum addresses the intentions of the CAPS curriculum?

*The Grade 12 curriculum addresses the intended curriculum.*

#### **4.12.4 Carol's understanding of the intention of the curriculum**

Carol was born and raised in a small town in the rural areas of the Northern Cape. She described herself as a novice teacher with very little experience of teaching life sciences. She described her experience as a teacher as both stimulating and challenging at the same time. She suggested that there were still teachers who experienced challenges in implementing the curriculum. To illustrate, Riffel (2020, p 152) states that: "It would be very difficult for teachers who are used to the traditional chalk and talk method of teaching to implement the new instructional curriculum model without any prior training". Carol shares the same sentiment with Vuyo as well as Riffel by asserting that:

*No curriculum changes for now. There is absolutely no need to change the curriculum in the foreseeable future. Too much changes in the curriculum bring resistance reinforces the view among many of teachers that they are tired of curricula changes as government or power changes hands.*

Carols' view is that the current CAPS life sciences curriculum has become a burden rather than being a delight for many teachers who see themselves as mere guinea pigs for curriculum

experimentation in the hands of policy makers. In her view all left for them was to resist the new curriculum in the same way, they resisted the apartheid curriculum. This view corroborates findings in earlier studies (e.g., Jensen & Christie, 1998; Koopman, 2013, 2018; Ogunniyi, 2004; Rogan & Grayson, 2003).

The challenge for the DBE has been to find ways in which the goals and values of social justice, democracy can be integrated into the curriculum. There is nothing wrong with that aspiration but the rapid revision of the curriculum has infuriated teachers than encouraging them to join government in their desire to attain equity and social justice. The advancement of values responsible for behaviour is important. By implication Giroux (1995:6) suggests that “public schools must assist in the unending work of preparing citizens for self-governance in an evolving social environment ... learners can be taught the values and skills necessary to administer, protect and perpetuate a free democratic society.”

#### **4.12.5 Interview with Brady**

Question 1: Please tell me more about yourself...2). At which institution did you study? Explain why you chose that institution....3). What are your major subjects for your qualification...? 4). What was your experience as learner in life sciences/biology...? 5) How many years have you been teaching Grade 12 life sciences? 6) What was your personal experience (difficulties, challenges) while implementing the Grade 12 life sciences?

*My name is Brady. I grew up in a small town in the Northern Cape Province. I am an experienced teacher and hold a B.Ed. from the CPUT. I have nine years of teaching experience. I teach both the Afrikaans and English streams in the school. My experience of life sciences is that it was too theoretical because we did not have any laboratories at school. My life sciences teacher was very passionate about the subject despite the fact that he had minimal resources. I studied life sciences during the implementation of the NCS. We were trained in the NCS curriculum. I started my career as a life sciences teacher in 2008. My aim is to educate our learners and make a difference in their lives.*

Question 2. What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are you on the right track in terms of the implementation process? What was your preparation for the curriculum?

*The Grade 12 life sciences curriculum implementation was not without challenges. For me at least. Uhm ... I think the curriculum is loaded and too much is expected from us in terms of*



*curriculum delivery. The department focus too much on Grade 12 results and neglect other grades. I think we are on the right track with the implementation of the curriculum.*

Question 3. What are your perceptions regarding curriculum reform? Given that we come from OBE, to NCS and RNCS and now CAPS?

*In my view I think teachers are really ... umh how can put it. They are overburdened. From where I am seated there is no need for a curriculum change now in South Africa, but I will support whatever changes are made to strengthen the curriculum.*

Question 4. What do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?

*The intention of the curriculum is to promote Specific aim 3 of the life sciences curriculum and to make us aware of environment and its benefits to humans; to bring total transformation to the curriculum. As a country, we acknowledge where we are coming from and understand the injustices that was done to people of colour by the apartheid government and how they used the curriculum to indoctrinate society to gain their political objectives. With CAPS, we want to see a curriculum that is free from racial prejudices that is aimed at transforming our society. I never changed the way I teach. As much as I embrace changes to the curriculum, my problem is that as soon as we acclimatised to the changes, new changes are on the cards.*

Question 5. In your view, as a life sciences teacher, do you think the Grade 12 life sciences curriculum addresses the intentions of the CAPS curriculum?

*Yes, I agree that it met the needs of the curriculum.*

#### **4.13 Brady's understanding of the intention of the curriculum**

Brady grew up in a small town of the Northern Cape Province. He is very passionate about making a difference in the lives of the children he taught. According to him, his lived experience of implementing the life sciences curriculum was not without challenges. He feels somehow overburdened but will need support for any curricular changes in future. He seems to be in support of Education for Sustainable Development (ESD) with particular emphasis on environmental issues that need to be integrated in the life sciences curriculum. He agrees with the participants that the Curriculum and Assessment Policy Statement (CAPS) focuses on social transformation and social justice. He also agrees with the others that the Grade 12 life sciences curriculum adequately reflects the goals of CAPS. Also, like Vuyo and Carol, he would not be favorably disposed to another

curricular review at least for some time to come because teachers are already overwhelmed with the series of reviews that had taken place.

In the final analysis teachers with little support from the curriculum planners tend to be confused and the learners, who are the end receivers, are likely to suffer from receiving a half-baked curriculum. It is for the same reason that teachers must be involved in the curriculum development and implementation process. Otherwise, there will be a yawning gap between the intention and what is enacted in the curriculum (e.g., Berhout, et al, 2010; Chaudhary, 2015; Jacobs & Brand, 2012; Nkopodi & Sunday, 2013).

#### **4.13.1 Interview with Neill**

Question 1: Please tell me more about yourself...2). At which institution did you study? Explain why you chose that institution...3). What are your major subjects for your qualification...? 4) What was your experience as learner in life sciences/biology...? 5) How many years have you been teaching Grade 12 life sciences? 6) What was your personal experience (difficulties, challenges) while implementing the Grade 12 life sciences?

*My name is Neill, I grew up in this region and attended the same school where I am a teacher for the past 26 years. I went to Southern Cape Teachers College and completed my teaching diploma and returned to my alma mater to take up a teaching post. My main subjects at college were biology and Physical Training. I started my teaching career in 1991. My aim as a life sciences teacher is to focus on education and developing learners in a more rounded way as full human beings. I think I reach my aims as a science teacher. I think a review of the curriculum is necessary to change the curriculum to get rid of our apartheid baggage since we have a history of oppression and to reduce historical inequalities. My aim is to do well in my job and help my learners become something in life.*

Question 2. What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are you on the right track in terms of the implementation process? What was your preparation for the curriculum?

*The implementation of the Grade 12 life sciences curriculum in my view was full of challenges. I think the quality of training we receive was not adequate. Well ... Ja, eh ... (laughing) I think as teachers we try our best with the implementation of the curriculum.*

Question 3. What are your perceptions regarding curriculum reform? Given that we come from OBE, to NCS and RNCS and now CAPS?

*Let me stabilise the current Grade 12 curriculum and do an assessment after 10 years or so to see what we can change. But if they need to amend certain sections of the curriculum, I will support and implement it.*

Question 4. What do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?

*To promote a green environment curriculum and promote education for sustainable development. To create social awareness in our learners. To help teachers with their content knowledge. In their quest to promote IKS in schools, the DoE should include more training on IKS since we did not have it in our teacher training. By so doing we can incorporate it into our science lesson at school and understand our cultures.*

#### **4.13.2 Neill's understanding of the intention of the curriculum**

Neill was born and bred in a town in the Northern Cape where the research took place. Neill spent his childhood and his early education in the same place where he is a teacher today. Neill's comment on his perception about the implementation of the life sciences curriculum illustrates that the implementation process was not without any challenges; particularly he refers to the quality of training that teachers received in preparation of the implementation of the life sciences curriculum. Neill indicated that the Curriculum Assessment Policy Statement (CAPS) document informed the concepts of IK. Neill valued the CAPS as a source that linked was to the formalising and legitimising of IK in the curriculum as articulated in the following statement:

*In their quest to promote IKS in schools, the DoE should include more training on IKS since we did not have it in our teacher training. By so doing we can incorporate it into our science lesson at school and understand our cultures.*

It seems that unlike Vuyo and Carol, Neill is not opposed to curriculum changes provided of course that it is necessary and it is backed by adequate training and support. For instance, he suggests that the inclusion of IKS in the curriculum should be backed by adequate training and administrative support. This suggestion supports earlier studies in the area (e.g., Koopman, 2018; Ogunniyi, 2004, 2007a & b, Rogan & Grayson, 2003).

#### **4.13.3 Interview with Dawid**

Question 1. Please tell me more about yourself...2). At which institution did you study? Explain why you chose that institution....3). What are your major subjects for your qualification...? 4). What was your experience as learner in life sciences/biology... 5?) How many years have you been teaching

Grade 12 life sciences? 6) What was your personal experience (difficulties, challenges) while implementing the Grade 12 life sciences?

*My Name is Dawid, I grew up in De Aar and I am 50 years of age. We were very poor when growing up. I have 26 years of teaching experience in teaching life sciences and biology, as it was known then. I studied at the Southern Cape Teachers College, completing my three-year diploma in teaching, specialising in mathematics and biology. The political climate of the day forced me into teaching. My main subjects at college were biology and mathematics. I started my teaching career in 1991.*

Question 2. What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are you on the right track in terms of the implementation process? What was your preparation for the curriculum?

*The implementation of CAPS and specific the Grade 12 life sciences curriculum was not what we expected. There was content in the Grade 12 curriculum that I was not trained on during my initial teacher training. The departmental training, we received was not good at all. As a district, we were lucky enough to receive content training from UWC to help us cope with the curriculum content especially on the section of evolution.*

Question 3. What are your perceptions regarding curriculum reform? Given that we come from OBE, to NCS and RNCS and now CAPS?

*I am totally against the curriculum reform soon after implementing a new curriculum. I want to see the curriculum stabilise. "I never changed the way I teach. As much as I embrace changes to the curriculum, my problem is that as soon as we acclimatised to the changes, new changes are on the cards.*

Question 4. What do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?

*The curriculum wants to promote a sustainable environment. To develop learners' scientific skills and expose them to indigenous knowledge systems. I want to add that it intends to develop learners' knowledge and skills so that they can become valuable members of society.*

Question 5. In your view, as a life sciences teacher, do you think the Grade 12 life sciences curriculum addresses the intentions of the CAPS curriculum?

*I am of the view that the Grade 12 life sciences curriculum does not only address the issues mentioned, but also serve the purpose for what it was created. Therefore, I agree that the Grade 12 life sciences curriculum addresses the intention of the curriculum.*

#### **4.13.4 Dawid's understanding of the intention of the curriculum**

Dawid grew up in De Aar and is an experienced life sciences teacher. In Merleau-Ponty words, Dawid's upbringing as a child in poverty is the lived body in action as an object grasping consciousness of being-in-the world in a particular place and time (Koopman, 2018). At the most basic levels his experiences in these conditions are constantly direct his body to make sense of and perceive what it meant to be 'poor'. These experiences shape his consciousness and therefore cannot be divorced from his experience. Dawid's comment in the interview further illustrates like other participants, was not ready for the implementation of the new curriculum.

Dawid laments the frequent changes in the curriculum by stating that, "*I am totally against the curriculum reform soon after implementing a new curriculum.*" The extant research literature has indicated that any new curriculum that goes against teachers' belief system is likely to result in cognitive conflict (Rogan & Grayson, 2003; Cross, 2007). Although a new curriculum is not without its own associated challenges but then to change it abruptly without allowing teachers to understand it is equally destabilizing for a considerable number of teachers. Whatever the case, some teachers might accept change while others simply reject change (Koopman, 2013). Like Brady, Dawid is of the view that the new curriculum supports sustainable development.

#### **4.14 Data presentation, findings and discussion of interviews**

This section of the study reports on the findings from the interviews, which was conducted with five Grade 12 life sciences teachers who were purposefully, selected from the 25 life sciences teachers participating in the completion of the questionnaire for the quantitative part of this study. As stated earlier, I interviewed five life sciences teachers to gain insight into their understanding of the basic intention of the CAPS Grade 12 life sciences curriculum. It was also done to answer the first research question: To what extent do life sciences teachers understand the intention of the CAPS Grade 12 life sciences curriculum? The participants were asked questions relative to their understanding of the intention of the CAPS Grade 12 life sciences curriculum. Each question, from 1–5, is provided, as well as an overview of the questions and themes that emerged from the analysis of the interview data. The interview was divided into a question that seeks to obtain general information (Question 1) to questions more specifically aimed at obtaining data about the respondents' understanding of the intention of the Grade 12 life sciences curriculum. Each interview transcript and responses of the

participants are outlined in a table in the next section. For each participant, a transcript based on items 1–5 was created and then presented in themes based on the responses of the participants.

#### **4.15 Emerging themes for discussion**

Consistent with the Husserlian transcendental phenomenology and the application of Moustakas' (1994) framework and methods, the themes were derived from the data by capturing the essence of the phenomenon in question. The following discussion of the themes is guided by an interview schedule and comprises four questions (see Appendix K).

Question 1: What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are on the right track in terms of the implementation process? What was the nature of your preparation for the curriculum? The focus of these questions was on soliciting the views of teachers and gaining insight into their personal experiences in terms of their engagement with the life sciences curriculum on a daily basis. Various themes emerged from this question that ranged from poor or inadequate training to unrealistic expectations of the DoE. For the purpose of reporting and brevity, I have concentrated only six themes under this question, as reported below.

##### **4.15.1 Teacher training**

The five participants acknowledged the importance of adequate training in implementing the life sciences curriculum. Training and development play a vital role in implementing any new curriculum, not only for the learners, but also for teachers. If teachers are not adequately trained in the life sciences curriculum, they will not be able to implement the life sciences curriculum effectively. The quality of training will have an effect on the quality of learning in the classroom and effective implementation of the life sciences curriculum.

The participants were of the view that, for teachers to build a deep disciplinary (content) knowledge and knowledge on how to effectively implement their specific subjects, they should receive uniform, adequate preparation on the curriculum. They regarded the five-day block period of training as inadequate. They regarded the training as necessary, but inadequate for implementing the life sciences curriculum. It is their view that for the training to be relevant and meaningful, it has to be done several times for a much lengthier period of time. They further state that it is unlikely that training for the implementation of the life sciences curriculum on a small scale will bring about a significant shift from the old life sciences curriculum to the CAPS Grade12 life sciences curriculum.

#### 4.15.2 Curriculum reform

Question 2: What are your perceptions regarding curriculum reform? Given that we came from OBE, to NCS and RNCS and now CAPS?

The purpose of the question was to uncover the perceptions of life sciences teachers regarding curriculum reform. With the exception of Carol, a new entrant into the teaching profession, all the other four teachers unanimously agreed that they were totally against any further curriculum reform for the foreseeable future.

In this study the majority of the participants disagreed with curriculum reform and did not feel the necessity for curriculum reform. Only one participant was cautiously optimistic about curriculum reform because she was still new to teaching. In other words, she had not had much experience in curriculum reform and what it entailed for the teachers. One participant supported curriculum reform and appeared to understand the government's attempt to rid the curriculum of its apartheid content.

When the teachers were asked about their views on the curriculum reform in life sciences, they made the following remarks:

*Vuyo: I am of the opinion that the government is using education to transform our society, but there were too many changes the past decade. Once you get used to the curriculum, the government affect changes to the curriculum. Sometimes it will be small changes like altering or shifting content. But to bring about wholesale changes, I think it is not good for education at all.*

*Carol: I am still new in teaching but we must be involved. At the end of the day curriculum reforms affect us as teachers.*

*Brady: I never changed the way I teach. As much as I embrace changes to the curriculum, my problem is that as soon as we acclimatised to the changes, new changes are on the cards.*

Brady's stance that he never changed the way he taught could be interpreted in different ways. It might mean that sticking to the traditional chalk and talk approach or that in view of the frequent revision of the curriculum in the past two decades; he had adopted a teaching method found to be effective. Whatever the case, his attitude was to teach in a way that would help to maintain learners' interest in the subject. When teachers were probed about their perceptions of the curriculum reform, the majority of teachers replied that there is no need to change the current life sciences curriculum. The participants made it clear that they are not in favour of a curriculum reform in the near future; however, they indicated that they will support a change if certain sections of the curriculum need to be amended.

Four of the participants involved in this study taught biology under the apartheid system of education and were familiar with the curriculum for life sciences in the apartheid era. Ever since then, they experienced many curriculum reforms in the recent past. Participants in this study felt negative about curriculum reform and the changes in the education system. However, Carol as a new entrant to teaching did not hold a strong negative feeling towards curriculum reform like Vuyo, Neill and Dawid. The statement below aptly captures her view:

Carol: *I am still new in teaching but we must be involved. At the end of the day curriculum reforms affect us as teachers.*

Of course, the participants were well aware that they had no control in deciding what curriculum should or should not be implemented in their classrooms. They were also conscious that curriculum reforms are inevitable in a changing society but what they opposed was the frequent changes as soon as there is a new political order in the country. Participants emphasised that curriculum change is necessary at times, because of the changes in society and changing political and social priorities. Carol contends that:

*As teachers in the system, we were never consulted about the introduction of a new curriculum. We learn this through the media and our unions. How can the government expect us to implement a curriculum that we as ordinary teachers did not participate in? We are the end-users but was never involved in the writing of the curriculum.*

Teachers were not represented in working groups that revised the curriculum. Participants' entire attitude about the life sciences curriculum reform is encapsulated by Vuyo when he exclaimed: "Oh no, not again." Vuyo states further that:

*I am of the opinion that the government is using education to transform our society, but there were too many changes the past decade. Once you get used to the curriculum, the government affects changes to the curriculum, sometimes it will be small changes like altering or shifting content. But to bring about wholesale changes, I think it is not good for education at all.*

Brady in agreement with Vuyo and Carol went further by stating that:

*Although I did not experience any changes to the curriculum in my short teaching career, I want policy developers to involve all in the curriculum writing process. It is a fallacy to think they know every solution to the challenges education in South Africa is facing. And why changing all the time, why fix something that is not broken. But I am excited to teach the CAPS curriculum. Every new minister that was appointed in the education ministry had to change the curriculum in one way or the other. Education in our country is not free from*



*politics. Personally, I don't have a problem with curriculum reform, but it should benefit the learners and teachers. Often teachers are left out when they plan a new curriculum. We are only left with the implementation part of the curriculum.*

Brady expressed the same view about curriculum reforms in a succinct manner as follows:

*Curriculum reform in South Africa became a political playball. Government wants to change the curriculum but never worry about teachers. The pace in which they implement the changes is unbelievable. It is as if they want to undo injustices of the past overnight. I don't want to be pessimistic but soon CAPS will be thrown out of the window and a new curriculum will be introduced. Really.*

In agreement with Vuyo, Carol and Brady Neill were of the view that:

*If the government bring reforms to the curriculum, let it be in a coherent fashion and provide adequate training to teachers. My experience on curriculum reforms is that it is implemented in a haste with not sufficient and adequate training to teachers. All that have a bearing effect on teachers when they needed to implement the curriculum. You found that teachers in the same school do different things but are teaching the same curriculum. Why? Because our training is different and not of a good quality. Am totally against the reform of the curriculum.*

Dawid added:

*I see it all! From report 550 (Old biology curriculum), OBE to CAPS. I understand the political motivation for the curriculum reforms and given our past where we coming from. I am from the old school so these new changes to the curriculum did not go down well with me but like I said I understand where the government coming from and I support changes to the curriculum. I realise changes is not widely accepted in our schools, but what can one do, except for implementing policy from the DoE and the government.*

#### **4.15.3 Social justice and transformation**

Question 3: What do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?

The aim of this question was to establish what teachers thought was the intention of the new life sciences. The following themes emerged during the interview, and because of the similarities in their contents they were grouped together. According to the DBE (2011), social transformation ensures that the educational imbalances of the past are redressed and that equal educational opportunities are

provided for all sections of the population. Each of the four participants spoke about their unsavoury experiences during the oppressive apartheid education system. They considered such a system of education as contradictory to the central theme of an emancipatory education system whose goal is social transformation. This point is emphasised by Da Costa and Meerkotter (1994) in the following excerpt:

The cultural colonisation of the African, Asian, Afro-Asian and Latin American peoples has been most devastating and glaring in the field of education. Thus, the content of education from the primary school to the tertiary level is geared to develop in their recipients the perception that middle class Euro-American cultural norms are the only valid and worthwhile ones.

The view above is confirmed by Ogunniyi (2020) who argues that science education aims at advancing social justice through the development of scientific literacy. Many developing countries in an attempt to remove a racial and offensive curriculum make concerted efforts to replace it with a curriculum that will mirror the spirit of social justice as well as compatible with a democratic society. In South Africa the government gives a clear direction that the apartheid and Eurocentric colonial curriculum must be substituted with a curriculum that exemplifies Ubuntu, interdependence, social justice, equity, and communalism i.e., it must be commensurate with the Constitution of South Africa.

The participants provided responses that were grounded in the real world of learners. They all agreed that the South African government has a national agenda to transform a fragmented education system into one non-racial education system which is based on the ideal of lifelong learning for all South Africans. All the participants said that there is a need for social transformation and a redresses of educational imbalances of the past. They also believed that the implementation of CAPS was a scheme to entrench and transform the education system of South Africa.

In this regard Brady said the following:

*As a country, we acknowledge where we're coming from and understand the injustices that was done to people of colour by the apartheid government and how they used the curriculum to indoctrinate society to gain their political objectives. With CAPS, we want to see a curriculum that is free from racial prejudices, that is aimed at transforming our society.*

The above statements reflect an understanding of social justice and social justice education (Hackman & Raucher, 2001) As can be seen in the above quote, oppression is the recurring element that is highlighted as the justification for making the attempts to transform the curriculum into what

would make it a fertile ground for the germination of social justice informed by human rights (Lebowitz, 1998).

All the participants agreed with the views of Luo (2011) that social transformation plays an important role in curriculum changes, especially when the change is aimed at not only changing the curriculum, but also developing the human resources necessary to meet the requirements for global competition through the production of a new curriculum. This social transformation is related to social reconstruction and is intended to redress the educational imbalances of the past as well as provide equal opportunities for all. Most often, technical development or the need to transform societies based on values or ideological and political objectives can also necessitate curriculum changes (Seikkula-Leino, 2011). The social justice theme that is embedded in curriculum reforms is increasingly shaped by global policy ideas and practices (Savage & O'Connor, 2015), and is defining new global policy norms.

Curriculum change in South Africa and perhaps other African countries has become necessary because of the need to transform the education sector to reflect their aspirations, global trends and the need to provide education that conforms to international standards (Liping & Kasanda, 2013). The main intention of curriculum change is to ensure that the needs for rapid transformation in the age of globalisation are met through the provision of a sound curriculum. Statements in CAPS reflect principles and practices of social justice as defined in the Constitution of the Republic of South Africa (RSA). The curriculum can play a vital role in creating awareness of the relationship between human rights, social justice and inclusivity. During the interviews, all the five participants, regardless of their race and work experience, stated that the curriculum should enhance social transformation and social cohesion. All of the teachers also agreed that if we, as South Africans, want to move the country forward, then social cohesion and transformation must begin at our schools. The views of the teachers have been succinctly summarised in the following single comment by Vuyo:

*Vuyo: It is not easy to achieve social cohesion in social transformation in schools, but we have a progressive constitution that promoted social justice and put human rights high on the agenda. In life sciences under Specific Aim 3 we can further enhance social cohesion through studying science. Life sciences exposed us to the history of IKS and other cultures and other cultural groups in South Africa.*

#### **4.15.4 Indigenous knowledge systems**

The participants perceived the life sciences curriculum to be geared towards learners in the Further Education and Training (FET) phase being exposed to IKS. They are of the opinion that indigenous

knowledge systems should be part of the life sciences curriculum. According to Langehoven (2014), western science has made use of diverse indigenous knowledge to grow science to the point where it is today. The participants of this study argued that the incorporation of IKS into the life sciences curriculum will be in accordance with what the CAPS document states in terms of "... valuing indigenous knowledge systems: acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution" (CAPS Grade 10–12, p. 5). Two of the participants (Vuyo and Carol) acknowledged the importance of IKS in the life sciences curriculum and stressed further that the introduction of IKS into the life sciences would enable learners to see the relationship between what they learn at school and what they experience daily in their homes. During the interview, they alluded to IKS and its importance in education as follows:

*Vuyo: Indigenous knowledge systems is a foreign concept to us; it was not something that we learn about in the curriculum until I got to university. If we introduce IKS in the curriculum, we will not only learn about the relationship it has with life sciences but it will afford us the opportunities to change our world views and how the world operates. Learners will be able to understand life sciences in different cultural contexts.*

*Carol: I think IKS is useful and should be integrated in other content subjects as well and not only in life sciences and it should be something that is not saved for life sciences teachers only for a specific period but should be taught across the curriculum. It should be linked to and taught in conjunction with other topics and to specific areas in the life sciences subject content.*

During the interviews, it emerged that the five participants in the interview were of the view that the intention of the life sciences curriculum was inter alia to promote the inclusion of indigenous knowledge education as an inherent part of the life sciences curriculum. Only three of the five participants were exposed to IKS during their initial teacher training courses. Neill and Dawid were very vocal on including IKS in professional development programmes.

**Neill and Dawid:** *In their quest to promote IKS in schools, the DoE should include more training on IKS since we did not have it in our teacher training. By so doing, we can incorporate it into our science lessons at school.*

The inclusion of IKS or local funds of knowledge in the curriculum has been hailed all over the world especially as multicultural classrooms have emerged virtually everywhere. The science education literature is replete with frequent allusions to integrate IKS in the curriculum as well as train teachers on how to accomplish this goal (e.g., Ogunniyi, 2004, 2007a & b, 2011). The views range between partial or

cautious inclusion (e.g., Finley, 2009 as quoted by Ogunniyi, 2011) to infuse the two as equal and legitimate knowledge bodies with the provision that they are not judged on the same theoretical frameworks (e.g., Snively & Corsiglia, 2001; Garrouette, 1999; Nichol & Robinson, 2000; Aikenhead, 2000).

From the literature it is clear that there is a shift towards a curriculum that embraces the lived-experiences of both teachers and learners. Such a curriculum requires a shift from knowledge that is imposed from outside to one that is local and is inwardly constructed (Koopman, 2013; Koopman, 2018). To achieve this ambitious aim means a switch from mode-1 knowledge that is pure, discipline-oriented, homogeneous, expert-led, supply-driven, to mode-2 knowledge that is applied, problem-centred, trans-disciplinary, heterogeneous, and so forth (Gibbons, Limoges, Nowotny, Schwartzman, Scott & Trow, 1994). Shifting to mode-2 knowledge means nurturing fresh ideas that emanates from our experience. Ultimately the outcome of the knowledge can be described as socially distributed knowledge (Koopman et al).

Around 2004, the Department of Science and Technology in South Africa adopted a policy on indigenous knowledge systems (IKS) with the purpose of enhancing an African identity. The DoE policy identified the possible contribution of cultural knowledge to the economy. In this regard, government has called on academics and applied researchers to help refine the policy and, in the process, come up with fresh ideas about IKS. The inclusion of IKS in the curriculum could provide teachers and learners the opportunity to formulate their own position about phenomena, cultural knowledge, and to learn what could be useful and appropriate for their own development and growth as well as buttress their sense of sociocultural identity. Instead of teachers seeing the learner as mere tabularasa (a clean slate) for knowledge transmission, the learner now becomes an intellectual resource drawing on his or her own experiences and embodied knowledge. As Merleau-Ponty (1945/1962) reminds us, "I am my body". The teacher is no longer dependent on textbooks and other electronic sources of knowledge only, but rather to see the classroom as involving ample opportunities for exploring individual experiences in which information flows from the inner human existence.

#### ***4.14.5 Education for Sustainable Development (ESD)***

What do you think were the intentions of the implemented Grade 12 life sciences curriculum? Can you mention a few? Dawid and Neill thought that the aim of the new curriculum was to: “promote a green environment curriculum and promote education for sustainable development... create social awareness in our learners... help teachers with their content knowledge.”

Dawid: *Promote a sustainable environment. To develop learners' scientific skills and expose them to indigenous knowledge systems. I want to add that it intended to develop learners' knowledge and skills so that they can become valuable members of society. Also, to impart knowledge.*

The study shows that two out of the five participants agreed that the life sciences curriculum intentionally promotes a sustainable life style as well as exposes learners to Education for Sustainable Development (ESD) activities. Whatever the minor differences in their opinions, all the participants acknowledged the need to establish an education system as well as design and implement a life sciences curriculum that promotes education for sustainable development. From the perspective of Spillane, Reiser and Reimer (2002), these participants appeared to have understood the surface-level policy message as intended by the curriculum designers on the integration of education for sustainable development in the curriculum document.

The construal of Education for Sustainable Development (ESD) is in line with the current popular view the literature. However, to attain such a goal depends largely on the success of the implementation process (Hargreaves and Shirley 2009). Over the past decade, ESD has emerged as a concept that enables transformative social learning in curriculum settings and expanding education (Pesaniyi & O' Donoghue, 2019). The Global Action Programme (GAP) envisages that modern governments should be supported in their efforts to implement ESD as a purposeful activity that promotes quality education that is relevant to the current times. The Global Action Programme (GAP) was launched at the World Conference on Education for Sustainable Development (ESD) in Aichi-Nagoya, Japan. It focuses on generating and scaling up ESD action in all areas of education. This education goal must be relevant to the context and to the peoples that are part of the African landscape of risk in need of change.

#### **4.15.5 Pedagogical Content Knowledge (PCK)**

This section presents the data regarding the participants' views on pedagogical content knowledge (PCK) with reference to the implementation of the life sciences curriculum. Semi-structured interviews were used to collect data on the participants' views. A description of their responses was made for each participating teacher (see Appendix Q).

This study has revealed that teachers' PCK plays a major role regarding the implementation of any curriculum. The findings in this study are in accordance with the research conducted by Haney, Czerniak and Lumpe (1996) concerning teachers' beliefs about curriculum. According the authors' teachers' acceptance of a new curriculum is a slow and gradual process. Vuyo, Neill and Dawid who taught for 26 years, pointed out that most newly graduated teachers from the university today find it

difficult to implement the life sciences curriculum effectively because of a lack of deep PCK. One of the areas that repeatedly emerged in this study is that of content knowledge. Brady is of the opinion that it is important to find a balance between PCK and the content of the curriculum to ensure a greater chance of future success in the subject. The excerpts below are representative of the participants' viewpoints:

*Vuyo: Teachers who are trained at universities are trained in a haste to meet the demands of the country. They do not possess deep knowledge about the subject. The curriculum of universities differs in terms of training, therefore their approach to the subject differs. PCK is vital for the implementation of the life sciences curriculum.*

During the interview, Vuyo revealed that most teachers do not understand the link between life sciences content knowledge and pedagogical content knowledge (PCK) to convey that knowledge to their learners in a comprehensive way.

*Carol: Most life sciences teachers think, because they are trained in the subject, they have content knowledge. They might understand the content, but to transfer the knowledge to their learners is somehow a problem. PCK is important for teachers and is central to the implementation of the curriculum.*

According to Neill, PCK is vital in the teaching of life sciences because it is a process through which teachers accumulate knowledge of subject matter, learners, possible misconceptions, the curricula and general pedagogy.

*Neill: It is not only sufficient enough to know the subject matter but you also need to understand the learners you teach and how to teach them. You should be able to use certain methodological skills in your class to impart knowledge to your learners. For me, it is important to understand the life sciences curriculum in order for me to teach my learners about scientific concepts and the life sciences curriculum.*

Vuyo further argues that PCK is very important in teaching any subject because it involves the teaching of a subject with a reservoir of knowledge of good teaching practice and experience. He stated that, through PCK, teachers are able to connect their understanding of subject content with the instruction they provide to their learners, thereby ensuring that the subject content is mastered well.

*Vuyo: When teaching life sciences, it is important that we know different teaching styles. In education, there are a myriad of teaching styles to your disposal. As a teacher, you should always reflect on your practice as a teacher with a view of improving it. Teachers are knowledgeable in*

*their different subjects and understand the content thereof, therefore the instruction they issue to learners should be about mastering and reinforcing the subject content.*

The results of this study indicate that to these life sciences teachers pedagogical content knowledge plays a major role with regards to the implementation of the life sciences curriculum. The findings of indicate that life science teachers' experiences in implementing the curriculum is influenced by their pedagogical content knowledge (Henze, van Driel, & Verloop, 2009). There seems to be a consensus among the participants that teachers with a strong Subject Content Knowledge (SCK) and PCK are more likely to implement a new curriculum than those with poor PCK (Beyer et al., 2009; Beyer & Davis, 2009; Gess-Newsome et al., 2010; Remillard, 2000).

The findings further suggest that majority of participants had no difficulties with their SCK. However, some confessed that they might have some challenges with their PCK. This implies that the curriculum should encourage teachers to think and reflect about their challenges as well as make their experiences explicit by becoming conscious about their PCK. Within the framework of Merleau-Ponty's 'lived body theory', the same can be said about how some viewed their content knowledge. Therefore, they are aware of the challenges.

In order to overcome the participants' concern about their PCK, curriculum developers will need to expose them more carefully to relevant professional development workshops where their limitations will be challenged and addressed in such a way as to make them more conscious of their deficiencies as well as find ways and means to mitigate such deficiencies (Nicolini, 2016). Such professional development workshops should provide forums in which teachers can express their lived experiences freely. As they interact with other teachers with similar deficiencies, they are more likely to find better ways to deal with the challenges that are deeply engrained historical values and experiences of how they have come to perceived the life science curriculum (Koopman, 2013).

#### **4.16 Addressing the intention of the curriculum**

Question 4: In your view as a life sciences teacher, do you think the Grade 12 life sciences curriculum addresses the intentions of the CAPS curriculum?

The aim of this question was to establish whether or not the participants considered the implemented Grade 12 life sciences curriculum as addressing the intentions of the CAPS as a whole. The responses of the participants seem to indicate that they believed that it did.



#### ***4.16.1 Summary of the findings from the interviews***

As indicated earlier, an analysis of data derived from the interview were analysed thematically using Silverman's (2001) identification of emerging categories and/or instances of their occurrence. The most noticeable themes emerging from teachers' responses to the interview questions are as follows:

##### ***Theme 1***

##### ***Teacher training***

While the participants' views on teacher training differ, the majority of the participants are of the view that training in the implementation of the curriculum plays a major role. During the interview the participants revealed that the training they received to prepare them for the implementation of the CAPS and invariably the Grade 12 life sciences curriculum in particular was inadequate. As a result they were not confident to implement the CAPS curriculum. For example, the participants felt that the training should have been made more relevant and meaningful to their instructional practice than was actually the case. They furthermore felt that adequate training could have brought the curriculum and the implementation together more closely than was the case. They argued that the realisation of the curriculum is dependent of quality training, and that it is only through quality training that teachers will be able to implement the curriculum effectively. It emerged during the interviews that due the poor training they received, they did not clearly understand what they were to do and therefore they were still grappling with the implementation of the CAPS curriculum.

From the foregoing, it seems apposite that those tasked with curriculum planning and training of teachers should appreciate the teachers' concerns. If curriculum planners understand the inner fears, the subjective truth of teachers' daily realities, and the consciousness of teachers, they will not assume that all is well after exposing teachers to a crash training programme. By being aware of teachers' sources of anxiety, curriculum planners from the DoE will be better prepared to run a long-term training programme that is effective and forward-looking than has been the case so far.

The findings confirmed what Mulkeen (2010) has also found in another context. He noticed that in the event of implementing a new curriculum, teachers usually receive inadequate training to assist them with implementing the new curriculum. In this respect he agrees with De Beer (1999) who claimed that teacher training programmes for a new curriculum is not in line with what teachers need in the classroom. Often the training is too theoretical and the content knowledge is out of sync and not closely aligned with the goals of the new curriculum. In a study conducted by De Beer (1993) it was found that science teachers in South Africa were not properly trained to conduct practical lessons for learners. I agree with scholars (e.g., Badungela, 2012; Mourshed, Chijikoe, and Braber,

2010; Sayed & Ahmed, 2015) who believe that adequate training is a critical requirement for teachers in an environment where inclusivity is the goal to successfully implement a new curriculum.

## ***Theme 2***

### ***Social justice and transformation***

The responses of the participants showed the compatibility between this theme and the National Curriculum Statement Grades R–12 whose emphasis is “Social transformation: ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of the population” (DBE, 2011, p. 2). The responses of the participants were further reinforced by the CAPS for life sciences, which promotes basic human rights, inclusivity, social justice and transformation, as defined in the Constitution. Scholars in the domain of social justice regard education as vital for radical educational and social change. For them it is important that in the educational arena, ways are created to bring about educational change. Education and by implication the new life sciences curriculum has the potential for change and they aver that education needs to create an arena where global and local issues may be addressed. Rikowski (2004) suggested that the curriculum should advance human rights and social justice consists.

The intention of the life sciences curriculum echoes the positions of Freire and Habermas regarding the agential role of a curriculum that aims at enlightenment ideals and the establishment of equity and social justice. According to Feagin (2001) social justice requires equal distribution of resources, fairness and respect for diversity. My contention is that this might be a utopian ideal and that we are not there yet in South Africa. The curriculum and schools are not fully transformed and schools still experience inequitable political, economic, and social exclusion that characterised the apartheid era. Social justice in the context of schools is driven by the new curriculum. There is a clear divide between rhetoric and practice.

Only when concerted efforts by teachers to construct their social justice experiences of teaching can the new life sciences CAPS curriculum achieve the goal of equity, transformation and social justice. Teachers need to build social justices’ activities into the curriculum and make it integral to the process of learning and teaching e.g., by engaging learners in debates on current local issues such as environmental pollution, global warming caused by burning fossil fuels, littering gutters with plastic materials, the use of pesticides and so on. This strategy would advance Freire ‘s *Pedagogy of hope* (2004) where he posits that the tasks of progressive educators, is to unveil opportunities for hope no matter what the obstacles may be... (Freire, 2004:4). Only then can teachers reconstruct their knowledge and teaching strategies that would promote social justice as intended by the new life sciences curriculum.

### ***Theme 3***

#### ***Perceptions of curriculum reforms***

As indicated earlier, all the participants identified this theme in response to the question of what their perception were regarding curriculum reform. All except one reached consensus that they did not need another curriculum change, which is in line with earlier findings (e.g., Jacobs, Vakalisa & Gawe 2004; Koopman, 2013, 2018; Ogunniyi, 2004, 2007a, 2011; Rogan & Grayson, 2004) indicating that curriculum change in South Africa has invoked unhelpful emotions and despair among teachers. But if viewed from a positive perspective, it can actually bring about some hope that would ultimately lead to growth and progress.

The findings suggest that assumptions could influence the way the participants might have viewed curriculum change and reform. For instance, their assumption of the self has to do with the knowledge they possessed about themselves with respect to the curriculum and the subject they taught. Here it is important to acknowledge the indelible mark that their lived experiences and training as teachers might have left on their consciousness and/or sense of self, which has a direct bearing on their work-life lived experiences as well. Four of the participants pointed out unequivocally that they were not in favour of curriculum change. Constandi (2010:88) notes that, “We are who we are.” Based on the participants’ responses and descriptions of their experiences, it is fair to say that their past experiences of curriculum change have never really changed but rather it might have had a cosmetic facelift (Said cited in Constandi, 2010). In other words, it still existed within their lived spaces and work life spaces. Of course, this assertion remains to be proven beyond a reasonable level of doubt. Findings in neuro-science suggest that our so-called lived or embodied experiences, which we may not be able to recall easily, may in fact be stored in the deep recesses of our long-term memory. More investigations on this are certainly warranted in future studies.

### ***Theme 4***

#### ***Indigenous knowledge systems***

The participants indicated that the intention of the curriculum is to advance indigenous knowledge systems as encapsulated by Specific Aim 3 of the life sciences curriculum. Aim 3 specifically emphasises the need to understand the applications of life sciences in everyday life. The same aim wants learners to understand the history of scientific discoveries and the relationship between indigenous knowledge and science (DBE, 2011). The aim further emphasises that: “... Since the knowledge that will be acquired in respect of Specific Aim 3 also relates to specific subject content, the content provides the context for learning about various aspects of science in society. Science should therefore be taught in an integrated way in order to both enhance the subject and to clarify the

relationship between the subject and society i.e., indigenous knowledge systems that relate to a specific topic, related history of scientific discoveries and the applications of science in everyday life....” (DBE, 2011, p.17). This is in line with Langehoven’s (2014) view that science must pay attention to the cultural issues in our country in order to address a curriculum that is mainly stripped of cultural context.

This study was designed to capture the lived experiences of life sciences teachers when they engaged with the implementation of the new CAPS curriculum. All the participants without exception felt that IKS is generally marginalized because it is a foreign concept to them. Based on the life sciences teachers’ responses to both the questionnaire and the interview, it appears that they neither implemented IKS-related activities as demanded by CAPS nor attempted to pay much attention either to Specific Aim 3 dealing with Indigenous Knowledge Systems (IKS) in particular. As a result, they could not infuse IKS in their teaching practice. According to Riffel (2020) some teachers have the perception that IK is outdated, degenerated, and not in synch with modern or current thinking.

#### ***Theme 5***

##### ***Education for Sustainable Development (ESD)***

Following from the responses of the participating teachers, it is interesting to note that two of the respondents are of the view that the curriculum intends to advance Education for Sustainable Development. Teachers lack the understanding of the integration of Education for Sustainable Development (ESD) activities into the life sciences curriculum. By implication, there are no clear guidelines to assist teachers when and where to integrate ESD activities. The intention of the curriculum, according to participants, is the achievement of sustainable development (SD). As contained in Chapter 36 of Agenda 21 (UNCED, 1992, Section 36), “life sciences can play a critical role as a vehicle for integrating ESD activities into the Grade 12 life sciences curriculum.” The endorsement of the Grade 12 life sciences curriculum is indispensable in promoting sustainable development and ESD.

Although the CAPS life sciences for the Further Education and Training Phase (Grade 10-12) policy document suggests some strategies for implementing ESD, it is not taught in the Grade 12 curriculum. Therefore, the sustainable development concept is not a central theme in the Grade 12 curriculum. Generally, CAPS provides an enabling policy framework, with a lot of opportunities for implementing ESD through the curriculum. But in the context of the Grade 12 curriculum, sustainable development has not been explicitly emphasized in the policy document.

Most of the participants acknowledged the incorporation of environmental concerns across the curriculum. In view of Spillane, Reiser & Reimer's (2002) model of policy implementation, the participants have got the policy message as intended by the curriculum designers on the infusion of environmental activities as intended by the curriculum (Dube, 2012). However, they still have to engage with deeper-level sense-making regarding the Human impact on the environment. The policy document has an enabling framework which provides only opportunities for incorporating environmental issues in one grade over the phase. As one participant categorically stated, there are no opportunities for teaching ESD in the Grade 12 curriculum as it is only taught in the Grade 11 curriculum.

### ***Theme 6***

#### ***Pedagogical Content Knowledge (PCK)***

As far as the overall pedagogical content knowledge is concerned, the data revealed that teachers based themselves on a level that indicated that they lacked deep content knowledge. However, they acknowledged that in order to succeed in implementing the Grade 12 life sciences curriculum, they needed to have deep content knowledge. The following excerpt from Carol illustrates this point succinctly:

*I would not say that I possess deep content knowledge and I am not too confident with the subject matter.*

Most teachers feel uncertain about their content knowledge. This is in line with findings in other studies that were conducted in other countries. It was found that teachers often experience uncertainty about their content knowledge when a new curriculum is implemented (Henze, Van Driel & Verloop, 2008). A possible reason for teachers' uncertainty about their content knowledge in relation to the new curriculum may be due to the fact that they had not been teaching Grade 12 for long enough for them to feel confident with the curriculum and the content. On the other hand, it may be due to the fact they were unfamiliar with the new CAPS as a whole. It is expected that a life sciences teacher who wants his/her learners to develop a deep Subject Content Knowledge (SCK) must him/herself possess a deep knowledge of that subject as well as the PCK to convey that knowledge to them.

#### **4.17 Data gathered from the document analysis**

This subsection concentrates on the analysis of the official Grade 12 life sciences curriculum policy document. I have made use of inductive analysis techniques, as stated in Subsection 3.11.2, by following the document analysis protocol to answer the first research question: ***To what extent did***

*the life sciences teachers understand the basic intentions of CAPS?* In order to answer this research question, I needed to analyse the Grade 12 life sciences curriculum as laid down in the CAPS policy document. The analysis of the official document is important as it addresses the unpacking of the intended curriculum and thus creates a foundation for the construction of how teachers understand the intention of the life sciences curriculum.

#### **4.18 Background**

The South African government introduced CAPS in the FET phase in 2011. All the subjects (including life sciences) were introduced into the schools. A policy document, CAPS for life sciences, Grades 10–12, 2011, was published by the DBE. As such, it was distributed to schools and teachers. This policy document needs to be understood and contextualised in the classroom. My point of departure has been to analyse the CAPS for Grade 12 life sciences policy document, which is used and interpreted by teachers at school level. It is critical to analyse the official CAPS policy document more closely to comprehend its intent or goal. This is done in response to the Action Plan 2014: “Towards the realisation of schooling” whose goal is to increase the number of Grade 12 learners passing life sciences and physical science by 2025 considerably (DBE, 2012) than has been the case.

#### **4.19 Findings from the document analysis**

For the purpose of documentary analysis, the statements that refer to the emerging themes of the interviews were extracted and connected to the categories of indicators of the analytic framework described above. As stated earlier, the aim of analysing the CAPS document was to gain insight into the intention of the Grade 12 life sciences CAPS curriculum. This account is shared by Bawden (2007), who contends that understanding is an appropriate concept, rather than a theoretical basis, for science. Appendix R provides an overview of the frequency of the themes that emerge from Section 1 of the life sciences CAPS document and is laid out according to category; examples of statement related to the category; and frequency statement. This entails text analysis of categories and instances of their occurrence in each item (Silverman, 2001). Emphasis has been added to specific words or terms within statements related to the categories.

In Section 1 of the CAPS policy document, the themes that corroborated the themes that emerged from the interviews are: social justice and transformation; knowledge and skills; the role of indigenous knowledge is of basic significance and is highlighted; ESD; and PCK. The aim of the government and policy developers was to construct an education system and a curriculum that recognises and develops all ethnic groups in the country. One of the approaches to accomplish this

objective was to introduce a socially significant curriculum that incorporates indigenous knowledge into the school curriculum (Langenhoven, 2014). In the development of the CAPS, there appears to be an accentuation on acknowledging and making a more intense effort with the all-important role of IK in relation to the sciences and technology education. According to Langenhoven (2014), a highlight of this policy is that it guided the DoE to make strides and phase in the integration of IK into the official curriculum and applicable accreditation systems. Social change and social justice are cross curriculum features in the school curriculum.

The findings of the document analysis further revealed that the intention of the curriculum was to promote social justice and to transform the curriculum. This is based on the frequency with which the theme appeared in the CAPS for life sciences document. Noticeably from the analysis is the high frequency of occurrence of the theme 'knowledge and skills. Because of the high frequency, it can be deduced that the curriculum set a high premium on the development of knowledge and skills of the learners (Ogunniyi, 2020). This is corroborated by the even higher frequency of the theme in Section 2 of the curriculum. Of interest is the emergence of the theme of ESD. A value three frequency statement thus indicated a positive trend with regards to the way in which teachers view the intention of the curriculum in response to the integration of ESD into the curriculum.

In Section 2 of the CAPS policy document, a technique of analysis similar to what is used in this section, is used. Table 4.19 above provides an overview of the frequency of themes found in Section 2 of the life sciences CAPS document, laid out according to category; examples of statement related to the category; and frequency statement. A distinction in this section is that the intention of the curriculum intensively depends on knowledge and cognitive abilities that learners should develop through the curriculum. It tends to be found that there a high frequency rate of the dispositional statement that alludes to skills and knowledge. Knowledge production in sciences is an ongoing process that usually happens gradually, but occasionally knowledge and insights take a leap forward as new knowledge. As with all knowledge, scientific knowledge changes over time as scientists improve their knowledge and expand their knowledge base.

Social justice as a specific dispositional category and statement is minimally observable in Section 2 of the CAPS document. This does not invariable mean that social justice is overlooked in the CAPS document. Rather, it can be argued that, because of its presence in Sections 1 and 2 of CAPS, it has the intended outcome of understanding the contribution of science to social justice and societal development, as well as understanding the need for using scientific knowledge responsibly in the interest of people and society (DBE, 2011).

The curriculum aims to produce learners who will be able to develop an awareness of what it means to be a responsible citizen in terms of the environment and lifestyle choices that they make.

The CAPS curriculum supports good citizenship discourse by its infusion of the principles of social justice, social transformation and human rights, as defined in the Constitution of the Republic of South Africa (RSA). The curriculum is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age and disability. Although these issues deserve a fuller treatment, they are not the focus of this study. For this section, I perused the National Curriculum Statement Grades R–12: Curriculum and Assessment Policy Statement (DBE, 2011), which came into existence after the replacement of the National Curriculum Statement Grades R–9 (2002) with CAPS. The CAPS document was scrutinised for themes that emerged during the interviews, i.e., the content relating to indigenous knowledge, social transformation, social justice, knowledge, skills, ESD, and a connection to the learners' world.

In Section 3 of the CAPS policy document, the same method of analysis was used as was used in Section 1 and 2 of the CAPS policy documents. This section of the CAPS policy document outlined the specific content areas of life sciences in the FET phase, which are further broken down into topics, concepts and skills to be taught and learned. In summary, it outlines what needs to be covered throughout the year. I wish to point out that various content sections may not seem to reflect the dispositional category or theme, but the learner investigation or activity may relate to the dispositional category. Appendix R outlines the classification of 'complete', 'partial' and 'incomplete' of each of the emerging themes.

The analysis of this section revealed the majority of the IKS issues to be completely represented in the life sciences curriculum. Secondly, the dispositional category of social transformation was classified overall as complete because it constitutes a greater part of the curriculum. Social transformation ensures that the educational imbalances of the past are redressed and that equal opportunities are provided for all sections of the population. I classified knowledge and skills as complete, given that our curriculum is aimed at giving expression to knowledge and skills. The intention of the curriculum is to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives (DBE, 2011). The connection to the learners' worlds within this section of the CAPS document reveals that the curriculum is in line with their everyday experiences. The next subsection presents the results of the observation process.



## **4.20 Data derived from classroom observations**

Classroom observations were conducted in the classes of the five participants in order for me to answer the second research question, namely: **What pedagogic strategies did they use to implement CAPS in their classrooms?**

I scheduled each visit with the teachers, obtained permission from the principal and spent approximately 55 minutes in each classroom. The observation instrument (Appendix H) is a traditional evaluative instrument from the Florida Performance Measurement System (FPMS) and was adapted to suit this study. Each teacher was observed once in the classroom, at the very least. All lessons were recorded and were used as data capturing tools, and they were also used during the reflection stage of the study. I conducted classroom observations to gain more insight into how teachers implemented the life sciences curriculum. I also hoped that the observations would help me to understand more fully how the teachers taught and implemented the life sciences curriculum in their respective classrooms.

Through this method, I could observe what was actually happening in the classroom when the curriculum was implemented. The observation tool was adapted and further modified in line with Brightwell's (1993) suggestion. According to him, teachers benefit from observations that provide positive feedback rather than critique. The observation tool was designed to remind the observer of important aspects of the lesson to be taught and expected competencies of the lesson. It was not designed to evaluate teachers' abilities, but rather to gauge the level of the implementation of the life sciences curriculum.

Each lesson was observed with the same observation schedule, and attention was given to CAPS features in the lesson such as: the lesson procedure; the physical setting; availability of policy documents; the organisation of the classroom; pedagogical content knowledge (PCK); and assessment strategies of teachers, learning resources, extra learning material available and the support that teachers received from the Northern Cape DoE.

### ***4.20.1 Teachers observed in practice***

Five different lessons were observed during August 2017 (see Appendix I). During these observations, the teachers' implementation of Grade 12 life sciences curriculum was noted. Different aspects of a lesson were followed and recorded. As stated in the previous chapter, the data collection method for the second research question involved classroom observations of the implementation of the life sciences curriculum at four different research sites. In order for me to provide a detailed account of the implementation process of each of the lessons, detailed observations of each lesson in

each research site were given. In addition, general observations were provided to make the setting comprehensible to the reader (Hartley, 2002).

#### **4.20.2 The lessons**

As mentioned above, the purpose of the observation was to focus on the strategies that teachers used in their implementation of the Grade 12 life sciences curriculum. The general observations revealed that the implementation process could be regarded as satisfactory. The majority of teachers used the textbook and chalkboard for conducting all aspects of their lessons. However, it was observed that in general, most of the teachers demonstrated that they possessed the required skills and pedagogical content knowledge to implement the curriculum. Although the participants' content knowledge appeared to be adequate, in terms of the teaching strategies, most of them used the traditional teaching methods. This might be attributed to the way they were taught and introduced to conducting lessons in their training as teachers. The teachers preferred the talk and chalk method of delivering lessons whilst occasionally using oral strategies for probing questions to determine if learners understood the content. In terms of questioning techniques, one teacher out of five performed better than others in this aspect. The other four participants displayed poor and deficient questioning techniques by directing their questions only to certain learners. This approach tends to exclude other learners from participating in classroom discourse. The reason for teachers to have a basic understanding of questioning is that it is one of the most effective instructional teaching strategies that a teacher can employ to facilitate classroom discourse. According to Ma (2015) questioning is used very often for the following reasons:

- (1) Questioning enables teachers to elicit a particular lesson structure.
- (2) Questioning enhances learner participation in the classroom.
- (3) Questioning helps teachers to determine learners' understanding of content.

The planned and allocated times for each of the lessons, were adhered to. This partly explained why the lessons started on time. Consequently, they were forced to skip some of the basic teaching skills. In most cases the lessons started on time. Good time management on the part of teachers allowed them to accomplish more within the allocated period of time. This in turn proved advantageous for learning opportunities. The lessons observed consisted of four sections: the introduction, the body, the conclusion and daily assessment which provided opportunities to assess whether or not the learners understood what they taught them. As far as the lessons were concerned, teachers appeared to be adequately prepared to cover as much as possible what they had planned. The teachers availed me the opportunity to examine their lesson notes to ascertain how they did their daily and weekly

planning. As a rule, they introduced their respective lessons by writing the topic on the board and did revision by asking their learners questions pertaining to the previous lessons or to gain sense of their prior knowledge of the topic.

Some teachers provided their learners with the outcomes of the lesson i.e. what they were expected to know at the end of the lesson. In general, these findings are line with Holme's (1994) suggestion that a good introduction provides motivation for students to pay close attention to the purpose of the lesson. It also helps students to become aware of what new knowledge they might gain in the lesson. The different daily assessment activities assisted the teachers to gain some insight about what their learners had learned and what they still had difficulty learning. The following section provides specific additional information on the lesson taught by each participating teacher:

### **Vuyo**

The total number of learners in this class was 35. The lesson started at 09h00 and lasted until 09h55. The topic Vuyo (also the principal) dealt with was the endocrine system. The classroom organisation was good. The classroom was neat and spacious. The tables were arranged in neat rows. Vuyo was on time for the lesson and received the class outside in the corridor. The learners walked in neat rows. The school was quiet and there was no unnecessary noise coming from the classes. The classroom provided plenty of opportunities for support and teaching. The learners were neatly dressed in their school uniform. The learners entered the classroom and knew exactly what was expected from them. They immediately took out their books and waited for the teacher. The class Representative Council of Learners (RCL) member took the subject attendance and recorded it in a book designed for that purpose. There were no unnecessary small talks amongst the learners. Vuyo is a strict disciplinarian. The learners were curious about their former teacher i.e., the researcher observing a lesson of their principal.

The quietness that prevailed in the school was indicative of a culture of learning in the school. From my observation, it was apparent that Vuyo was well conversant with the different teaching methods and classroom management techniques. At the beginning of the lesson, he indicated to the class what he expected them to achieve at the end this lesson. It provided the learners with the outcomes of the lesson. Vuyo's lesson preparation book was made available to me to ascertain how he did his daily and weekly planning. What I observed in the planning and what was set out according to the Annual Teaching Plan (ATP) was that Vuyo was behind schedule with the teaching programme. My visit to the school coincided with the beginning of week three of the teaching program. This meant that Vuyo should have started "Evolution by Natural Selection" of Term 3. Vuyo displayed deep content knowledge of the subject. He was well aware of the different assessment strategies. At the end of the

lesson, Vuyo gave learners a daily assessment sheet, which was prepared prior to the lesson. He explained that, by giving them three to five questions on a daily basis, he forced them to engage with the content and reinforced the implemented lesson of the day. The learner resource materials that I noticed was the textbooks for life sciences Grade 12, Mind the Gap (resource from DBE) and a study guide that each learner had in front of him/her.

On perusal of the teacher's file, I noticed that the file was well organised and that the teacher had a copy of the three policy documents, which are needed to support the implementation of the life sciences curriculum in the teacher file. The documents are: Curriculum and Assessment Policy Statement: life sciences Grades 10-12; The National Policy Pertaining to the Programme and Promotion Requirements of the NCS Grades R–12 (NPPPR); the National Policy Pertaining to the Conduct, Administration and Management of the National Senior Certificate Examination (CAM); and the National Protocol for Assessment Grades R–12 (January 2012). Another available document was a Programme of Assessment (PoA). The PoA is designed to spread formal assessment tasks in all subjects in a school over the course of a term. According to the CAPS (DoE, 2011) for life sciences, assessment is a continuous planned process of identifying, collecting and interpreting information on learners' performance with a variety of assessment methods. It further indicated that there are two types of assessment, namely informal assessment (or daily assessment) and formal assessment. Informal assessment is concerned with the daily monitoring of learners' progress and should be a precursor to formal assessment. Examples of such an assessment include daily tasks, observations, discussions, practical demonstrations, learner-teacher conferences as well as informal classroom interactions. It could involve simply stopping during a lesson to observe or to discuss how learning is progressing. Results generated from informal assessment are not taken into consideration in terms of the promotion of a learner. Nevertheless, this type of assessment is in line with formative assessment as it attempts to inform the teaching and learning process rather than the promotion of learners.

In terms of extra learning resource materials, teachers made use of DVDs of the Western Cape Education Department in conjunction with the University of Stellenbosch. When I asked Vuyo if the teachers received any support from the subject adviser, the response was positive, but he also mentioned that the subject adviser resigned in 2016 and that they had not had a permanent subject adviser since then. They therefore had to rely on the support of a lead teacher who temporarily filled the position. Vuyo is conscious about the type of learners he taught under apartheid and post-apartheid. He finds it difficult to navigate his way through disjuncture spaces. According to Koopman (2018) post-apartheid spaces can be described as disjunctural; under apartheid teachers followed a more structured, rigid and dogmatic syllabus with complete disregard for cultural

diversity. In South Africa today, the curriculum, although structured, provides teachers with more freedom to be more innovative. The learners' good behaviour was probably because Vuyo their principal was there, and from all indications he appeared to be very strict. The learners showed some deference by raising their hands instead of shouting out their answers. It was observed that Vuyo involve learners in a small way by posing some questions to them in order to establish their prior and newly acquired knowledge. This is in line with the principle of teaching according to which teachers should establish prior knowledge and newly acquired before they can transmit more new knowledge.

### **Carol**

The number of learners in this class was 30. The lesson started at 12h15 and lasted until 13h10. The topic Carol dealt with was plants, responding to the environment. The class was not so neat. The desks were not organised in proper rows because a Grade 11 class used the class before the observed lesson. The teacher had a good relationship with the learners but they were noisy for a Grade 12 class. It was evident from my observation that Carol did not entirely have control over the class. Some of the boys seemed to be the same age as the teacher. Several learners talked throughout the lesson. In spite of these problems, the teacher managed to speak to the class in an encouraging tone. The learners were dressed in neat uniforms. As they walked in rows towards the class, there was a degree of noise. As they entered the class, they headed for their seats. Once they greeted the teacher and me, they took their seats and took out their workbooks and textbooks. The teacher introduced the lesson by writing the topic, plant hormones, on the blackboard.

Carol had her daily preparation available. The lesson was signed off by the Departmental Head, a clear indication that monitoring took place in the school. However, she lacked some basic classroom management skills. Carol introduced the lesson by stating what topic they were going deal with. From her teaching she seemed to possess the required subject content knowledge (SCK) to teach the topic. In the teacher's file, I found evidence of the following documents that are necessary for teaching life sciences and support the implementation.

They include: CAPS life sciences Grades 10 - 12; the national policy pertaining to the programme and promotion requirements of the NCS Grades R–12; the National Protocol on Assessment Grades R–12 (January 2012); the National Policy Pertaining to the Conduct, Administration and Management of the National Senior Certificate Examination. The implementation of the curriculum needed to be strengthened using good learning and support teaching material and teaching support material. The teacher indicated that she received the necessary support from the district in the form of content workshops and professional development in 2016. She attended every content workshop arranged by the Northern Cape DoE. Despite this, Carol struggled to maintain order in her

classroom. Though she was confident and possessed adequate content knowledge, she seldom provided learners with an enrichment opportunity. She did not provide adequate stimuli to the learners and did most of the talking herself. Carol approached teaching with great confidence and there was a willingness to explore unfamiliar approaches and accept challenges within the subject. However, Carol needed to improve on her classroom management techniques. The curriculum was implemented in the classroom. No daily assessment was given to the learners.

Carol's lesson can be compared to the way an anthropologist teaches about another culture. Both can be seen as involving a tribe of people with particular knowledge, a certain language, customs, practices, traditions, attitudes and values. When I describe the nature of lesson, I am considering the special characteristics, values, of the lesson that is based on and how the lesson developed. Both the teacher and the learners were actively involved in the lesson. The learners ask some questions after the lesson, but it was not really high order questions but more of elementary questions. The learners did not encounter any problems with the content. The difference between Vuyo and Carol was that she involved her class slightly more and made effort to make them part of the lesson whereas Vuyo was more distant and just transmitted the new knowledge with little effort to establishing whether the learners grasped the newly acquired knowledge or not.

### **Brady**

The lesson started at 09h00 and continued until 09h55. The learners greeted us as we entered the class. The class was very neat and the floors polished. It could be ascribed to the fact that it was his first lesson of the day and that he took care to clean it beforehand as he knew that I would be visiting him. Brady did an excellent job with the organisation of his classroom set up. The pictures of Grade 10-12 life sciences on the walls were very interesting. Brady introduced the lesson of the day: Evolution by natural selection. In order for the learners to comprehend the new body of knowledge, the teacher revised and referred to the work done early in the year on DNA, genetics and heredity. It is necessary to revise the work in order to understand the concept of change, natural selection and evolution. The content for this lesson deals with the concepts of evolution and the origins of ideas about origins (fossil records, modification and other forms of evidence).

The learners were neatly dressed in their school uniforms. They respected their teacher and behaved well as they made their way to the classroom. The most challenging aspect of the participants was likely that the teacher had to teach in both Afrikaans and English. The learners displayed positive classroom behaviour. This positive behaviour resulted in a gain of curriculum time and created a classroom conducive to learning. Brady's planning was CAPS compliant. The lessons were signed

by the departmental head, a clear indication that monitoring took place in the school. He had strong classroom management skills. He introduced the lesson by stating what the topic of the day would be. The teacher had the required content knowledge to teach the topic. In the teachers file, I found evidence of the following documents that are necessary for teaching life sciences:

The CAPS policy document for life sciences, Grades 10–12,

The national policy pertaining to the programme and promotion requirements of the NCS Grades R–12, National Protocol on Assessment.

Before the start of the lesson, Brady checked on the students and enquired how they were doing. For me, this was a good way of starting the lesson (getting a sense of how the learners were doing). Next, he discussed the content he was going to deal with in his lesson, essentially providing an outline of the lesson. This class was able to work independently. After completing a task, they raised their hands and Brady walked up to them to review the work. One of the things that stood out for me during the observation was that Brady had a well-established working relationship with his learners. The quality of the relationship was also noticeable when the learners exited the classroom and he wished them well for the remainder of the day. The teacher talked most of the time and the learners had little opportunity to engage with the teacher.

### **Neill**

The lesson started at 12h15 and ended at 13h10. Neill introduced the topic he was going to deal with. The topic was ‘evolution by natural selection’ and the lesson for the day was ‘the theory of Darwin and the difference between natural selection and artificial selection.’ The learners were neatly dressed in their school uniforms. They respected their teacher and behaved well as they made their way into the classroom. The learners displayed positive classroom behaviour. This positive behaviour created a classroom that was conducive for teaching and learning. The learning outcomes of the lesson were achieved by the teacher. The teacher had lesson preparation and presented it to me. It was signed by his departmental head. The lesson had all the relevant aspects of a good lesson. All the planning documents for the implementation of the life sciences curriculum were contained in the teacher file.

The class was neat and desks were arranged in single rows. It was evident that the teacher had a great depth of content knowledge. He provided opportunities for expansion of knowledge by bringing in general knowledge and perceptions of evolution and spoke about how the church dealt with this topic. The teacher applied different teaching strategies. It is my view that he could have done better. Neill had all the necessary learning resource material for the learners. Each learner had a textbook and a Mind the Gap study guide. Extra resource material included telematics DVDs from the

University of Stellenbosch. The teacher stated that he received support from the Northern Cape DoE. On reflection, I think that Neill was confident with the subject matter and implemented the curriculum to the best of his ability. He had the resources available to implement the curriculum and had in-depth PCK. Drawing from my observation there was an absence of learner engagement in the lesson and the teacher did most of the talking while learners were idle. This could be evident of his personal past experience of how he was taught.

Most teachers tended to emulate and adopt the style of teaching based on their personal experience of how they were taught. Merleau-Ponty (cited in Taylor, 2000:653), pointed out that our history and past experiences always influence how we experience life and work. Teachers who were trained at apartheid institutions exhibit difficulties with changing the way they teach, which may affect their engagement and interaction with their learners. For example, initiating a lesson by involving learners may be challenging to such teachers. Teachers' experiences and training they receive under apartheid became the collective consciousness through which they interpreted the training and subsequently construct their own meaning of how to implement the new curriculum. Their thoughts are between the present and the past, which bring an unwillingness to change their practice and embrace the new order. (Koopman, 2013).

#### **4.21 General comments on how the curriculum were implemented**

There are no limitations on the exploration of knowledge obtained by means of observing science classroom lessons, since the knowledge gained through observations can be applied to better understand human behaviour. Science has as its major premise and aims to follow a critical and universal approach to bodies of knowledge. Science constantly seeks to discover the truth, irrespective of personal belief, bias, religious or cultural persuasion (Nnanyereugo, 2017).

In my view, the potentiality and role of science in our everyday life is indispensable. Science has immense value not only for teachers and learners but also for researchers in science education. During the classroom observations, the teachers exhibited commitment to effective implementation of the curriculum. By no means do I wish to imply that other subjects in the CAPS curriculum are irrelevant in the overall implementation of the CAPS curriculum. Society needs change; therefore, it is inevitable that the curriculum must change in order to serve the needs of society. A curriculum that speaks to the needs of the country must to be developed. Therefore, it is every teacher's responsibility to interpret the curriculum and adjust it according to a world that our children can relate to.



From my classroom observation, I noticed that all teachers' files adhered to the requirements necessary for the successful implementation of the life sciences curriculum. Also, the teachers in this study used largely the traditional talk and chalk teaching approach. Jegede (1997) asserts that traditional teaching methods make learners adopt rote learning strategies. As a result, they tend to adopt strategies that enable them to understand school science explanations in their own way without believing any of them (Jegede, 1996). This is what Aikenhead & Jegede (1999) call the Fatima rote learning method. Of course, the method works well for most learners because the assessments are also based on recall rather than higher-order cognitive processes. Textbooks for every learner were available in all the five schools. All the teachers were issued with departmental laptops with pre-loaded lessons on the life sciences curriculum for Grade 10–12. No teacher in the study used information and communication technology (ICT) as a teaching strategy for the effective implementation of the life sciences curriculum.

From the foregoing classroom observation, it seems that all teachers were confident in implementing the curriculum. However, they failed to perceive the emphasis of the curriculum especially in relation to the learners' life worlds. Much as they faithfully attempted to cover the content of the curriculum in terms of the Subject Content Knowledge (SCK) their Pedagogical Content Knowledge (PCK) fell short of what is envisaged in the CAPS curriculum. In other words, for teachers, it was business as usual. This weakness in their delivery process may not be unconnected to the little or no impact that the crash programme had on their instructional practice.

Findings in the study suggest the need for the curriculum developers and policy makers to organize more effective workshops for teachers such that they become part and parcel of the curriculum development process. Petrovi (2010) points out that teachers tend to develop specific ways in their cognitive structures that lead them towards the development of habits within which they operate on a daily basis. These habits result in psychological complexes that crystallize and become very difficult to discard, especially when teachers are introduced to a new curriculum and teaching strategies of teachings that require them to unlearn old and traditional ways of teaching.

#### **4.22 What relationships exist between the teachers' demographic characteristics and their learners' academic performance?**

In this subsection, the investigation is concerned with a comparison of the overall school performance over an eight-year period using the examination scores as possible indicators of the curriculum implementation process. In South Africa, schools are evaluated by their learners' outcomes and achievement in the NSC examination. Great emphasis is placed on reaching targets that are set for schools in the beginning of each academic year by the Northern Cape DoE. A great

burden is placed on Grade 12 teachers to teach at this level and to have as many learners as possible pass this examination (Hartley, 2002).

Based on the outcomes of the overall Grade 12 results, schools are classified as performing or underperforming, depending on whether they reach the targets set out by the Northern Cape DoE. As in the rest of South African schools, the most experienced and qualified teachers were tasked to teach Grade 12 subjects. This situation has influenced how teachers implement the life sciences curriculum in schools. Teachers tend to rush through the curriculum without equipping learners with the necessary knowledge, skills and values for self-fulfilment and meaningful participation in society as citizens. The question of course is, “If we are result-driven, are we doing justice to give expression to the knowledge, skills and values worth learning in South African schools?” My view is that, based on a result-driven and curriculum-based performance model of the curriculum, we may not implement a curriculum that ensures that the learners acquire and apply knowledge and skills that are meaningful to their own lives.

(Appendix P) should be read in conjunction with the performance of learners in life sciences for the period 2011 to 2018. In 2017, as compared to previous years, there was a 2.5% decrease in the percentage of learners who achieved 30% and above and a 2.8% decrease in the percentage of learners who achieved 40% and above. The number of candidates nationally increased by 63 777 in comparison to that of 2011. The general performance of the candidates in the district decreased in 2017 as indicated by 69.5% with candidates obtaining 30% and above and 46% achieving 40% and above. Tracking the outcomes of the 2018 examination scores indicates a national average achievement of 76.3%, a 61.9% provincial achievement and a 56.5% achievement in the district. Nationally, the results improved with 2% and provincially there was an increase of 4.1%. The results of the district decreased with 13% from the previous year. The national results are the highest since the implementation of CAPS.

Appendix P represents the outcomes of the examination results nationally, provincially and at a district level for the years 2011 to 2013. According to the data, the pass rate for the period 2011 to 2013 was consistently above 70%, except for 2012. In 2011 and 2013 the results were 73.2%. There was a decrease in the results in 2012. For the years 2015 and 2016, the results dropped to 70.5% and 70.4%, respectively. In 2017, the results increased to 74.4%. This was the highest examination result obtained since 2011. In 2018, the results increased to 76.3%. Significantly, the results for life sciences at a national level could not surpass the 80% benchmark.

To analyse the examination results, I used data obtained from the Northern Cape DoE. The interpretation of the data obtained suggests that the results fluctuated between 57.2% and 68.6%. For the period before the implementation of the life sciences curriculum, the results ranged between 58.2% and 68.6%. For this period, the highest examination result was 68.6% and the lowest 58.2%. After the implementation, there was an improvement in the results. In 2014, the province scored 63.5%. In the subsequent year it dropped to 57.2%. In 2016, 2017 and 2018 the results improved again.

Based on the analyses, it is possible to conclude that the examination results with the old curriculum were lower than the results obtained for the CAPS life sciences curriculum. In accordance with this, the success rate was increasing. At a district level, the success rate for the period 2011–2013 (old curriculum) was 67.2% on average. The pass rate for life sciences in 2011 was 73.9% and dropped to 61.9% and 58.2% in 2013 and 2014, respectively. There was a decrease in the results for this period. On the average, the pass percentage for the years 2014–2017 was 76.6%.

It is possible to say that, on average, scores seemed to increase during the period after the implementation of CAPS life sciences. The districts broke through the 70% barrier for the first time. During the period 2011–2013, the data obtained confirmed the following results. At school A, the pass rate for 2011 was 75%, and in school B, the result was 75%. School C and D obtained 65% and 53%, respectively. In 2012, school A increased its results from 75% to 85%; an increase of 10%. School B for the same year also improved their examination results from 75% to 77%. At school C and D (2012), a decrease in the examination results was recorded; they dropped to 49% and 38%, respectively. In 2013 at school A, teachers indicate that they were disappointed in the examination results. The pass rate dropped from 85% to a mere 29%. A reason for the drop was that a novice teacher was appointed to teach the Grade 12 life sciences learners in that particular year. At school B, there was a decline of 0.4% in their results from 77% to 73%. School C and D consistently perform poorly in life sciences – as indicated in (Appendix O) they were at 29% and 41%, respectively.

According to the data obtained, the results indicate some decline for the period 2011–2013 (old curriculum) in school C and D, while school A and B performed above average, which indicates a tendency of consistency for the said period. The examination results of life sciences post-implementation of CAPS for life sciences (2014–2018) revealed that in the first year of CAPS (2014) school A scored 76.9%, school B recorded a 41.2%, school C scored 28.6%, and school D 29.4% (Appendix O). In 2015, school A scored 53.0% and school B 80.0%. School C scored 43%, while school D scored 32%. For the period 2016, school A scored 56% and B scored 71%, while school C scored 65% and school D 57%. In 2017, school A scored 80%, school B 80% and school C and D

47% and 48% respectively. In the fifth year of implementation (2018), school A managed to score 72.6% and school B 80%, while schools C and D scored 26% and 66.7%, respectively. Data revealed that school A improved their results and scored above 70% and 80%. School B scored consistently above 70% and 80% for the last two consecutive years. School C underperformed in life sciences since the inception of the CAPS and consistently scored at a pass rate of not more than 45%, while school D scored above 55%.

For the last five years, the results improved dramatically from 29.4% in 2014 to 66.7% in 2018. The pass rate for life sciences in the four schools fluctuated since the implementation of CAPS for life sciences. Although school B obtained an 80% for two consecutive years in a row, this does not necessarily mean it is a well performing school, as the results of all the subjects were not considered. However, the school performed well over the past four years (2015–2018). The DoE came up with intervention programmes in the district to help improve the pass rate in Grade 12 life sciences. School C had consistently underperformed in life sciences since the inception of the CAPS curriculum and school D displayed similar trends in 2014–2018. However, the schools' results improved dramatically in 2018. The sudden improvement of results in one year and the almost immediate decline in the following year brought into question the suitability and sustainability of the implementation process. Certainly, the reasons for these fluctuations are worthy of closer consideration in future studies.

#### **4.23 Possible influence of teachers' demographic characteristics on learners' academic performance**

This subsection is concerned with the 24 teachers who filled the questionnaire. The first part of the questionnaire deals with biographical factors and how they might have influenced their learners' performance. The participants' ages ranged from 20–25 years (8.3%); 26–30 years (16.6%); 31–35 years (45.8%); 36–40 years (4.1%); 41–45 years (8.3%) and only (16.6%). The data suggest that 8.3% of the respondents had teaching experience of 2–3 years; 16.6% had 4–5 years; 41.6% had 6–10 years teaching experience at the time of the study, followed by 20.8% of the respondents who had 11–15 years' experience, while 4.1% had 16–20 years of experience and 8.3% had more than 26 years of teaching experience.

From the data set, 4.1% accounted for a principal and 41% for deputy principals, followed by 16.6% who were departmental heads and the majority (75%) were post level 1 teachers. In terms of qualifications, the findings indicate that 4.1% of the respondents held a Diploma in Education, followed by the majority of respondents who held a B.Ed. degree, while 8.3% of the respondents

held a B.Ed. (Honours) degree, 8.3% held a professional degree and a Post Graduate Certificate in education (PGCE) and lastly only 4.1% of the respondents held a masters' degree in education. The results further suggest that the majority of the respondents (79.16%) classified the schools they are working in as township schools, while 20.84% of the respondents classified their schools as suburban schools. Teachers' demographic factors and lived experiences do impact their level of success in implementing the curriculum (Tafai, 2017). Teachers are viewed as significant agents of change on the one hand while on the other hand, they may be obstacles to change because of their devotion to out-dated forms of instruction (Anderson, 1997; Tong, 2012). Although teachers' demographics e.g., age, gender, teaching experience and qualifications have been pointed out in the literature as a critical constituent that positively or negatively affect the successful implementation of a new curriculum (e.g., Salvano-Pardieu et al., 2009; Yuen & Chan, 2005) it is not quite clear at this stage how these factors actually played out in this study. At least this has not been the case with the five teachers discussed above.

#### **4.24 Chapter summary**

In this chapter, I have presented and analysed the data that sought to address the research questions of this study. The results of the research were presented. The findings mainly focused on the research objectives. The issue of curriculum implementation is an issue that affect the effectiveness of the new changes to the life sciences curriculum. The historically disadvantaged schools are still faced with a lack of resources for the success of curriculum implementation and continuous sustainability of curriculum development. In Chapter 5, I will discuss and give an overview of the research findings.

## **CHAPTER 5: DISCUSSION**

### **5.1 Introduction**

The main purpose of this chapter is to discuss the findings using the extant literature and how these findings validate, augment and advance the research on teachers' lived experiences in implementing the life sciences curriculum. The experiences and perceptions of reality are combined to crystalize a common phenomenon, a phenomenon shared by five life sciences teachers, interlaced by the construction of their lived experiences. As such, the nexus of the phenomenon provides a glimpse of what it means to be a life sciences teacher during the time of implementing a new curriculum. Moreover, the four research questions outlined in Chapter one are discussed based on the research findings. Further, the study assumes that life sciences teachers' experiences are influenced by the way they make sense of, and understand their real world and the consciousness that is shaped by the world they live in.

This study addresses the gaps in science education using a phenomenological approach. To achieve the purpose of this chapter, this chapter has been organised in such a way to further analyse, interpret and explain the research findings. In the previous chapter, the data obtained were presented and described, while this chapter presents an analysis and explication of the data. The aim of phenomenological inquiries as has been stated earlier, is to search for subjective truth as a response to their existence in the real world (Negumbo, 2018). In the same vein, this investigation construes the teachers involved in the study as reflective professionals who were ready to share their encounters while implementing the CAPS Grade 12 life sciences curriculum. This focal point is in line with the phenomenological theoretical framework as espoused by Schön (1987), where the teacher is regarded as a technician enacting the curriculum in practice (Pitso & Mail, 2013). The findings discussed are drawn from the data to answer each of the four research questions. The section that follows discusses the findings as they relate to each research question.

### **5.2 Key features of chapter five**

Chapter five identifies particular findings that seek to provide answers to the four research questions. In this describes, analyzes, and evaluates whether or not the teachers implemented CAPS curriculum curriculum as expected by the Department of Basic Education (DBE). Previous studies have shown the challenges that have emerged while implementing the new science curriculum (e.g. Koopman, 2013; Ogunniyi, 2004). In this regard, the study has attempted to unpack some of the challenges encountered by five life science teachers in a particular school district in the Northern Cape Province. The research questions which galvanized the study were:

- d) (a) To what extent did the life sciences teachers understand the basic intention of CAPS?
- e) (b) What pedagogic strategies did they use to implement CAPS in their classrooms?
- f) (c) What were their perceptions of, and experiences with CAPS?
- g) (d) What relationships exist between the teachers' demographic characteristics and their learners' academic achievement?

### **5.3 General overview of the study**

In Chapter 3, I presented a description of the methods that were used to conduct this research. I further elucidated the research study strategy, which is the mixed-method phenomenological research strategy and the selection of this approach was justified. The appropriateness of the instruments to respond to the research questions was also discussed. A detailed description on the process of data collection, its analysis, as well as the interpretation thereof has been presented. A brief discussion on the validity and reliability of the study were presented to ensure that the instruments measured what I intended them to measure.

In the chapter 4, I presented descriptions of teachers' perspectives on the implementation of the curriculum, and the practices regarding current reform efforts in the Northern Cape Province, South Africa. These include the data analysis and their interpretation and understanding of curriculum implementation in the study. I also described the experiences of 24 life sciences teachers who attempted to implement the new curriculum using a questionnaire. Lastly, I examined more closely the experiences of five life sciences teachers in a particular school district who implemented CAPS curriculum using an interview schedule and classroom observations. In my descriptions, I ensured that the teachers' experiences were captured in the best way possible to give a vivid picture on what really happened in their classrooms as far as the implementation of the life sciences CAPS was concerned. As much as possible I attempted to explore the nature of the teachers' perceptions of the implemented curriculum through careful data analysis.

### **5.4 Teachers' experiences and reflections**

Based on my analysis of the teachers' comments on the questionnaire and during the interview, it seemed that they were coerced to implement a curriculum without adequate training. The lack of adequate training was cited as one of the critical challenges teachers experience in this study as they prepared to the implement the curriculum (Malgas 2012). The specific challenges they faced include:

- External factors e.g. inadequate instructional resources, inappropriate training and the ever-changing curriculum.

- Internal factors related to the teachers themselves e.g., lack of pedagogical training, lack of subject content knowledge, and the inability to relate the curriculum especially with respect to the learners' life worlds.

Teachers' understanding of the curriculum is complex and influenced by a range of factors, including how willing they are to change their own perception towards curriculum change and the curriculum they supposed to implement, their background experiences, the sub-culture of the subject, and the level of support given to teachers during the change process (Jones, Bunting and De Vries 2011). The participants' background among others was one of the challenges this study manages to unravel. In engaging participants to disentangle their challenges and experience of their background it became evident that the legacy of apartheid left deep scars in the lives of the participants in terms of accepting change and to embrace the new curriculum.

Resources and support were some the major concerns for teachers. Although there was a massive resource shift to previous disadvantage schools, most township schools have continuing low matric pass rates. A lack of sufficient pedagogical content knowledge (PCK) from their own experience during the implementation process implies that teachers understood what they had to teach, whether they are able to understand how to teach the content and also whether they were able to illustrate the notion they had to teach from the perspectives and milieu of the learners' everyday life experience to define the extent of their own knowledge of the subject matter. This refers to teachers' in-depth understanding of concepts or the metacognition, and their knowledge to conduct lessons depicting their knowledge of tangible examples from the learners' perspectives and understanding to display mastery of the knowledge of the subject matter. Each teacher in the study had the potential to contribute to the successful implementation of the curriculum as Nelson (2008), states that each individual (teacher) has unlimited potential. Humans are the only living things able to improve the quality of the lives of other and themselves through implementation of the CAPS for life sciences policy.

Using Schön's (1983,1987) notion of reflective practitioner as an essential element of what he calls, "reflection-in-action" (Schön, 1983, 1987) I structured my reflection as an attempt to exhibit how we think and experience of what it means to be a life sciences teacher when confronted with and implementing the 'new' curriculum (CAPS). To borrow a terminology used by van Manen (1995) will serve as a starting point for my journey through reflection- in- action. He uses the term "do things with immediate insight". The immediate insight" can be construed in this study as an immediate response to the challenges and experiences of teachers when confronted with implementing the curriculum. Teachers 'consciousness of how they implement the curriculum manifest through and can be



seen and understood in the context of their responses often required when confronted with implementing the curriculum in a formal educational process. When implementing the curriculum and how teachers experience the process in the class appears to be what they think about the curriculum. This reflects back on their practices as life sciences teachers. The implementation process actually “talk back to teachers” not in a literal way, but in a figuratively way.

According to Schön (1983, p. 79). “The situation’s back-talk, is the “reflection-in-action”. In their reflection-in action on the curriculum teachers in this study revealed that the curriculum was mostly delivered through the traditional way of teaching and by old habits of teaching as encapsulated under apartheid education. In Conroy’s (2003) words such teachers are *an agent’s agent* or, agents of a system (e.g., apartheid) through which they navigated their thoughts. As reflective practitioners’ the teachers were supposed to be attentive and pay attention and acknowledge this shortcoming as part of their action (immediate response). By so doing teachers developed the ability to keep possibilities in their action which would be to correct the practice through implementing immediate action. (Insight). Schön himself expresses this in almost the same way when instead of reflection he refers to a “double vision” that involves “the capacity to keep alive, in the midst of action, a multiplicity of views of the situation” (Schön, 1983, p. 281).

The findings in the study also reflect on their negative attitude towards the curriculum as they oscillated between past curricula reforms while at the same time they continuously struggled to come to terms with yet another curriculum that needs to be implemented. South African teachers suffer from “curriculum change fatigue”. They constantly struggle against the phenomenological self and attitude as they are continuously and without end confronted with curriculum reforms. Their fears constantly placed them in a position of concern going into what they considered as structural and policy tension which goes against the grain and spirit of the implementation of the CAPS curriculum.

Teachers’ fears about curriculum reforms might not necessarily capture the full picture of the real situation; but it may actually be very accurate and true in some instances. Normally, however, if it is accurate enough as captured in this study the reflection-in action practitioner (in this case, the life sciences teacher) considers every situation to be unique, and is always prepared for unexpected eventualities such as inadequate training and lack of support. This preparedness does not allow any ground for uncertainty *in* action as teachers know how to go on. Schön calls this “experimentation”. And since the teacher is paying attention, he/she is also learning from this “experimentation”. Teachers in this study went through a stage trying to come to terms with exactly what the intention of the curriculum was to actualize the goal of the curriculum. Their experiences of the intention of the curriculum are framed in their descriptions of social justice and indigenous knowledge systems to

mention a few. Their descriptions suggest that social justice require of them to become transformative intellectuals whereas indigenous knowledge systems made them agents of integration that promotes IKS and enact policy of integrating science and IKS (Riffel, 2020).

## **5.5 Discussion of the findings**

The discussions of the findings were developed around the primary sources of the data explicated namely interviews, document analysis, questionnaire, observations and an analysis of the matric results. The idea was to see how established and experienced teachers reflect on their actions that would assist with the implementation of the life sciences curriculum in the Pixley Ka Seme District in the Northern Cape Province. Padilla-Diaz (2015) argues that phenomenological studies become useful in education and research in social sciences. Padilla-Diaz (2015) also points out that researchers in phenomenology have realised that phenomenology is a legitimate way through which participants may manifest their understanding of life experiences.

During my interaction with both teachers and the schools, I observed that a link existed between teachers previous and new experiences as they engage with the implementation of the life sciences curriculum. There was consensus among teachers that there was no synergy or cooperation among teachers on how they as teachers could work together on curriculum implementation. Because of this disjuncture, teachers and schools have failed to effectively tap into the expertise and knowledge of colleagues to the advantage of curriculum implementation.

## **5.6 Discussion based on research question 1 (RSQ 1)**

*Research Question 1: To what extent did the life sciences teachers understand the basic intention of CAPS?*

This question is important because the curriculum is expected to shape the lived experiences of life sciences teachers as they implemented the CAPS curriculum. According to Ratner (2000) teachers create a social reality through which they actualize the goal of the curriculum in their lifeworld. Teachers lived experiences include the choices that they make and all of their endeavours within their world. Teachers' world of experience is primarily their organisational (school) and societal world of lived experiences (Anakwe, 2002). That will be their everyday world in which teachers live and experience their everyday interactions and endeavours (Van Manen, 2007). Furthermore, studies by (Mourshed, Chijioke & Barber, 2010) demonstrated that the implementation of a curriculum is influenced by teachers' understanding of the intentions of the curriculum which were shaped by teachers' lived experiences and societal lifeworld. Comments from teachers in this study corroborated views of Mourshed, Chijioke and Barber (2010) that curriculum implementation in

South Africa varied depending on how teachers are allowed to act as agents of change and consequently allowed free will to creatively implement the curriculum. During the interviews, teachers were asked to relate what the intention was of the CAPS Grade 12 curriculum. The interviews were necessary for them to narrate what they thought the curriculum intended. In my analysis I try to explore and understand the phenomenon under study (Basit, 2003). From the two data sources it was found that teachers have diverse interpretations of the intentions of the life sciences curriculum. The results from the two data sets are shown in themes of what teachers' experience were about the intention of the life sciences curriculum. The following themes emerged from the interviews.

### **5.6.1 Teacher training**

From the interview data, four participants indicated that they received training on the implementation of the life sciences curriculum, whereas one participant was trained at university on the implementation of the life sciences curriculum. However, participants claimed that the training was ineffective, inadequate and failed to prepare them to implement the CAPS Grade 12 life sciences curriculum. Although teachers were of the view that the training were needed, but the training they were offered was inadequate to prepare them to implement the CAPS curriculum successfully in their classrooms. One participant suggested that the training should take place continuously to ensure that teachers are confident to effectively implement the life sciences curriculum. From the perspective of the participants, there seems to be an underlying consciousness of being lost and their struggle within their minds to find direction in implementing a curriculum (Koopman, 2013). Furthermore, their descriptions of the training are packed with ambiguities and confusion as their expectations and needs were not met. As one participant puts it, "*we were more confused after the training.*" The findings are in line with the findings of Jansen (1998) who found that the training teachers received in preparation for OBE implementation was inadequate, misguided and incomplete. Furthermore, there are similarities between studies of Aloovi (2016) and Mulkeen (2010) who found that whenever a new curriculum is introduced, teachers receive inadequate training. Mulkeen (2010) points out that the training offered to teachers is not in line with what happens in the classrooms.

### **5.6.2 Social justice and transformation**

Social transformation plays an important role when the aim is directed at not only to change the curriculum, but also to develop the human capital aligned to the requirements for global competition through the invention of a new curriculum (Lou, 2011). The main initiative since 1994 has been the transformation of the South African school curriculum (Chisholm, 2004). Participants in this study shared the view that a drastic transformation of the life sciences curriculum would require of teachers

to involve themselves in the transformative process to implement the curriculum. The foundation of the NCS Grades R – 12 is: “Social transformation: to change imbalances in education and make sure that everyone has access to the same opportunities” (DBE, 2011, p. 3). A welcome feature of the NCS Grades R–12 is the issue of diversity such as poverty, social justice inequality, race, gender, language, age, disability and other factors. Participants agree that for teachers to be sensitive and responsive to issues such as social justice, they must become transformative teachers for a transformative life sciences curriculum. Teachers, as transformative intellectuals, should start questioning the purely instrumental approach to teaching.

The participants in this research contend that the life sciences curriculum intends to enhance social justice and to bring about not only individual change in the lives of the learners and teachers but also to transform the everyday lives of the learners by providing them with knowledge and skills that do not only perpetuate the dominant ideology but rather fosters a sense of agency to challenge oppressive practices (Mdunge, 2014). Regarding social justice and transformation as an aim of the life sciences curriculum, it locates the curriculum primarily to institutionalised and societal forms of oppression (DBE, 2011). The call for transformation and social justice in life sciences is inadvertently a focal point of the CAPS Grade 12 life sciences curriculum. Teachers in this study unanimously concur on a transformational agenda of the life sciences curriculum. Vuyo is of the view:

*In order to work towards a life sciences curriculum that promotes transformation and redress, we as teachers need to understand where we are coming from. Thus, in order for us to work towards a curriculum that promotes redress, we must help our learners to embrace, transformation and how to challenge it and eventually work towards a curriculum free of injustices.*

The participants interviewed were in support of the intention of the curriculum to bring about social transformation in society. They share a common view of the issue of social transformation as they made mention of social transformation and redress as encapsulated in the following statement made by Brady:

*Social transformation is about changing the curriculum and redress past injustices and inequalities. In order to achieve the goals of social transformation in education, it is important to level the playing fields so that everybody can have an equal chance and compete on an equal basis.*

### **5.6.3 Teachers’ perceptions of curriculum reform**

A major theme that has emerged from the study relates to teachers’ consciousness about the curriculum reform that has undergone repeated changes within a short period of time. The continuous changes in the curriculum have had an overall negative impact on the South African education

system. Hardly before teachers have settled to a new curriculum than a revised version is presented to teachers; thus, rendering them incompetent to enact what is intended for their classrooms. The study revealed that the numerous curriculum changes and policy reforms were mostly axiomatized by their past experiences engrained in their memory in post-apartheid South Africa. Guided by the responses of the participants, it is crystal clear that teachers are tired of implementing curriculum changes. On the question of “What are your perceptions regarding curriculum reform”, they overwhelmingly answered that they did not need a curriculum change in the foreseeable future.

The current view is that the curriculum must stabilise first before making any amendments to it. This view is in agreement with quantitative data derived from the responses of 24 participants to the questionnaire. Further, the participants were well aware that curriculum reform is driven by social, economic and political changes as well as global changes which put pressure on teachers in every country to rethink their curricula. Major curriculum changes have been made over the last 30 years globally. In this regard, the same can be said about South Africa with the introduction of OBE and recently the current phase framed in terms of the Curriculum and Assessment Policy Statement (CAPS). These findings agree with Gumede and Biyase (2016) who believe that educational reforms and curriculum transformation have been a priority for the South African government since 1994. They also indicated that despite numerous reforms the quality of education remains a challenge in post-apartheid South Africa. However, as Gumede (2013) argues, there remain policy issues that need to be addressed.

#### **5.6.4 Indigenous knowledge**

During the interviews teachers indicated that they were very positive about teaching IKS and implementing Specific Aim 3 of the CAPS life sciences dealing with the inclusion of indigenous knowledge (IK) in their teaching. Specifically, Specific Aim 3 of CAPS states that the teaching of life sciences should entail: “Valuing indigenous knowledge systems: acknowledging the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution” (DBE, 2011, p. 3).

In contrast, the policy document is not clear on how the integration of indigenous knowledge should take place. While many teachers indicate their desire and willingness to promote indigenous knowledge (IK), many do not have adequate knowledge about indigenous knowledge. It is observed that in the literature, there is no like-mindedness among science educators about what aspects of IK should be integrated into the curriculum (Ogunniyi, 2011). The CAPS Grade 12 life sciences policy document is neither clear of how the integration of IK should take place, nor does it prescribe how the implementation of a science-IK curriculum should take place (Ogunniyi, 2007a, 2007b; Koopman, 2017).

These views are not surprising because Michie (2002) also makes us aware that teachers, especially those in high schools, tend to lack knowledge of indigenous knowledge. Based on his study in Kenya, Thomson (2003) has confirmed that teachers he worked with lacked adequate knowledge of IK. Despite the fact that the new life sciences curriculum acknowledges Indigenous Knowledge (IK), teachers lack the knowledge of how to integrate IK in standard school science (Rogan & Aldous, 2009).

#### **5.6.5 Education for Sustainable Development (ESD)**

The analysis of the interviews revealed that the majority of teachers believed that the life sciences curriculum intends to promote ESD, and there is a need to incorporate ESD activities in their lessons. Environmental concerns form an integral part of the life sciences curriculum. It states that studying life sciences will create “an awareness of what it means to be a responsible citizen in terms of the environment and lifestyle choices that they make and use science and technology effectively and critically showing responsibility towards the environment” (DBE, 2011, p. 7). Given Spillane, Reiser and Reimer’s (2002) model of policy implementation, these teachers seem to have understood the surface-level policy message as intended by the curriculum designers on the integration of environmental issues into the curriculum policy document. However, teachers have to engage with an in-depth discovery regarding the nature of life sciences promoted in the policy document, and the nature of ESD, and the transformational approaches as set out by the policy. The CAPS life sciences policy document provided an enabling framework which provides teachers with sufficient opportunities for incorporating ESD activities into the curriculum (Dube, 2012).

ESD is concerned with redirecting the South African society from being unsustainable towards a sustainable society. To align the curriculum with ESD, and to realise the sustainable goals, the intention should be for teachers to try as much as possible to see to it that their instructional practices are aimed at promoting ESD (Teise, 2013).

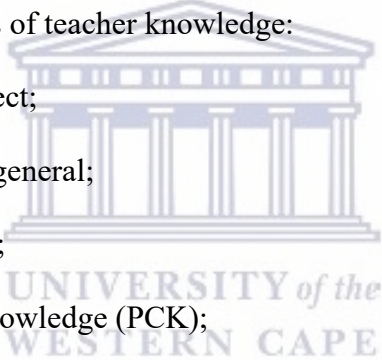
#### **5.6.6 Pedagogical Content Knowledge (PCK)**

It is strongly believed that learner attainment relates to teacher content knowledge and teachers’ ability to apply teaching methods to shape conceptual comprehension of learners through the teaching and learning process (Wilson, Floden & Ferrini-Mundy, 2002). To Darling-Hammond (1998) states teachers’ knowledge and the applications thereof, are key to teaching and learning. These statements were probably what Vuyo and Carol had in mind when they commented as follows on PCK:

Vuyo: *I am adequately qualified to teach life sciences. I have a good understanding and grasp of life sciences subject matter. I am aware that PCK stands central in effectively teaching life sciences. My view is that effective teaching is dependent on adequate PCK. Learner success is dependent on PCK.*

Carol: *I would not say that I possess deep content knowledge, but I am confident with the subject matter. As a teacher, teaching life sciences, you need to demonstrate PCK. My level of content knowledge assisted me in teaching life sciences. For learners to attain, teachers need to have good PCK.*

Research by Hill, Rowan and Ball (2005) concur with this world view that teachers' knowledge of subject content can positively influence student performance in mathematics and science. Similarly, researchers interpret that students' comprehension of the subject matters can be attributed to the difficulties teachers have with regards to their experience with the subject content, suggesting that the majority of teachers have little PCK experiences (Reading & Shaughnessy, 2000). The importance of the previous studies has a commonality to the work of Shulman (1986, 1987a, 1987b). Shulman (1987) indicate seven types of teacher knowledge:

- 
- Knowledge of the subject;
  - Content knowledge in general;
  - Curriculum knowledge;
  - Pedagogical content knowledge (PCK);
  - Characteristics and traits of learners and their knowledge;
  - Knowledge of educational settings; and
  - Educational knowledge.

Dawid corroborated what is stated by Shulman about having PCK. He commented as follows in the interview:

Dawid: *While I agree that PCK is needed in teaching life sciences. It is also my view that you need to understand and have the skills to deal with difficult concepts in the subject. You might possess deep content knowledge but have no idea to transfer that knowledge to your learners in the class. You must understand the context and milieu of the school.*

As an expert on PCK, Shulman states that teachers often target certain skills with their assessment (e.g., finding the arithmetic mean from a variety of data sets and contexts); these inquiries should be grounded in the “applications of pedagogy to specific subject areas” (Shulman, 1987). The

importance of PCK is highlighted in *The Professional Standards for Teaching Mathematics* (NCTM, 1991), which suggests that PCK is an important aspect and that teachers must improve their knowledge of the subject, subject concepts, procedures and finding a way of joining it to form relationships. Establishing these relationships is the focal point of PCK (Tirosh, 2000; Watson, 2001). CAPS for life sciences requires specific subject matter knowledge by teachers for the successful implementation and that teachers need to comprehend the content (specific subject terminology) and also have the necessary skills to enable the implementation of the FET life sciences curriculum effectively. The responses of teachers on PCK are in line with what has been stated in the literature.

*Brady: My name is Brady. My view is that it is imperative to have the required content knowledge to teach life sciences. My PCK helps me to expose the learners' misunderstanding of concepts. My subject knowledge assisted me in giving the correct explanation and also to deal with learners' misconceptions.*

*Neill: I am of the viewpoint that to be effective, I need to display knowledge (content knowledge) to probe learners with regard to assessing whether they understood my lesson.*

As in earlier studies (e.g., Darling-Hammond, 1998; Shulman, 1987; Wilson, Floden & Ferrini-Mundy, 2002), this study found, that teachers with considerable pedagogical content knowledge (PCK) tend to produce learners with higher academic achievement than those less endowed. All in the interview supported the same view. The data from the document analysis revealed that there is an alignment with the themes that emerged with the interviews. Virtually all the participants were in agreement that the curriculum intended to promote social justice and transformation, knowledge and skills, ESD, PCK as well as the indigenous knowledge systems of teachers. Although they feel that the curriculum wants teachers to integrate ESD activities into the life sciences curriculum and care for the environment, they were not sure how to infuse ESD in the curriculum. Latourelle et al. (2012) argue that the curriculum should enable teachers to connect socially relevant issues to the subject matter when teaching and learning take place. When Mnguni (2011) analysed the South African life sciences curriculum, he also found that the content in the life sciences curriculum does not support the learning outcomes which give rise to the application for knowledge or behavioural changes. Equally, Jansen (2012) takes issue with a curriculum that does not provide learners with the necessary knowledge and skills that they can apply in their professional careers.



## 5.7 Discussion based on research question 2 (RSQ 2)

*Research Question 2: What pedagogic strategies did teachers use to implement CAPS in their classrooms?*

This section gives an account of the data gathered from observing the lessons that were conducted by five of the 25 participating teachers in the study. The objective of the observation of the lessons was to see what strategies teachers used when implementing the curriculum. The lessons observed consisted mainly of one lesson per participant. The teaching method that was mainly employed was chalk-and-talk. From the observations of the lessons, some commonalities were particularly critical to how the life sciences curriculum was implemented. It was that all teachers have in their possession the documents necessary for the implementation of the life sciences curriculum. The following observations were made:

Participants in this study as part of their experience when implementing the curriculum, regardless of their teaching years' experience of teaching life sciences, stated that they virtually have no challenge to implement the life sciences curriculum and have access to all the policy documents of the curriculum either as a hard copy or in electronic format. However, it is their general view that they barely look at the other documents, except for the CAPS for life sciences policy document. There was consensus among the participants who strongly agreed that, although they do not have all the resources available to implement the life sciences curriculum, they nevertheless implement the curriculum because the learners will benefit from the curriculum. As one participant stated:

*As teachers, we must be flexible and adapt to the situation.*

This study suggested that the participants have a clear comprehension of the implemented CAPS Grade 12 life sciences curriculum and take responsibility for implementing the life sciences curriculum. The interpretation of the data suggests that the schools in this study lacked resources to effectively implement the curriculum, teachers take it upon themselves to make it work; thus, impacting negatively on the implementation; therefore, there is a general concern about the quality of teaching and learning in previously disadvantaged schools. They reiterated the narrative that the curriculum is important to them despite the difficulty they seemed to face in terms of resources.

The participants believed that they had no real problems in implementing the life sciences curriculum and were sure about the content they needed to teach and the order of the concepts that should be taught. According to the participants the curriculum is clear, specific and prescriptive enough. However, based on my observation, none of the teachers addressed to a great extent the issues raised in the interviews regarding such things as: social justice and transformation; the integration of

science and IKS in the classroom; the advancement of education for sustainable development (ESD). IKS forms an integral part of life sciences CAPS as articulated in Specific Aim 3. Specific Aim 3 relates to the “understanding the applications of life sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between indigenous knowledge and science” (DBE, 2011, p. 11). I also observed that none of the participants used specific strategies when engaging with the implementation of the curriculum.

The integration of IKS in the official curriculum is hailed by Jegede and Aikenhead (1999) as a positive acknowledgement of the contribution made by the indigenous people in the country. In terms of the aspects of life sciences CAPS, a welcome feature of teachers was that all of them conform to the designing of lessons for the observation. Four out of the five teachers (80%) had prepared an informal daily assessment activity for the learners.

It is noteworthy that informal assessment formed an important part of the life sciences curriculum. The observational data suggested that only one out of five (i.e. 20%) of the participants do not comply with curriculum coverage as he is behind in terms of the Annual Teaching Plan (ATP). The participants aligned their teaching methods to where the teacher is the focal point of teaching and learning. Overall, the teaching methods and strategies used by the participants to a large degree reflected a teacher-centered approach.

None of the participants attempted to engage the learners in the lesson. Rather, they merely asked questions throughout the lesson. In my opinion, teachers did not do enough to actively involve the learners in the class. The conventional chalk-and-talk method of teaching was the most dominant form of instruction. In a study by Blignaut, Venter and Stoltz (1998) it was found that the traditional method of talk-and- chalk was not an effective form of instruction. They therefore recommended that other instructional strategies such as cooperative learning where learners benefit both on a personal and social basis should be preferred. Alias (2019) posits that the Chalk and Talk’ is generally associated with the traditional teacher-centred approach where the teacher is doing the talking with no learner participation. To him, this strategy is definitely not the panacea of effective teaching strategies to implement a new curriculum. Jegede (1996) has also noted that a lack of harmony may occur if the teaching strategy is not in sync with the spirit of a science curriculum. The conclusion is that resourcing plays a major role in how CAPS is implemented. Thus, poor resourcing, poor implementation. This appear to be the general trend in many African countries.

## **5.8 Discussion based on research question 3 (RSQ 3)**

*Research Question 3: What were their perceptions of, and experience with CAPS?*

This subsection aims at giving an account of the findings from the questionnaire concerning the teachers' preceptions and experiences with the implementation of the Grade 12 life sciences CAPS. An analysis of the data based on the 24 participants' responses to the questionnaire dealing with this question has resulted in the emergence of the following themes:

### **5.8.1 Themes**

For Braun and Clarke (2006), the analysis of themes is a poorly buffered, often misunderstood, yet broadly utilised qualitative analysis method. A theme zooms into something important about the data for the research question and represents a degree of patterned responses or meaning within the specific data set (Braun & Clarke, 2006). The data from the questionnaires are presented and discussed from the following themes:

- Teachers experiences of implementing the CAPS Grade 12 life sciences curriculum
- Teachers' knowledge and understanding of the CAPS Grade 12 life sciences curriculum
- The implementation process of the CAPS Grade 12 life sciences curriculum
- Policy documents in support of the implementation process
- The implementation of the CAPS Grade 12 life sciences curriculum at the school level
- Planning for the implementation of CAPS Grade 12 life sciences curriculum
- Teachers' perceptions towards the CAPS Grade 12 life sciences curriculum

### **5.8.2 Teachers' experiences of implementing the life sciences curriculum**

The questionnaire items for this section were set up to gauge the experiences of teachers as they implemented the curriculum. This study was driven largely by the teachers' lived experiences as they attempted to implement CAPS. Based on their experiences, the participants believed that they actively implemented the curriculum and addressed as much as possible the challenges that arose in the course of the implementation process. In other words, they perceived a positive link between the curriculum and the knowledge they possessed. Despite this, they indicated that they were initially not favourably disposed to the new curriculum. As explained before they were not properly consulted before the new curriculum was implemented. Even the crash workshops organized to acquaint them with the new curriculum in their view were inadequate.

### **5.8.3 Teachers' understanding of the life sciences curriculum**

Determining teachers' understanding and knowledge of the curriculum was important to me for two reasons. Firstly, I wanted to determine how the participants' knowledge and understanding of the

curriculum might have informed the way they implemented the curriculum. Secondly, I wanted to know how they conceptualised the curriculum. Based on their answers to this section of the questionnaire, it could be assumed that the participants had considerable understanding of the curriculum. There were strong similarities in the way they responded to the items in terms of their perceptions of the values associated with the new curriculum. However, in the absence of adequate consultation and training it should be predictable what the outcome was likely to be. This is because better prepared and equipped teachers are more likely to support a curriculum that coincides with both their intellectual and professional interests. In other words, being knowledgeable about the curriculum would have reduced their anxiety as well as enhanced their willingness to implement it in their classrooms.

In this study, the comprehension of life sciences refers to the general aims and subject-specific aims of the curriculum and the awareness of the teaching support material, teaching strategies and objectives of the curriculum. A teacher who knows and understands the curriculum is likely to develop an epistemic appreciation of his/her limitations and possibilities. The implication of curriculum comprehension is that learners will be assisted to appreciate the subject, something that is crucial for the development of science education. Drawing on the previous discussion, one can conclude that, in contrast to the finding of some researchers (e.g. Miller, 2008; Pieterse, 2004) who claimed that there is a disjuncture between policy and practice, this study has found that the Grade 12 life sciences teachers to some degree did understand the curriculum.

#### ***5.8.4 The implementation process of the life sciences curriculum***

Jansen and Fullan (2006) argue that a certain level of training is needed for the effective implementation of a curriculum. The majority of participants surveyed cited a lack of adequate training in implementing the CAPS Grade 12 life sciences curriculum. This finding is in line with the qualitative findings where the participants were of the opinion that they had inadequate training. The challenges highlighted by the participants about the inadequacy of the training corroborate those demonstrated by Fullan and Hargreaves (2010) and Pratt (1994). They argue that training should not be a once-off event but must be continuous. In a similar study, Taylor and Vinjevold (1999) suggested that training on curriculum implementation should be ongoing and structured in the form of workshops and community of practice meetings.

Teachers, key to the implementation process must not be neglected till the very end of that process. Otherwise, they would underperform and consequently their learners would also underperform. In fact, it is like rubbing pepper on the wound if teachers are again blamed for the poor results as discussed earlier relative to the five teachers that were interviewed in the study. The fluctuation

matric results when CAPS was implemented (2011- 2018), regardless of the participants' teaching experience, vividly illustrate the importance of the preparation and training of teachers as critical to curriculum implementation. As Taylor and Vinjevold (1999) have suggested, the training of prospective teachers and the in-service training of practising teachers cannot be regarded as a once-off endeavour. It must be part and parcel of the curriculum development and implementation process.

#### ***5.8.5 Policy documents in support of the implementation process***

This research demonstrates that there is a correlation between the availability of policy documents and the effective implementation of the CAPS Grade 12 life sciences curriculum. The literature suggests that the availability of policy documents should be a priority to ensure the effective implementation of the curriculum. Effective implementation of the curriculum impacts on the outcomes of the curriculum. Differently put, policy documents are a must have for teachers and not just a nice-to-have set of materials to be placed on the shelf. The effective implementation of any curriculum depends on the availability of policy documents that dictate how the curriculum should be implemented. Findings in the study are consistent with results regarding a study of teachers' perceptions of the implementation of the CAPS by Ramabula (2017) who found policy documents to be critical for the successful implementation of the curriculum.

#### ***5.8.6 The implementation of the life sciences curriculum at school level***

Internationally, there is a rich repository of studies investigating the implementation of new curricula (e.g. Fullan, 1991; Fullan & Hargreaves, 1992), but there is limited literature on how it has been done in the context of South Africa (Kriek & Basson, 2008; Ogunniyi, 2004, 2011; Rogan & Grayson, 2003). It is very difficult for teachers who are not used to implementing a new curriculum and who did not receive proper orientation and training. Given the thread in the foregoing, curriculum implementation at the school level in this study can be cautiously explained in the following manner. While on the one hand it can be said that the majority of the participants successfully implemented the curriculum, they neither attended the subject meetings nor had sufficient monitoring of the implementation process by their heads of department on the other hand. I am in agreement with Mellville, Hardy and Bartley (2011) who argue that the majority of science teachers struggle to adapt to new strategies associated with curriculum implementation because they are faced with a plethora of challenges. Some of such challenges include:

- a) A limited conception of the science curriculum, which in essence affect their teaching ability.
- b) Teachers' lack deep content knowledge.

- c) Some teachers possess restricted exposure and experience with the new curriculum (Koopman, 2013).

To make sense of this phenomenon is what Østergaard et al. (2008) refer to as the concept of the perceptual life-world that provides insight into why the participants responded the way they did. In other words, the teachers appeared to be satisfied with how the curriculum has been implemented. They seemed to gain a feeling of recognition through their contribution to the curriculum. The aforementioned is indicative of the important role that teachers play in implementing a new curriculum as the core agents in the implementation process (Koopman, 2013).

### ***5.8.7 Planning for the implementation of CAPS***

Although most of the teachers appeared to be very optimistic about planning for CAPS life sciences, they also concurred that planning was important to increase the quality of the outcome of the curriculum implementation process. The findings seemed to suggest that most of them were of the view that planning is at the heart of effective curriculum delivery and implementation. A concerning observation in this regard however, was that most of the the participants preferred planning individually than planning in groups. At the same time, they indicated that they needed assistance, including access to resources in the planning process. Despite this I observed that the teachers I observed had lesson plans and followed this systematically in their instructional practice.

The literature suggests that planning is a creative process that allows teachers to synthesise an understanding of teaching pedagogy, with knowledge about our subject, learners, the curriculum and teaching content. Jensen (2001) asserted that there are several planning benefits. First, planning produces more unified lessons; and second, it allows teachers to think deliberately about lesson objectives, the type of activities for the learners to be used in class and that will meet the lesson objectives, the sequence of those activities, the materials needed and how long each activity will take. His view is in agreement with what Hammon (2000), Seberian, Aghajani and Ghorbani (2003) and Momennasab and Tab (2002) found in their study that their subjects agreed that planning lesson were as important as teaching methods, educational aids and methods of assessment.

### ***5.8.8 Teachers' perceptions of the life sciences curriculum***

While the majority of the participants in the study had negative attitudes toward the implemented Grade 12 life sciences CAPS at the initial stage, the participants, especially those interviewed, had begun to see its relevance to the new South African society. Their initial negative attitudes towards the curriculum were based on their experiences at the time in terms of such things as: the inadequate training they had at the time of its implementation; the frequent curriculum revisions that took place

within a short period of time; the lack of consultation between the curriculum planners and the teachers who were supposed to implement it; the inadequate instructional resources; and so on. Therefore, what emerged from this unsavoury situation was the teachers' consciousness about the raw deal meted to them by the curriculum planners; and this ultimately shaped their attitudes towards the curriculum and the way they enacted it in their classrooms. This scenario prepared the proper setting for a philosophical or phenomenological research approach with its characteristic reflexivity. In recent years, there has been a movement towards phenomenological research in South Africa, with an emphasis on involving teachers towards the implementation of the science curriculum. A doctoral study that investigated physical science teachers' experiences in implementing a new curriculum was conducted by Koopman (2013) using a phenomenological approach. Koopman (2013) used phenomenology both as a theory and method and through its application as a data construction method to explicate the data. Jacobs et al. (2004) note that, notwithstanding the poor training teachers received in preparation for the curriculum implementation process, teachers inadvertently displayed signs of confusion and struggle to implement the curriculum.

Apart from the negative perceptions of the participants about the new curriculum at the initial stage, positive perceptions have begun to emerge among many of them about the new curriculum. Such positive perceptions are a good omen which can act as a stimulus that could encourage other life sciences teachers to reconsider their view about the curriculum. In other words, as teachers take more time to understand what the new curriculum is all about and explore the ideas more, they are likely to make sense of it than would have otherwise been the case. As stated earlier, teachers tend to teach what they value and understand.

## **5.9 Discussion based on research question 4 (RSQ 4)**

*Research Question 4: What relationship exist between the teachers' demographic characteristics and their learners' academic achievement?*

The objective of this sub-section is to compare the results at the national, provincial and district level. In addition, it aims to explore what the outcomes of the implemented life sciences curriculum were. Schools are evaluated according to their NSC examination results. It is thus important to uncover these relationships in order to understand what the outcomes of the implemented CAPS are. It is thus also important to see if high examination scores are indicative of the effectiveness of the curriculum implementation process.

The examination results were obtained from the Northern Cape Department of Education (DoE), Directorate: Examination and Assessment. The examination scores in the Grade 12 life sciences for the period 2011–2013, before the implementation of CAPS, and for the period of 2014–2018, after the implementation of CAPS, were compared. Comparative data about the examination results of the subject life sciences for the period 2011–2018 were therefore collected. Appendix P provides a summary of learner performances in the NSC examination (the final and exit examination in the FET phase). This research paid particular attention to four selected schools in the Pixley ka Seme District. The examination results must be seen as indicative of how both the old and new curriculum was implemented. To a large extent, examination results were and still are a measurement of a school's functionality and success.

### ***5.9.1 Results at the national, provincial and district level***

The number of candidates for life sciences increased to 73.23% in comparison to 2017. The general performance of candidates increased in 2018 as indicated by 76.3% of candidates achieving 30% and above and 46% achieving 40% and above. The national examination results showed in Appendix P were characterised by high examination scores nationally. The debate surrounding accepting marks below 50%, though important is beyond the scope of this study. Notwithstanding the fact that there is no correspondence between the national and the provincial results, it can be seen that the average examination scores of 75% achieved at the national level is higher than the below 69% achieved at the provincial level. Additionally, the average score for the district over the eight years is below 75% (Appendix P).

Furthermore, it is noted that since the inception of CAPS for life sciences, the results for 2018 were the highest at the national level while the district recorded its lowest score ever at a mere 56.5%. It is evident that, nationally, the results are far better than at the provincial and district levels. An examination of the scores at the national, provincial and district levels ), it is clear that, on a national level with an average score of 75%, the measurable performance of the examinations is positive and indicative of the successful implementation of the CAPS Grade 12 life sciences curriculum, while invariably, at a provincial and district level in the Northern Cape, the performance of learners is less favourable, which indicates the ineffectiveness of the implementation of the curriculum.

According to Umalusi (Council for Quality Assurance), the reason why life sciences performed poorly at a district level can be attributed to the challenges such as the new content in life sciences and the compliance with CAPS guidelines. Notwithstanding the above, there is a clear indication that the increase of the results for 2018 in life sciences that the system is gradually improving and is



evidence of a maturing system since the introduction of CAPS four years ago. Interestingly, the learner performances of life sciences had moved closer to the average historical performance profile of the province.

The high examination scores on a national level can be attributed to the interventions and improved strategies implemented by both national and provincial departments for learners. The improvement of results can thus be attributed to a maturing of CAPS-aligned curriculum over a period of four years that had begun to strengthen. Following the analysis of the examination scores, the findings in this subsection showed that there were positive learner outcomes and performance in the life sciences. In the next subsection, the results of three years before the implementation of CAPS are discussed.

### ***5.9.2 Results of three years before the implementation of CAPS***

Data about the examination scores of life sciences of selected schools of three years before the implementation of CAPS for life sciences was collected from the DoE for the year 2011–2013. For the examination scores, see Appendix P 2011, 2012 and 2013 were the last years in which the old NSC life sciences curriculum was taught. In 2013, learners had to study very hard because the repetition of the old curriculum was no longer possible. All learners from 2014 onwards had to follow the new implemented life sciences curriculum. This is the reason for the partial improvement of results in 2011 and 2012 in schools' B and C. It is not surprising that learners scored more in the NSC for the stated period. The decreasing tendency of the results for School C and School D, with an increasing tendency in School A, showed the worsening of results under the old life sciences curriculum. This may be caused by the scientific character of the subject and the unpopularity of science subjects in schools. The poor results can also be attributed to the poor scientific preparation of scientific skills of learners. Therefore, the lack of sufficient preparation of life sciences knowledge can be translated into poor performances under the old curriculum.

Teaching life sciences with insufficient life sciences/biology background has predictable results, namely poor teaching and frustrated learners, leading to poor examination results in life sciences. The worsening of examination scores in life sciences cannot only be attributed to teachers with insufficient life sciences knowledge but could partially correspond with the methods teachers use in classrooms. As discussed earlier, both teachers' content knowledge as well as their pedagogical content knowledge are critical to learners' overall performance not only in the life sciences but virtually in all school subjects.

All the five participants observed in this study made use of the traditional method of teaching and did not use more innovative ways of teaching. Partly, it can also be attributed to the traditional perception of learners who take the easiest way in a learning process. This means that learners are satisfied with the least results. This is a phenomenon that is prevalent in rural schools where learners have no hope of studying any further beyond Grade 12; they adjust their study efforts to only pass the examinations, not realising that this path of mediocrity is not the most satisfactory and is detrimental to their prospects. Such student behaviour was confirmed by a study with engineering students (Kolari et al., 2008), which showed that students are less concerned with excelling in their education and use less time studying than was allocated to them in the curriculum. Analysis of the examination scores before the implementation shows a slight increase in 2011. Very disturbing is the drop in results in 2012. From the examination scores data sets, it is clear that learners performed far better under the new CAPS-aligned curriculum than under the old life sciences curriculum.

### ***5.9.3 Results of five years after the implementation of CAPS***

This study indicates that teachers at School A and School B were happy with the outcomes of the examination results. They were also satisfied with the success rate and the ratio of the number of successful life sciences students. Their counterparts in School C and School D were less satisfied and felt a lot needed to be done to improve the examination results for life sciences. The findings of the outcomes of the examination results indicate that the results improved after the implementation of the life sciences curriculum in two schools, whereas the results in the other two schools remained below the 60% margin. Research results suggested a rather ambiguous relation between the results of the district and the school. Although there seems to be consensus that, with the implementation of the life sciences curriculum, examination scores improved, this general notion is not supported by empirical evidence.

When applied to the potential of the implementation of the life sciences curriculum, we should ask ourselves whether the implementation of the life sciences curriculum in schools in the district and the province reports on improved examinations scores. If compared, the results of the selected schools over the period after the implementation of the life sciences curriculum, is not a realistic scenario. In essence, when one compares the results of the schools' examination scores, teachers tend to have different views on the reasons for the examination scores. The big question one needs to ask is if teachers accept the examination results as their own and as a valid representation of the life sciences curriculum they daily deliver in class. In theory, the data collected could lead to changes in teachers' sequence of the life sciences curriculum they teach or to their teaching methods. It could also lead to teachers investigating their own teaching practices with a view of improving it to improve the life

sciences examination results in schools. Self-reflection on one's teaching practices could bring the realisation that certain teaching practices are characterised as passive and out-dated in the ever-changing educational environment.

No matter how difficult it is, change seems an unavoidable aspect for teachers. It is difficult to relate the outcomes of examination scores to the new curriculum, but I am convinced that the effective/poor implementation of the life sciences curriculum has partially contributed to examination scores. An interesting feature of the results is the marginal differences in performance across the four schools. For example, Schools C and D had the lowest scores/results and two schools with the same geographical and socio-economic context A and B had better results over the same period 2011–2018. The only conclusion one can draw from these findings is that the implementation of the life sciences curriculum was poor in Schools C and D. It is evident from the data that the results of schools are not stabilising or there is no consistency in their performance over the years.

#### ***5.9.4 National Senior Certificate (NSC) results as an indicator of success in schools***

NSC results reflect the perceptions of the standard of education. Its impact is a reflection of the trust or mistrust parents and stakeholders have in education standards. Therefore, the NSC results had become the benchmark against which the functionality of a school is measured and also serves as a benchmark of reliability. NSC passes open doors for entrance to universities and it correlates with the ranking of schools (Motala, 2005). The government uses NSC results as a barometer of the state of the school system. Jonathan Jansen, a prominent commentator on education, argues that other data revealed that South Africa has been stagnating. The non-governmental organisation, Equal Education, said that the annual NSC pass rate is misleading and does not provide the full picture of the overall performance of the education system. It further argues that NSC results are a superficial barometer of the schooling system in South Africa.

Equal Education posits that when NSC results are released, the DBE does not take into account the high dropout rate of learners. The DBE claimed that the matric pass rate has consistently been above 70% over the past four years and that it is increasing, but in contrast to the claim of the DBE, the throughput rate suggests that the pass rate has been declining if one takes into account how many learners who started Grade one some 12 years ago did not finish Grade 12. According to the DoE (2015), the NSC results alone are not a good measure of academic performance in the school system.

My contention is that the NSC results are not an effective barometer for assessing the state of education in South Africa if one had to look at the great disparities that exist between township schools and the more affluent suburban schools. Nic Spaull (2013), suggested that when it comes to

assessing the state of education in South Africa, there are better indicators for measuring the education system than the NSC results, such as the South African Consortium for Monitoring Education Quality. Soudien, a Professor at the University of Cape Town, made a similar point. It is not about the NSC results but rather about what the matric certificate means (Davies, 2018). Minister of Basic Education, Angie Motshekga (2018), asserted that the NSC examination results are one of the most important barometers for evaluating progress made by the government in improving access and redressing and improving quality of teaching and learning outcomes.

With regards to demographic variables of teachers, findings of this study revealed that academic, gender, age, teaching experience, years of teaching, designation, qualifications and type of school had no significant influence on the outcomes of the curriculum. This means that, irrespective of academic qualification, educators' experiences of the curriculum are the same. These findings concur with those of Alexander et al. (2010) who said that results and outcomes are not measurable against the quality of education. Ismail (2010) suggests that teachers with lower qualifications have lower levels of commitment compared to teachers with higher qualifications. However, these findings are not in line with that of Maphalala (2006), who revealed that unqualified teachers and highly qualified teachers reported a positive experience and outcome of implementing the National Curriculum Statement in the GET band.

### **5.10 Chapter summary**

This chapter reported on the main findings derived from the interviews, observations, questionnaires, document analysis and results analysis among teachers in the Pixley ka Seme District, in the Northern Cape Province. It also presents an analysis of research findings based on the research questions in Chapter 1 of the study.

Research question 1 deals with the teachers' understanding of the basic intention of CAPS. Virtually all the teachers (i.e. those interviewed as well as those who filled the questionnaire) indicated that they were coerced to implement the new curriculum. Most of them talked about their unpreparedness to implement the new curriculum. For instance, they had not been adequately exposed to new instructional strategies required to teach CAPS, they lacked adequate instructional resources and administrative support both at the school level and the Department of Basic Education level. For the same reason, they did not have much time to undertake reflection-in action i. e. doing things with immediate insight (Schons, 1987).

Bereft of necessary innovative instructional strategies, the teachers mobilized mainly the teacher-centred traditional instructional strategy of chalk- and-talk contrary to what the new curriculum

demanded. Instead of being confident to enact the new curriculum, they were continuously placed in a precarious condition of uncertainty as they attempted to navigate the structural and policy tensions. But finding not much consolation as they oscillated between the old and new curricular reforms, the teachers pragmatically regarded the whole encounter with the CAPS curriculum as a sort of learning experience or what Schon (1987) would call experimentation.

Of course, the teachers' experiences with the CAPS curriculum should not be considered entirely in a negative way because tensions or conflicts could create new opportunities for innovation, creativity and even adaptation to new learning experiences. Another positive outcome could be to create teachers' awareness about the need for social justice and transformation than was the case during the apartheid era. In the latter, the focus was racial segregation contrary to what is need in the current emerging multicultural classrooms- a situation which compels teachers to become agents of social justice and transformation. In other words, teachers cannot shy away from using instructional strategies that give all learners equal chances of success regardless of their socioeconomic backgrounds. In addition, the new curriculum could make teachers to become more aware about the goal of education for sustainable development (ESD) and their role as social agents to make this goal a reality than was previously the case.

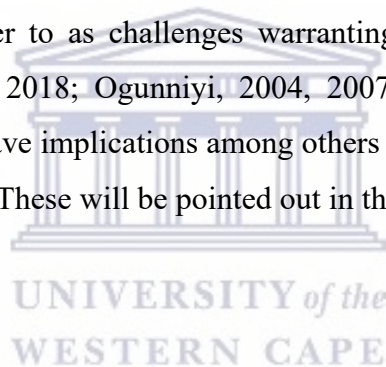
Question 2 deals with the pedagogical strategies that the teachers needed to implement the CAPS curriculum. As indicted under question 1 above, the teachers were not well prepared to implement the new curriculum. Apart from not being involved in the curriculum planning process, they were neither thoroughly familiar with the idealization of the CAPS curriculum nor how to implement it in their classrooms. Even the hurriedly organized curriculum workshops and the frequent curriculum revisions which took place afterwards, seemed to confuse most of the teachers rather than help them to fulfil their professional mandate. This is because a considerable percentage of the trainers themselves were also not thoroughly familiar with the demands of the new curriculum.

Question 3 deals with the perceptions and the experiences of the teachers with the implementation of the CAPS curriculum. As indicated under question 2, the teachers had limited conceptions about the new curriculum before they were saddled with the implementation process. Apart from the teachers' limited exposure to the new curriculum, many of them lacked deep subject content knowledge (SCK) while the majority lacked the pedagogical content knowledge (PCK). Since they were largely excluded from the curriculum planning process, they were left to their own devices, so to speak, as far as the implementation of the curriculum was concerned. Even with the best human intentions, it should not be a surprise why many of them were initially not favourably disposed to the new curriculum. Despite high spending on education and teachers, the quality of teachers remain poor and

most lack deep content knowledge and pedagogical skills to teach the subjects they are currently teaching (Jonas, 2019). It can be argued that the system lack in the area of teacher development.

Question 4 is concerned with possible relationships between the teachers' demographic characteristics and learners' academic achievement since the implementation of the CAPS curriculum. An analysis of the national matric results between 2011 and 2013 and between 2014 and 2018 showed some sort of fluctuations from year to year which could not be attributed to solely by the teacher factor. What seemed obvious at this exploratory stage is that the various anomalies mentioned under questions 1-3 and the responses of the teachers both to the questionnaire and the interview probably contributed to the unclarity of the situation. Certainly, this would require a deeper in-depth investigation in the future than is presently possible in this study.

Although the findings discussed in this chapter are not intended to be generalised to other teachers or school districts, nevertheless, certain deductions could be made about the implementation of the life sciences curriculum. For instance, the findings suggest some gaps in the implementation process which earlier studies probably refer to as challenges warranting a closer attention (e.g. Diwu & Ogunniyi, 2012; Koopman, 2013, 2018; Ogunniyi, 2004, 2007a & b, 2011). The findings also provide additional insights which have implications among others for teacher preparation, curriculum planning and instructional practice. These will be pointed out in the next chapter.



## CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

### 6.1 Introduction

The study, based on a phenomenological framework as espoused by Schön, explored life sciences teachers' lived experiences as they implemented the curriculum. Using a questionnaire, relevant data were gathered from 24 life sciences teachers. This was followed by interviews with selected five teachers from the 24 teachers to collect more data to gain a deeper insight into teachers lived-experiences. For ease of reference, the data were analyzed to answer the four research questions. Having analyzed the data derived from the interviews, observations, questionnaires, document analysis and result analysis a brief summary of the findings were given towards the end of chapter 6. Moreover, this study highlights some pertinent issues which necessitate further research.

In this chapter, the study is concluded by referring to the different sections of the study. Section 6.1 gives an introduction to this concluding chapter. In section 6.2, critical reflections and methodological considerations is discussed while section 6.3, highlight the key findings of the study. Section 6.4 reflects on the implications of the study. Section 6.5 suggests possible contributions the study may have contributed to knowledge in the area. Section 6.6 focuses on the limitations of the study, Section 6.7 deals with why the study primarily makes use of only five teachers. This is followed by suggestions for future studies in Section 6.8. Section 6.9 reflects on the general recommendations based on the finding in the study while section 6.10 is the chapter summary. As stated in Chapter 1, the study sought answers to the following questions:

- d) (a) To what extent did the life sciences teachers understand the basic intention of CAPS?
- e) (b) What pedagogic strategies did they use to implement CAPS in their classrooms?
- f) (c) What were their perceptions of, and experiences with CAPS?
- g) (d) What relationships exist between the teachers' demographic characteristics and their learners' academic achievement?

### 6.2 Critical reflections and methodological considerations

Schön (1987), a scholar and philosopher on “reflection practice” and reflective education, has a bilateral way of explaining reflections, namely reflection-in-action and reflection-on-action. Reflection-on-action is looking back after the event, while reflection-in-action occurs during the event. Both parts of reflection are important but for the purpose of this study, I will only focus on reflection-in-action as it plays a leading role in providing better insights into teachers' experiences of implementing the CAPS Grade 12 life sciences curriculum.

In this context, reflective practice implies that teachers had reflected and shared their experiences of implementing the CAPS Grade 12 life sciences curriculum in the light of how and what strategies they used to implement the curriculum. Reflection inevitably is necessary in equipping teachers with skills and teaching strategies and relating to the implementation of the Curriculum and Assessment Policy Statements (CAPS). When teachers reflect on the implementation process of the curriculum, it enables them to think about what, how and why they implement the curriculum. It is against this background that Schön's (1987) phenomenological reflection-in-action theoretical framework was used in this study, and it had a crucial role to play in the implementation of the CAPS Grade 12 life sciences curriculum. The life sciences curriculum (DBE, 2011), through the assessment process, also endorses the reflection process since teachers need to develop reflective competencies to "assist teachers, parents and other stakeholders in making decisions about the learning process and the progress of the learners" (DBE, 2011, p. 68).

By its nature, lived experiences and narratives are sensitive and personal (Given, 2008). In this case, the life sciences teachers' narratives and experiences are worthy of close consideration. For this reason, it was necessary to employ a methodology that recognises the sensitivity. Because I was known to all of the participants, and being a life sciences teacher myself conducting this study, I was aware of the culture and environment in which teachers operate. Despite this, I tried as much as possible to avoid any form of subjectivity by making the interviews as natural and as relaxed as possible. As such, the participants were in a relaxed mood to offer opinions freely without feeling any form of threat (Dillon, Madden, & Firtle, 1994).

### **6.3 Key findings of the study**

From this study, it is clear that the contextualised challenges faced by teachers in schools have a direct bearing on the ability of teachers in implementing the new curriculum and how they view their role in implementing the curriculum. The key findings of the study are largely based on the four research questions that guided the study. Empirical phenomenological research entails a return to embodied, experiential meanings aimed at newer complex, rich and more insightful explication of a phenomenon as it is experienced or lived by social actors (teachers) (Giorgi, 1997; Finlay, 2009).

#### **6.3.1 Research Question 1**

Research Question 1: To what extent did life sciences teachers understand the basic intention of CAPS?

A good way to address the first research question was to document the experiences of the participants in this study. These experiences were put in context to develop a better understanding of



the participants' daily experiences of implementing the CAPS Grade 12 life sciences curriculum. Phenomenology, as used in this study, has its roots in existential philosophy where the fundamental principle is that man, in a generic sense, is viewed in relation to his world. Hence, teachers involved in the study were viewed in relation to the classroom where they implemented the CAPS life sciences curriculum. Existential philosophy looks at the person in context and sees people as being contextualised (Valle, King & Halle, 1979).

Applying this principle through phenomenological methodology allows me to view the participants in relation to their teaching world. The relationship between participants in this study and the world they inhabited was exposed through their description of their lived experience in their own words and from their own perspective (Bricker, 2009). The description given by the participants indicated that, in developing the CAPS Grade 12 life sciences curriculum, the Department of Basic Education (DBE) had restructured the curriculum, with the basic intent to provide the end user namely, teachers an opportunity to include IK, to acknowledge the rich history of the country as an important contributor to nurturing the values contained in the Constitution of the country. Of critical importance, in relation to this basic intention of the curriculum, was social transformation of the life sciences curriculum. As stated earlier, the life sciences curriculum hopes to ascertain that the educational imbalances of the past are redressed.

Furthermore, the intention of the CAPS Grade 12 life sciences curriculum was to address environmental and sustainability concerns. The issue of environmental organization has been addressed by the Constitution of South Africa consisting of a framework that interlocked and ensure the right to an environment that will not harm the health and wellbeing of citizens (de Sousa; Richter; Raath, 2017). The current literature base emphasizes the cross curricular approach of education for sustainable development (ESD) and environmental issues. The South African Department of Education promotes environmental value education as a cross curriculum approach that needs to be accommodated in all subjects offered at schools including the sciences (Raath & Hay, 2016).

### **The participants' complaints about the implementation of CAPS**

Teachers in this study expressed their deep-seated dissatisfaction with what were being taught and how it was taught. Teachers were critical of the curriculum as a whole and felt that it did not make provision for transformation. Further, they argued that almost three decades after attaining democracy, there still has not been a focus on transforming the life sciences curriculum. In part, teachers felt alienated because some of topics such as evolution are foreign to them as teachers. The task of curriculum developers has been to implement a curriculum that enables learners to have what Morrow (1993) termed epistemological access to life sciences.

With the foregoing, it seems that the goal of the life sciences curriculum should be on inducting learners into the African ways of life as well as knowing what could contribute towards measurable academic performance. However, in reality the current life sciences curriculum is solely concerned with promoting learners' scientific knowledge and skills. This narrative finds expression in the life sciences CAPS policy document asserting that: "The National Curriculum Statement Grade R–12 acknowledges the knowledge, skills and values worth learning in South African classrooms. This curriculum aims to ensure that children acquire knowledge and skills that are meaningful to their lives" (DBE, 2011, p2).

According to the participants, the curriculum envisages learners as partners in education, connected to the world they live in. It could be said that the learners were existentially dependent on the life sciences curriculum to attain this aim. They were thus dependent on external factors in their world for connecting them with the rest of the world. These factors include: individuals; the Internet; teachers; different curricula; textbooks and resources in the school (world); and the virtual classroom. These factors are not independent of one another; rather, they are interrelated and collectively responsible for the learners' schooling development trajectory from primary school to high school. In analysing the intention of the life sciences curriculum, it is evident that it was developed in such a way that it responded to the needs of teachers and learners in many previously disadvantaged schools. It supports teachers to build PCK. Teachers and their content knowledge are and have always been the primary locus of schooling systems around the world (Spaull, 2013b).

The curriculum also intends to help life sciences teachers in particular to deepen their PCK. The life sciences policy document introduces the background and overview sections and provides the general aims of the curriculum. The commitment to progression from grade to grade and the development of more complex knowledge is highlighted. A key aim of the CAPS policy document was to provide more specific guidance for teachers. The idea of having a single document for life sciences covering curriculum and assessment issues is welcomed. The document also serves as a work schedule and an annual teaching plan (ATP), as the weeks are indicated. This is useful in helping teachers to stay on track. The curriculum indicates the required practical work that serves to create awareness and encourages the use of practical work in teaching. It is hoped, however, that teachers will integrate the practical work into the teaching and learning process.

### **6.3.2 Research Question 2**

Research Question 2: What pedagogic strategies did they use to implement CAPS in their classrooms?

I gave an account of what was observed during the on-site visits to the five teachers in the four schools. The NCS (CAPS) outlined what is to be learned and what is meant to happen in the classroom. But how does the CAPS Grade 12 life sciences curriculum take place in practice? Teachers are furnished with the CAPS documents. However, the selections that teachers make in implementing the life sciences curriculum may be quite far from what the CAPS curriculum intended.

Teachers unavoidably interpreted the curriculum according to their own knowledge, experiences and individual preferences. How teachers implemented the curriculum may rely on the resources available to them. If teachers are concerned about learners' needs, they may adapt the curriculum according to their needs. Teachers were expected to follow curriculum prescriptions required for curriculum implementation. Teachers interpreted the curriculum both consciously and unconsciously. For instance, they might unconsciously decide that the curriculum is not designed in a sound manner and so adapt it to improve it. They might also consciously resist implementing the new curriculum because they feel demoralised because of a lack of resources in the school.

Besides, curricula are often reinterpreted unconsciously by teachers. In other words, they may feel uncomfortable with new approaches and so carry on using old familiar and traditional approaches. Experience and knowledge of the subject matter also influence how teachers use a curriculum document. Teachers might, through having taught for many years or having learned about different teaching approaches, be in a position to come up with different ideas and methods that will work well in the classroom but that do not necessarily appear in the official curriculum document.

As indicated in the last chapter, the study indicates that teachers felt under-prepared to use new pedagogical strategies called for by the curriculum and as a result they feel threatened to effectively implement the curriculum. Oswald and De Villiers (2013) assert that new approaches to teaching and learning should be the cornerstone of the CAPS curriculum. Contrary to expectation, the participants depended on the use of traditional teaching methods whereby they did most of the talking with no learner participation (Aloovi, 2016; Badugela, 2012; Koopman, 2013).

I made on-site visits to the different research sites to observe lessons that were taught by the participants. During these observations, I observed that teachers displayed a common understanding of the curriculum. Further, I found that the success or otherwise of the implementation of the curriculum by teachers to a large extent depended on their knowledge of the subject matter and planning. In other words, those teachers who did not plan their lessons well inevitably experienced discipline problems in class than those with good lesson plans. Reflecting on what I observed it

became clear to me that well planned lessons of high quality are crucial for successful implementation of the curriculum (Motwani, Subramanian & Gopalakrishna, 2011). As stated earlier, the majority of teachers did not engage their learners in the lessons and did most of the talking. In other words, there was a visible absence of learner dialogue. This is in line with earlier studies suggesting that more often than not, teachers tend to do most of the talking during lessons and that learners have little opportunity to engage in the lesson (Driver et al., 2000; Duschl & Osborne, 2002).

The traditional teaching method accords with the technicist approach of curriculum implementation which makes learners consumers of information and teachers the distributors of knowledge. This is what Aoki describes as a school where the knowledge transfer process is instrumental, and he likened it to Freire's (1968) "banking concept" theory where learners are only receiving, filling and storing knowledge. Teachers become the dispensers of knowledge and information. According to Riffel (2020) teaching methods and classroom practices need to focus on enhancing learners' understanding and performance. The life sciences teachers' files, written lesson plans, planning, preparation, programme of assessment, time tables and Annual Assessment Plans (ATP's) seemed to adhere to the requirements of CAPS documents, assessment and moderation policy. The observation of lessons was done to see how the life sciences curriculum is implemented in the schools. I found that the following two factors in particular made it difficult for life sciences teachers to implement the CAPS curriculum as intended in terms of:

- a lack of the official policy documents to affect the curriculum; and
- a lack of resources for life sciences.

It is clear from the factors above that there is a gap between the intention of the CAPS curriculum and what was implemented in the classrooms. Resources are important in terms of their influence on teaching and a lack thereof and an enduring inequality in the distribution of resources in South African schools, as has been reported in earlier studies, is likely to have a negative impact on the curriculum.

### **6.3.3 Research Question 3**

Question 3: What were their perceptions of, and experiences with CAPS?

In addressing this research question, I used a questionnaire to obtain the participants' perceptions of the Grade 12 life sciences curriculum. The responses are related to the questions based on their experiences in implementing the curriculum. They indicated that they did not receive enough training and support from the district officials to implement the curriculum and as such it was difficult for

them to adjust their practice more easily than was actually the case. Honan (2004) argues that teachers do not easily adjust to a new curriculum because they tend to have a structuralised approach to the curriculum. Despite the inconsistencies in participants' responses however, they were of the view that given necessary support they were capable of implementing the curriculum as well as fulfil the mandate of the policy. The data derived from the questionnaire and the interview corroborates the same view.

The findings of the results revealed that there was a combination of factors that influenced the implementation of the Grade 12 CAPS life sciences curriculum. One was the participants' intrinsic determination to implement the life sciences curriculum. This pointed towards the attainment of the self-actualisation level of Maslow's hierarchy, suggesting a sense of autonomy and self-directedness on their part. Another significant factor seems to be the issue of planning. Planning in this study refers to the planning that the participants needed to do to confidently implement the CAPS life sciences curriculum and the challenges they described with planning high-quality lessons. While they made attempts to adhere strictly to CAPS aims and objectives they seemed to lack necessary strategies to do so. In the same vein, the poor administrative support at the school level in terms of heavy workload certainly exacerbated the challenges faced by the participants in their attempts to implement the new life sciences curriculum.

#### **6.3.4 Research Question 4**

Research Question 4: What relationship exists between teachers' demographic characteristics and their learners' academic achievement?

In answering this research question, I analysed the matric (Grade 12) results of their learners. It is noteworthy that three out of the five participants in the sampled schools which performed well in the NCS examinations held Bachelor degrees and post graduate qualifications (Master's degree) as their highest qualifications. Only two of the 24 teachers who completed the questionnaire held a three-year teacher training diploma as their highest qualifications. This suggests that the schools where the participants taught had a considerable number of well-qualified teachers. In light of this, it could be said that the calibre of teachers who participated in the study had improved considerable compared to what was the case during the apartheid period or even a decade into the new democratic dispensation. In fact, apart from the aforementioned issues relating to poor consultation, inadequate support to schools, the issue of teachers' qualifications did not seem to influence the learners' achievement to a great extent.

The findings, as stated earlier, revealed that learners performed better in the matric examinations than was the case at the provincial level. Indeed, matric results for life sciences seemed to fluctuate between 70% and 75%. Also, it seems that there is a glass ceiling in the performance of life sciences learners who with the implementation of the CAPS, never broke through the 75% margin. After the implementation of CAPS, the results register a steady improvement of above a 70% margin. Comparatively speaking, the results of the Grade 12's (2014–2017) were not dramatically lower than the life sciences results (2011–2013). Although it is difficult to ascribe the improvement of results to teachers or the DoE, it might well be attributed to the effective implementation of the curriculum. However, a more extensive study is called for to gain a clearer picture of the relationships between the teachers' demographic features and learners' performance in the matric examinations.

#### **6.4 Implications of the study**

This study described five life sciences teachers' experiences of implementing the CAPS Grade 12 life sciences curriculum. Where necessary, their experiences were discussed in the context of the 24 participants who filled the questionnaire. Whatever the case, the findings showed that teachers encountered challenges in their attempt to implement the new curriculum. In the section that follows an outline of the implications of the findings is provided.

##### ***6.4.1 The voices of teachers in curriculum implementation - A culture of silence***

Teachers are seldom consulted in the implementation of a new curriculum; and it was no different with the implementation of the CAPS. The teachers were hardly consulted in the planning process. They only got involved when they received some crash training programmes on how to implement the curriculum. In fact, the teachers' comments reinforced what Freire (1972) terms the "culture of silence".

The study was an attempt to break the culture of silence as well as to provide teachers with a voice by highlighting their views, challenges, beliefs, thoughts and emotions about the implementation of the curriculum. Since being a by-product of apartheid education and its strict authoritarian schooling system, teachers still bore the scars of the culture of silence. Their narratives provided me with insights into the realities they faced and self-conversations and arguments they might have had during the implementation process (Ogunniyi, 2007a & b).

It is imperative to comprehend the life sciences teachers' experiences in terms of the experiences they might have shared with the majority of teachers in the province in particular and the country as a whole. In my view, it is not good idea to keep teachers in the dark about their role in the planning and implementation of a new curriculum. Also, simply producing white and green policy papers on

education is not enough. Teachers must get opportunities to make submissions, whether written or verbally on the implementation and development of a new curriculum. Teachers must also be actively involved in writing the curriculum.

#### **6.4.2 *Inadequate training***

Findings in this study reveal that teachers are not happy with the sub-standard quality of training they received in order to implement CAPS. Participants refer to the training as a total waste of time. Furthermore, parts of the training were ambiguous and confusing and their expectations and needs were not met, as indicated by the following words of one participant:

“We were left with greater stress ... those officials who were responsible for the training were even more confused than us”. This suggests that training officials dismally failed in their task to lead teachers to develop greater insight into how to implement the curriculum. This left them feeling unsure about how to orientate themselves positively towards the curriculum. The tensions between being and feeling lost and finding oneself during the training created a dichotomous focus that would have increased their tension.

#### **6.4.3 *Poor resourcing***

Fullan (2007) maintains that transformation can only make a positive impact on a school if there is an ongoing process of preservation of the change. Change, he stresses, is meaningless to a school if the transformational process is not implemented in a way compatible with the mandate of the curriculum. The continuous maintenance of the process of change should focus on the roles and strategies of various types of change agents. Teachers' choice of how they are going to implement the curriculum greatly depends on the resources available in their schools. According to (Spaull, 2019) a massive resource shift happen to previous disadvantage schools, but this resource shift does not result in good educational outcomes.

More than three decades ago Berman and McLaughlin (1977) indicated that sustained interest, monetary support and structural assistance are needed for the preservation of a positive level of change. These researchers then argued that, if funding for the educational organisation's change is coming from an outside source, the chances that the change process will continue after the funding has ceased is unlikely. In support of this view, Carl (2009) contends that the implemented curriculum may be superior to or inhibited by the availability or scarcity of resources such as study materials, instructional and learning aids, equipment, physical accommodation and other facilities. Teachers, as the enablers of curriculum innovation, should understand the characteristics of curriculum materials; otherwise, their effort to implement the curriculum may be futile.

According to Mulaudzi (2009) Raselabe (2006) without resources such as teachers' guides and other learning materials teachers will not be able to implement the curriculum successfully in the classroom as they should. Also, Bogliaccini (2007) states that teachers all over the world experience difficulty in implementing a new curriculum if there is a shortage of resources. These findings corroborate earlier findings in South Africa. In the latter essential laboratory equipment such as Bunsen burners, spirit lamps, hand lenses, microscopes, prepared slides, glass slides, cover slips and glass beakers were either unavailable or in short supply. As a result, teachers' attempts to implement the curriculum were greatly impeded. These studies have also revealed a general lack of adequate space for learners to carry out investigations. In terms of equipment, schools have to make every attempt to ensure that this critical equipment is made available for laboratory use (Dlova, 2019, Mokgato, & Mji, 2006; Sibanda, 2016).

A related issue to the above situation is the use of improvised equipment. Although it is not the ideal, teachers should not underrate the value of improvised laboratory equipment. They need to realise that it is better for learners to have the experience of carrying out different investigations than to rely on the availability of standard laboratory equipment. In other words, in situations where there are no options, teachers should be encouraged to improvise. The same scientific skills can be developed using improvised equipment. However, if there are no alternatives, it is still worthwhile for teachers to demonstrate an investigation than not to do anything simply due to a shortage of equipment. Secure storage for equipment and chemicals must be provided by the school. It is also important to note that the schools involved in this study did make some effort to see to it that each learner had access to textbooks. As indicated earlier, the Department of Education (DoE) could undermine teachers' attempts to effectively implement the life sciences curriculum by not providing necessary resources.

## **6.5 Contributions made by the study**

This study focused mainly on the lived experiences of a group of selected life sciences teachers in a particular school district in the Northern Cape Province, South Africa. The purpose was to unearth a fresh set of data which hopefully would provide a rich and more insightful understanding of the lived experiences of a group of social actors (teachers) (Giorgi, 1997; Finlay, 2009). Most phenomenological research studies in the field of educational research have focused mainly on lived experiences of physical science teachers while paying little attention to the experiences of their life sciences counterparts (e.g., Ehrich, 2005; Husserl, 1964; Koopman, 2013, Koopman, 2018; Makoe, 2007; & Maposa, 2012; Todres, 2006; Van Manen, 2007). To fill this research gap, this study has attempted to explore the lived experiences of five life sciences teachers. The participants' lived experiences were described in relation to their perceptions of the intentions of the new life sciences



curriculum or CAPS. It also attempted to give an account of how the teachers implemented the Grade 12 life sciences CAPS curriculum and what the outcomes were. It was hoped that the findings from the study would be found informative and useful for all the stakeholders interested in finding out more about the success or otherwise of the implementation of the life sciences curriculum.

## **6.6 Limitations of the study**

The findings and conclusions of this study are limited and cannot be generalised as the research sample of the main study was limited to only five life sciences teachers from disadvantaged schools in one specific district of a province. This study provides theoretical insight in understanding teachers experiences as they implement a new curriculum. As the study included a limited number of teachers in one province in a specific context, the findings cannot be generalised with regard to all educational environments in this specific province.

This study was constrained by certain limitations. Firstly, it only focused on one education district in the Northern Cape Province, and a small sample size of five teachers was involved in the main study. Secondly, the research size is not likely to be representative of the full spectrum of life sciences teachers in the entire Northern Cape Province. However, the intention of the study was not to generalise the findings to all life sciences teachers but to investigate the experiences of a group of selected life sciences teachers. Generally, accepted in the phenomenological tradition is that there is a lack of reproducibility in an effort to gain insight into the experiences of participants (Patton, 2001). Despite these limitations it is hoped that the findings have to some extent revealed how a previously disadvantaged school district is coping with the recent curriculum reforms particularly in the life sciences area of study.

## **6.7 Reasons for involving only five teachers in the main study**

Groenewald (2004) suggests that not more than ten participants are sufficient to saturate a phenomenological study. Another reason for choosing five participants was to obtain the data that made the study more feasible. In line with this, Barnett, Thorpe, and Young; Vasileiou, (2018) assert that qualitative sample sizes should be large enough to allow the unfolding of a new and richly textured understanding of a phenomenon under study, but small enough so that the deep case-oriented analysis of qualitative data is not precluded.

## **6.8 Direction for further studies**

From this study on the lived experiences of teachers as they were busy implementing a new curriculum, the following priority areas are recommended for future research. While this study has

shown that the participants initially had a generally negative view about the implementation of Grade 12 life sciences curriculum, continued investigation involving a large number of life sciences teachers is a critical next step. Although this study provided new contextual information about Grade 12 life sciences teachers' experiences of implementing the Grade 12 life sciences CAPS curriculum, many new areas of study may be explored. A further recommendation is that a broader study, with a bigger sample is conducted on the implementation of the curriculum, thereby extending the scope of the research. The next few sections will provide an outline of several directions for future research.

### ***6.8.1 How can life sciences build social cohesion and advance social justice in schools?***

One of the aims of CAPS curriculum is based on the principle of social transformation by “ensuring that the educational imbalances of the past are redressed and that equal educational opportunities are provided for all sections of the population” (DBE, 2011, p. 2). Many schools in South Africa do not create classroom spaces that reflect the diversity of our society. To ensure that schools create those learning spaces in a diversity-rich classroom, future studies are recommended with a focus on social justice and social transformation. There is an unquestionable need for learners to engage in issues such as, inter alia, social justice, transformation, human dignity and the decolonisation of the life sciences curriculum particularly as decolonisation of the curricula in higher education featured highly on the agenda of the Fees Must Fall movement protests.

### ***6.8.2 Research on the lived experiences of learners in the life sciences classroom***

This study investigated the lived experiences of life sciences teachers. It represents the voices of only five teachers. A further study is recommended which specifically focus on the lived experiences of the learners in the life sciences classroom. Investigating the lived world of the learners might provide insight into and an understanding of the uniqueness of how learners experienced the subject. Most studies in science tend to overlook the uniqueness of how learners experience the learning of life sciences, agricultural and physical sciences. By investigating the lived experiences of the learners, we would be able to understand not only how each learner experiences the teaching and learning of the subject, but we could also discover the essence of a learner (Koopman, 2013).

### ***6.8.3 Inadequate resources***

Another topic of possible interest to future researchers is that of inadequate resources in schools. Schools know that they must invest in resources and recognise the value of resources, which, like knowledge, are powerful. A future investigation which specifically focuses on the use of resources and what impact they have on teaching and learning in a life sciences classroom is recommended.

#### ***6.8.4 Providing mentoring, support and opportunities for pre-service life sciences teachers in implementing an effective life sciences curriculum***

Throughout this study, I was of the belief that the stage has been set for teacher researchers to probe the area of curriculum implementation more deeply since most reported data on implementation and curriculum development tend to focus on in-service teachers. It is my contention that novice teachers and student teachers in higher education institutions have an important role to play in implementing the life sciences curriculum effectively in the classroom and not only on focusing the transfer scientific knowledge. This accords with what Ghebru and Ogunniyi (2013) probably mean with taking the classroom past the positivist's view of scientific knowledge construction.

#### **6.9 General recommendations based on the findings**

The recommendations made in this study are in line with my assertion that while understanding the working of a curriculum it is essential for understanding the dynamics of the life sciences curriculum in different contexts. The following account offer recommendations that could improve the implementation of the Grade 12 life sciences curriculum in South Africa. Based on the findings of this study, general recommendations have been made. However, it should be borne in mind that this is not a complete list of recommendations.

These recommendations are directed at assisting life sciences teachers in their implementation of the Grade 12 curriculum and ultimately to help learners to perform better in the subject than has been the case. A general recommendation directed at schools and the district is to ensure that novice teachers who enter the system are mentored by an experienced teacher, preferably the departmental head, to ensure an effective implementation of the curriculum. It is also the duty of the subject advisers to orientate teachers and make sure they have all the required documents in their possession for curriculum implementation. This can take place once at the beginning of the year, provided that there will be new entrants in life sciences. The Northern Cape DoE should ensure that there is an ongoing support and in-service training programmes for life sciences teachers to stabilise the implementation of the curriculum and to improve learner performance in the province. According to Jonas (2019) a key source of support to teachers in understanding and implementing curricula should be the education district offices. Officials based at the district offices are expected to provide district-based support to schools between national and provincial level.

In the course of the study, the participants indicated that planning for life sciences is a challenge. It is recommended that departmental heads, as the subject specialists, should exercise a more systematic monitoring and support of the implementation of the life sciences curriculum. This coincides with the

view of Southworth (2004) who concluded that monitoring is critical in addressing and fulfilling the outcomes of the NCS curriculum. It is evident from the above that the challenges facing the South African education system is systemic and serious intervention is required to address the crisis.

## **6.10 Chapter summary**

The aim of this study was to examine the lived experiences of Grade 12 teachers while implementing the life sciences curriculum. In pursuance of this aim, four research questions were posed for a closer consideration. According to Manen (1990) researchers' need more research methods that will give more meaning to the lifeliness and the experiences of those being researched. He argued that meaning is deeply interrelated with the experiences of individuals. Van Manen (1990) regarded phenomenology as a method that does not only lead us to new understandings of our fellow-beings, but also confronts teacher researchers with the reality. In light of this, I have documented the major findings in line with the research questions, provided an overview of the scope of the thesis and contributions made by the study and mapped the way forward for further studies. The life sciences teachers involved in the study expressed the need and desire to improve the implementation of the life sciences curriculum as well as the quality of teaching and learning. The life sciences curriculum seems to have laid the foundation to help teachers to realise the intention of the curriculum. However, the policymakers and the DoE need to support teachers while they implement the curriculum. As in earlier studies, this study has shown that it will take some time for the teachers who are charged with the responsibility of implementing the curriculum to move out of their comfort zones of old habits and traditional teaching styles.

The findings have also shown that teachers have continued to encounter some challenges while implementing the life sciences curriculum. These challenges among others include: shortage of learning resources; inadequate/poor training; non-involvement of teachers in the curriculum planning process, poor resourcing, inadequate administrative support, and so on. As far as the outcomes of the NSC examinations are concerned, life sciences teachers need to improve learner performance. Learner performance is significantly below what it should be in terms of the implemented Grade 12 life sciences curriculum. This study has provided me with a vehicle to enter the lives of a group of life sciences teachers. It has also exposed to some extent their attitudes towards the curriculum. Equally, it has enabled me to understand the teachers' frustrations and realities concerning the implementation of the life sciences curriculum. This research study is part of reflective practice which is concerned with finding out about the means that life sciences teachers are making in their teaching practices to achieve the goals of the new curriculum. It is hoped that the findings will encourage other life sciences teachers to learn from the experiences of their counterparts and thus be

more committed to the successful implementation of the curriculum that has hitherto being the case. An important characteristic of this phenomenological study was to learn about who we are as life sciences teachers and how we can improve our practice by learning from past experiences of others (Koopman, 2018).



## REFERENCES

- Abayomi, A. (2017). The Interpretative Phenomenological Analysis (IPA): A Guide to a Good Qualitative Research Approach. *International Journal of Education & Literacy Studies*, (5), 9-19.
- Abes, E. S. (2009). Theoretical borderlands: Using multiple theoretical perspectives to challenge inequitable power structures in student development theory. *Journal of College Student Development*, 50(2), 141-156.
- Addyman, D. (2009). Phenomenology “less the rosy hue”: Beckett and the philosophy of place. *Journal of Modern Literature*, 33(4), 112-128.
- Adler, J. Parker, D. & Webb, L. (2005). *Working with students 'mathematical productions: elaborating a key element of mathematical knowledge for teaching*. In Chick, H.L. & Vincent, J. L (Eds.) *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education*. Department of Science and Mathematics Education. Melbourne University. Australia. Volume 2, pp.1-8
- Aikenhead, G. S. & Jegede, O. J. (1999). Transcending cultural borders: Implications for science teaching. *Research in Science & Technology Education*, 179, 45-66.
- Akinoglu, O. (2017). Pre-service teachers' metaphorical perceptions regarding the concept of curriculum. *International Journal of Instruction*, 10(2), 263–278.
- Alias, A.K. (2019). ‘Chalk and Talk’ or Technology. Do I Have a Choice? Making a case of the complementary role of technology in achieving an impactful learning experience. *The Learning Series (1)* 225-235.
- Albert. R. & Hermans, P. (2010). *The analysis of examinations results as a pre requisite for improved teaching*. 36<sup>TH</sup> IAEA Annual conference, Bangkok, Thailand August 22-27.
- Aldridge, A. & Levine, K. (2001). *Surveying the social world. Principles and practices in survey research*. Buckingham: Open University Press.
- Aldous, C. (2004). Science and mathematics teachers' perceptions of C2005 in Mpumalanga secondary schools. *Africa Journal of Research in Science, Mathematics and Technology Education*, 8, 165-179.

- Aldous, C. M. & Rogan, J. M. (2009). The implementation of the natural science outcome three: Embedding the learning of science in societal and environmental issues. *African Journal of Research in MST Education*, 13(1), 62-78.
- Alexander, G, Le Roux, N. Hlalele, D. & Daries D. (2010). Do educators in the Free State Province of South Africa engage learners via outcomes-based teaching styles? *Journal of Social Sciences*, 24(1), 15-22.
- Allais, S. (2007). Education service delivery. The disastrous case of outcomes-based qualifications frameworks. *Progress in Development Studies*, 7(1), 65-78.
- Alonsabe, O. C. (2009). *Curriculum implementation*. Retrieved October 5, 2010, from <http://www.deped.gov.ph/cpanel/upload/issuancelmg>
- Aloovi, O. A. (2016). *Biology teachers' experiences of the Namibian Senior Secondary Certificate (NSSC) curriculum*. (Unpublished master's thesis), Stellenbosch University, Stellenbosch.
- Altinyelken, H. K. (2010). Curriculum change in Uganda: Teacher perspectives on the new thematic curriculum. *International Journal of Educational Development*, 30, 15-161.
- Aluwihare-Samaranayake, D. (2012). Ethics in qualitative research: A view of the participants' and researchers' world from a critical standpoint. *International Journal of qualitative methods*, 11(2), 64-81.
- Alvesson, M. & Sandberg, J. (2011). Generating research questions through problematization. *Academy of Management Review*, 36 (2), 247-277.
- Anderson E. S. 1997. Understanding Teacher Change: Revisiting the Concerns Based Adoption Model. *Curriculum Inquiry*, 27(3), 332 – 367.
- Angie Motshekga- Minister of Basic Education on 2018 release of Matric results. Department of basic education. Available at [www.education.gov.za](http://www.education.gov.za). Accessed 22 February 2017
- Anosike, P. Ehrich, P. L. and Ahmed, P. (2012). 'Phenomenology as a Method for Exploring Management Practice', *International Journal of Management Practice*, (5), 3, 205 – 224
- Aoki, T. (2004a). Inspiring the curriculum. In T. Aoki, W. F. Pinar, & R. Irwin (Eds.), *Curriculum in a new key: The collected works of Ted Aoki* (pp. 357-365). Mahwah, N.J.: Lawrence Erlbaum.

- Aoki, T. (2004b). *The dialectic of mother language and second language*. In T. Aoki, W.F. Pinar, & R. Irwin (Eds.), *Curriculum in a new key: The collected works of Ted Aoki* (pp. 235-245). Mahwah, N.J. Lawrence Erlbaum.
- Apple, M. W. (2007). *Ideology and curriculum*. London: Routledge and Paul.
- Appelrouth, S. & Edles, L. D. (2011). *Sociological theory in the contemporary Era – Text and readings*. USA: Sage.
- Appelrouth, S. & Edles, L. D. (2012). *Classical and contemporary sociological theory – Text and Readings*, USA: Sage Publications, Inc, 2nd Edition
- Argyris, C. & Schon, D. (1974). *Theory in practice: Increasing professional effectiveness*. San Francisco: Jossey-Bass.
- Ashley, M. (1989). *Ideologies and schooling in South Africa*. Rondebosch. South Africa Teachers Association (SATA).
- Asikhia, O.A, (2010). Students and Teachers' Perception of the Causes of Poor academic performance in Ogun State Secondary Schools in Nigeria. Implication for Counselling for National Development. *European Journal of Social Sciences*; 13(2): 229-242.
- Arskey, H. & Knight, K. (1997). *Interviewing for social scientists. An introductory resource with examples*. London: Sage.
- Atkinson, R. K. Derry, S, J., Renkl, A. & Wortham, D.W. (2000). Learning from examples: Instructional principles from the worked examples research. *Review of Educational Research*, 70, 181-214.
- Avramidis, E. Bayliss, P. & Burden, R. (2000). A survey into mainstream teachers' attitudes towards the inclusion of children with special educational needs in the ordinary school in one local education authority. *Educational Psychology*, 20(2), 191-121.
- Aykac, N., & Celik, O. (2014). Comparison of the metaphorical perceptions of teachers and prospective teachers in regard of curriculum. *Education and Science*, 39(173), 328– 340.
- Azolukwam, A. V. and Perkins, J. S. (2009). 'Managerial Perspectives on HRM in Nigeria: Evolving hybridization?' *Cross Cultural Management: An International Journal*, (16), 1, 62-79.
- Azwihangwisi, M. (2010). Ploughing new fields of knowledge, culture and the rise of community schooling in Venda. *Journal of Education*. 48(1), 137-154.



- Babbie E. (2007). *The practise of Social Research*. 11th ed. Belmont: Thomson Wadsworth.
- Babbie, E. (2011). *The basics of social research*. (5<sup>th</sup> edition). Belmont, USA: Wadsworth.
- Badugela, T.M. (2012). *Problems facing educators in implementing the National Curriculum Statement: The case of Tshifhena Senior Secondary School, Vhembe District, Limpopo Province*. (Unpublished master's thesis). University of South Africa, Pretoria.
- Bailey, E. (1995). *A guide to field research*. Thousand Oaks CA: Pine Forge.
- Ballenger, C. (1992). Teaching and practice. *Harvard Educational Review*, 62(2), 199-208.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, 84(2), 191-215.
- Bantock, G.H. (2010). *Dilemmas of the curriculum*. Oxford: Martin Roberts.
- Bantwini, B. & McKenzie, E.L.K. (2011). District officials' assumptions about teacher learning and change: Hindering factors to curriculum reform implementation in South Africa. *International Journal of Education*, 3(1), 1-25.
- Bantwini, B.D. (2009). District professional development as a way to introduce primary school teachers to Natural Sciences curriculum reforms in one district in South Africa. *Africa Journal of Education for Teaching*, 35 (2), 169-182.
- Bantwini, S. (2011). Assessment reform in South Africa: Opening up or closing spaces for teachers. *Educational Studies in Mathematics*, 78, 91-107.
- Barab, S. L. & Luehmann, A. L. (2003). Building sustainable science curriculum: acknowledging and accommodating local adaptation. *Science Education*, 87, 454-467.
- Barnard, J. (2017). *Grade 6 English first additional language teachers' perceived preparedness for pedagogical content knowledge in writing education*. (Unpublished master's thesis) University of Stellenbosch, Stellenbosch.
- Bawden, J.M. (2007). Organised, complexity, meaning and understanding, *ASLIB Proceedings*, 59 (45), 307-327.
- Bergess, L. (2007). *Qualitative research methods for the social science*. Boston. Allyn & Bacon.
- Beets, P. & Le Grange, L. (2005). Geography education in South Africa after a decade of democracy. *Geography*, 90 (3), 267-277.
- Bell, J. (1993). *Doing your research project*. Buckingham: Open University Press.

- Bell, J. (1997). *Introduction till forkningsmethod*.4. Uppl, Denmark: Studentlitteratur.
- Belmont Report. <http://ohsr.od.nih.gov/guidelines/belmont.html>
- Bennet, S. (2005). *An investigation into curriculum alignment of the building construction curricula*. (Unpublished master's thesis.). University of Pretoria, Pretoria.
- Benz, M. R., Lindstrom, L., & Yovanoff, P. (2000). Improving graduation and employment outcomes of students with disabilities: Predictive factors and student perspectives. *Exceptional Children*, 66, 509-529.
- Bernet, R. (2002). Unconscious consciousness in Husserl and Freud. *Phenomenology and the Cognitive Sciences*, 1: 327-351.
- Berman, P. & McLaughlin, M. W. (1977). *Federal programs supporting educational change*. Vol.VIII: Factors affecting implementation and continuation (Report No. R- 1589/7 HEW. Santa Monica, CA: The RAND Corporation.
- Bergman, M.M. (ed.). (2008). *Advances in mixed methods research: Theories and applications*. London: Sage.
- Berggren, K. (2014). 'Sticky Masculinity: Post-structuralism, phenomenology and subjectivity in critical Studies on men', *Men and Masculinities*, 17, (3), 231-252
- Bernstein, B. (1996). *Pedagogy, symbolic control and identity: Theory, research critique*. London: Taylor and Francis.
- Bernstein, B. (1975). *Class, codes and control: Towards a theory of educational transmission*. London: Routledge.
- Bertells, T. (2003). *Rath and strong six leadership handbook*. New Jersey: John Wiley.
- Berkhout, J.S., Booysen, J., Brand, C., Harber, C., Lemmer, E., Le Roux, C.S., Naicker, S., Phasa, N., Pretorius, S.G., Smith, B., Van Niekerk, P & Van Wyk. N. (2010). *Themes in South African education*. Cape Town: Pearson's Education.
- Bernard, H.R. (2013). *Social research methods: Qualitative and quantitative approaches*. New Delhi: Sage.
- Beyer, C., & Davis, E. A. (2009). Supporting preservice elementary teachers 'critique and adaptation of science lesson plans using educative curriculum materials. *Journal of Science Teacher Education*, 20 (6), 517.

- Black, T.R. (1999). *Doing qualitative research in the social sciences: An integral approach to research design, measurement and statistics*. London: Sage.
- Bless, C., Higson-Smith, C. & Kagee, A. (2006). *Fundamentals of social research methods – An African Perspective*. Cape Town: Juta.
- Blignaut, S. E. (2006). *Teachers' epistemologies as frame factor in the implementation of curriculum policy*. (Unpublished doctoral dissertation) Nelson Mandela Metropolitan University, Port Elizabeth.
- Blignaut, R., Venter, I.M. & Stoltz, D. (1998). *Chalk-And-Talk versus Cooperative Learning. A Comparative Study*. A Comparative Study. 139-148.
- Bloch, G. (2009). *The Toxic Mix. What's wrong with South Africa's schools and how to fix it?* Cape Town: Tafelberg.
- Bloor, M., Frankland, J., Thomas, M., and Robson, K. (2001). *Focus groups in social research*. London: Sage.
- Bobbie, E. and Mouton, J. (2001). *The practice of social science research*. Cape Town: Oxford University Press.
- Bobbitt, F. (1918). *The curriculum*. Boston: Houghton Mifflin.
- Bobbitt, F. (1918). *How to make a curriculum?* Boston: Houghton Mifflin.
- Bogdan, R., & Biklen, S. K. (2003). *Qualitative research for education: An introduction to theory and methods* (4th ed.). Boston, MA: Allyn and Bacon.
- Bogdan, R.C. Biklen. S.K. (1982). *Qualitative research for education theory and methods*. Boston: Allyn and Bacon.
- Bogliaccini, J.A. (2007). *Primary Education: Changing Mainstay of Uruguay*. International Handbook of Urban Education, 685-703.
- Bor, R. Miller, R. & Goldman, E. (1993). *Theory and practice of HIV counselling: as systemic approach* (1st ed.). New York: Brunner/Mezar Publisher
- Booyse, C. (2008). *The educator as learning program developer*. South Africa: Van Schaik.
- Booyesen, B. (2015). *Toward a cooperative learning process in building social cohesion in a Grade 10 Geography classroom: An action research approach*. (Unpublished master's thesis) University of Stellenbosch, Stellenbosch.

- Booyesen, R.M. (2018). *The perspectives of secondary school teachers regarding the flexible implementation of the Curriculum and Assessment Policy Statement*. (Unpublished master's thesis). North-West University, Potchefstroom.
- Borrow, R. (1999). The higher nonsense. Some persistent errors in educational thinking. *Curriculum Studies*, 31 (2), 27-31.
- Bottorf, J. L. (2004). Observations, types of. In M.S. Lewis- Beck, A. Bryman, & T.F., Liao (Eds), *The Sage Encyclopaedia of social science research methods*, 2(752-753). Thousand Oaks: Sage.
- Bouwer, A., Sivalingam, C., Ford, M., Goliath, J., Lombard, G., Mjali, N., Pillay, G., Pretorius, R., & Wiese, S. (2014). *Mind the Gap: Life Sciences study guide grade 12*. Pretoria: Government Printers.
- Bowen, G. (2008). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2). 27-40. Doi. 10.3316/QRJ0902027
- Boyd, C.O. 2001. *Phenomenology the method*. In Munhall, P.L. (Ed.), *Nursing research: A qualitative perspective* (3rd. ed., pp. 93–122). Sudbury, MA: Jones and Bartlett.
- Boyd-Dimock, K. V. (2009). *Systemic thinking for turning around low-performing schools*. Texas District Turnaround Institute, Austin, TX.
- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3 (2), 77–101.
- Braun, J.A. & Crumpler, T.P. (2004). The social memoir: An analysis of developing reflective ability in a pre-service methods course. *Teaching and Teacher Education*, 20 (1): 59-75.
- Bryman, A. (2006). Integrating quantitative and qualitative research: how is it done? *Qualitative Research*, 6 (1), 97-113. doi: 10.1177/1468794106058877
- Bricker, D. (2009). *The lived experiences of sex workers* (Unpublished doctoral thesis) University of Johannesburg, Johannesburg.
- Brodie, K., Zaheera, J. & Modau, S. (2009). Challenges in implementing the new mathematics curriculum in grade 10: A case study. *African Journal of Research in Mathematics, Science and Technology Education, special issue: 19-33*.
- Brown, E. (2009). Educating all students: Creating culturally responsive teachers, classrooms, and schools. *Intervention in School and Clinic*, 43 (1), 57-62.

- Brink, J.B. & Wood, M.J. (1998). *Advanced design in nursing research*. 2<sup>nd</sup> edition. Thousand Oaks: Sage.
- Brightwell, D.S. (1993). *Improving college instruction: A strategy for assisting professors*. Paper presented at the Mid-South Educational Research Association Meeting, New Orleans, and 12 November. ERIC Document Reproduction Service No. ED 368 310.
- Bryman, A. (1988). *Quantity and quality in social science research*. London: Routledge.
- Bryman, A. (2003). *Business Research Methods*, UK, London: Oxford University Press, London, 1st Edition
- Bryman, A. (2012). *Social Research Methods*. UK, London: Oxford University Press, 4th Edition
- Budd, J.M. (2005). Phenomenology and information studies. *Journal of Documentation*, 72 (1), 65-80.
- Budd, M. J. and Velasquez, D. L. (2014). Phenomenology and Organizational Communication, *New Library World*, 115, (7), 394 – 404.
- Bullock. A., Sallybrass, O & Trombley, S. (1988). *The Fontana dictionary of modern thought* (2<sup>nd</sup> Ed). London: Fontana Press.
- Burns, N. & Grove, S.K. (1998). *The practice of nursing research: Appraisal, synthesis and generation of evidence* (6ed). St Louis: Saunders.
- Burns, N & Grove, S.K. (2003). *Understanding nursing research*. 3<sup>rd</sup> Edition. Philadelphia: Scunders.
- Burgess, J. Robertson, G. & Patterson, C. (2010). Curriculum implementation. Decisions of early childhood teachers. *Australian Journal of Early Childhood*, 35 (3), 51-59.
- Caelli, K, Ray, L., & Mill, J. (2003). ‘Clear as mud’: Towards greater clarity in generic qualitative research. *International Journal of Qualitative Methods*, 2 (2), 1-13.
- Carl, A.E. (1997). *Empowerment through curriculum development*. Stellenbosch University. Stellenbosch.
- Carl, A.E. (2002). *Teacher empowerment through curriculum development*. Cape Town: Juta.
- Carl, A.E. (2007). *Assessment as learning*. California. Corwin.
- Carl, A.E. (2008). *Teacher empowerment through curriculum delivery and practice*. Cape Town: Juta.

- Carl, A.E. (2009). *Teacher empowerment through curriculum development*. Theory into practice. 3<sup>rd</sup> edition. Pretoria: Juta.
- Carl, A.E. (2010). Die stand van kurrikulum binne opvoedkundefakulteite aan Suid Afrikaanse universiteite: navorsing- en oorsig artikel. *Tyskrif vir Geesteswetenskappe* 52(4) 67-75.
- Case, D.O. (2012). *Looking for information: A survey of research on information, seeking needs, and behaviour* (3<sup>rd</sup> ed.). Bingley: Emerald Group.
- Census 2011- District Municipality Pixley Ka Seme [http://census2011, adrainfrith.com](http://census2011.adrainfrith.com).
- Charalambous, Y.C, Philippou, G.N & Kyriakides, L. (2008). Tracing the development of pre service teachers' efficacy beliefs in teaching mathematics during fieldwork. *Educational Studies in Mathematics*, 67, 125-142.
- Chardhary.G.K. (2015). Factors affecting curriculum implementation for students. *International Journal of Applied Research*, 1 (12), 984-986. Human Science Research Council.
- Chenail, R. J. (2011). 'Ten Steps for Conceptualizing and Conducting Qualitative Research Studies in a Pragmatically Curious Manner'. *The Qualitative Report*, (16), 1713-1730
- Chowdhury, C.G. & Chowdhury, S. (2011). *Information users and usability in the digital age*. London Facet.
- Chikumba, T.J. & Makmure, R. (2000). *Curriculum theory design and assessment*. SADC. <http://vangidunda>. Retrieved 08 August 2007
- Chisholm, L. (2003). *The politics of curriculum review and revision in South Africa*. Paper presented at the oxford international conference on Education and Development. 9-11 September 2003. The session on culture and the quality of learning.
- Chisholm, L., ed. 2004. *Changing Class: Education and Social Change in Post-Apartheid South Africa*. Cape Town: HSRC Press.
- Chisholm, L. (2005a). The making of South African Curriculum Statement. *Curriculum studies*, 37 (2), 193-208.
- Chisholm, L. (2005b). Curriculum 2005. Review committee report. DBE.
- Chisholm, L. (2005c). *The practice of curriculum review and revision in South Africa in regional context*, 35 (1).
- Chisholm, L. & Sujee, M. (2006). Tracking racial desegregation in South African schools. *Journal of Education*, 40, 141-159.

- Christie, P. (1999). OBE and unfolding policy trajectories: Lessons to be learned. In Jansen, J & Christie, P. (Eds). *Changing cliff: Students on outcomes-based education in South Africa*. Cape Town: Juta.
- Christiansen, I., Bertram, C., & Land, S. (2010). *Understanding research* (3<sup>rd</sup> Ed) UKZN Faculty of Education.
- Cilesiz, S. (2010). A phenomenological approach to experiences with technology: current state, promise, and future directions for research. *Educational Technology Research and Development*, DOI: 10.1007/s11423-010-9173-2
- Clark, A. (2000). The Tooley report on education research: Two philosophical objectives. *Educational Philosophy and Theory*, 32 (2). Accessed 28 September 2017. [https:// doi/org/ 10.1111/j. 1469-5812. 2000. tb. 0047. X](https://doi.org/10.1111/j.1469-5812.2000.tb.0047.X)
- Clarke, P. (2003). Culture and Classroom Reform: The case of the district Primary Education Project include in *Comparative Education*, Vol. 39 No. 1.
- Clarcke, N. (1997). Curriculum 2005: Introduction to main issues in education. Educators link March / April 1997: Rivonia.
- Cohen, L & Manion, L. (2002). *Research methods in education* (5<sup>th</sup> ed.). London and New York: Routledge Falmer Press.
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7<sup>th</sup> ed). London and New York: Routledge Falmer Press.
- Cohen, L. & Manion, L. (2002). *Research methods in education* (6<sup>th</sup> ed). London and New York: Routledge Falmer Press.
- Collins English dictionary (1991).
- Collins, K. M. T., Onwuegbuzie, A. J., & Sutton, I. L. (2006). A model incorporating the rationale and purpose for conducting mixed-methods research in special education and beyond. *Learning Disabilities: A Contemporary Journal*, 4, 67–100. Retrieved on 22 October 2009 from <http://mmr.sage>
- Connelly, M. & Clandinin, J. (1999). Knowledge, Context, and Identity. In: M. Connelly and J. Clandinin (Eds), *Shaping a Professional Identity: Stories of Educational Practice*. New York, NY: Teachers College Press.

- Connelly, F. M., & Lantz, O.C. (1991). *Definitions of curriculum: An introduction*. In A. Lewy (Ed.) *The international encyclopaedia of curriculum*. New York: Pergamon.
- Conklin, T. A. (2008). Method or madness: Phenomenology as knowledge creator. *Journal of Management Inquiry*, 16 (3), 275-287.
- Constandi, S. (2000). Meandering through my epistemological patchwork quilt: A narrative inquiry of my landscape of learning. *Journal of Philosophy and History of education*, 50: 86-92.
- Cornbleth, C. (1990). *Curriculum in context*. Basingstroke: Falmer Press.
- Corbin, J. & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage.
- Cornoldi, C., Terreni, A., Scruggs, T. E., & Mastropieri, M. A. (1998). Teacher Attitudes in Italy. After Twenty Years of Inclusion. *Remedial and Special Education*, 19 (6), 350-356.
- Cross, M., Mungadi, R., & Rouhani, S. (2002). From policy to practice: curriculum reform in South African education. *Comparative Education*, 18 (2), 171-187.
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6<sup>th</sup> ed) London: Routledge Falmer Press.
- Concise Oxford Dictionary. (2011). University Oxford Press. South Africa.
- Constitution of the Republic of South Africa, 1996.
- Corbin, J. & Strauss, A. (2008). *Basics of qualitative research. Techniques and procedures for developing grounded theory* (3<sup>rd</sup> ed.). Thousand Oaks, CA: Sage.
- Creswell, J. W, (1999). Mixed methods research: Introduction and application. In *Handbook for educational policy*, ed. T. Cijek, 455-472. San Diego, CA: Academic Press.
- Creswell, J.W. (1998a). *Research methods in education*. London: Routledge.
- Creswell, J.W. (1998b). *Qualitative inquiry and research design: Choosing among five traditions*. London: Sage.
- Creswell, J.W. (2003). Research Design: *Qualitative quantitative and mix methods approach*. Thousand Oaks: CA.
- Creswell, J.W. (2003). Research design: *Qualitative, quantitative, and mixed-methods approaches*. 2nd ed. Thousand Oaks: Sage.



- Creswell, J.W. (2005). *Educational research, planning, conducting and evaluating qualitative and quantitative research*. Pearson Prentice Hall: New Jersey.
- Creswell, J.W., & Clark, P. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd Ed.). Thousand Oaks, CA: Sage.
- Creswell, J.W. (2008). *Educational research planning. Conducting and evaluating qualitative and quantitative research*. Upper Saddle River, New York: Pearson's Education.
- Creswell, J.W. (2009). *Research design. Research qualitative, quantitative and mix approaches*. Thousand Oaks, CA: Sage.
- Creswell, J.W. (2012). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks: Sage.
- Creswell, J. W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research*. (4th ed.). Pearson.
- Creswell, J.W. (2013). *Qualitative research inquiry & research design: Choosing among five approaches*. Los Angeles, CA: Sage.
- Creswell, J.W. (2014). *Research design: qualitative, quantitative, and mixed-methods approaches*. Los Angeles, CA: Sage.
- Creswell, J. & Clark, P.V. (2011). *Designing and conduction mix methods research (2<sup>nd</sup> ed)*. Thousand Oaks. CA: Sage.
- Creswell, J.W. & Garrett, A.L. 2008. The movement of mixed methods research and the role of educators. *South African Journal of Education*, 28,321-333.
- Creswell, J.W. & Plano-Clark, V.L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks: Sage.
- Cross, M., Mugadi, M. & Rodhani, S. (2002). From policy to practice. Curriculum reform in South African education. *Comparative Education*, 36 (1), 101-105.
- Cross, M; Mngadi, R, & Rouhani, S. (2002). From policy to practice: Curriculum reform in South African Education, *Comparative Education*. 38 (20), 171-187.
- Cuban, L. (1995). The hidden variable. How organisations influence teachers' response to secondary science curriculum reform. *Theory into Practice*, 34 (1), 4-11.
- Curriculum 774. *Stellenbosch University course reader*. Stellenbosch University.

- Curtis, S., Gesler, W., Smith, G. & Washburn, S. (2000). Approaches to sampling and case selection qualitative research: examples in the geography of health, *Social Science & Medicine*, 50, 1001-1014.
- Czaykowski, T.J. & Patterson. J.L. (1980). *Curriculum change and curriculum development in the SADC*. The school ASCD Yearbook 158-175. 09 March 2017.
- Da Costa, Y. & Meerkotter, D.A. (1994). Dug-up customs and implanted foreign crops: The [de]colonization of education in South Africa. In Y. Da Costa, C. Julie & D.A. Meerkotter (Eds.). *Let the voices be heard: Process and practice in education*. Cape Town: Wyvern.
- Dahlberg, K. (2006). The essence of essences – The search for meaning structures in phenomenological analysis of lifeworld phenomena. *International Journal of Qualitative Studies on Health and Well-Being*, 1, 11-19.
- Dahlin, B.O., Østergaard, E. & Hugo, A. (2009). An argument for reversing the bases of science education- A phenomenological alternative to cognitions, *Nordina*, 185-199
- Damon, N.B. (2017). *The introduction of online mathematics assessment to facilitate mathematics learning of Senior Phase Deaf and Hard of Learning Learners*. (Unpublished doctoral thesis), Stellenbosch University, Stellenbosch.
- Dare, E.A., Ellis, J.A. & Roehrig, G.H. (2018). Understanding science teachers' implementation of integrated STEM curricular units through a phenomenological multiple case study. *International Journal of STEM Education*. 2018.5:4.
- Dass, S., & Rinquest, A. (2017). *Amended national norms and standards for school funding*. Government notice no. 869. Government Gazette no. 29179 of 31 August 2006. Pretoria: Government Printers.
- Datnow, A., & Stringfield, S. (2000). Working together for reliable school reform. *Journal of Education for Students Placed at Risk*, 5 (1 & 2), 183-204.
- Dattollo, P. (2010). Ethical dilemmas in sampling. *Journal of Social Work, Values and Ethics*, 7 (1) 144 -152.
- Davison, T.L. (2013). The effect of the recession of 2007-2009b in community band environment. *International Journal of Business and Social Science*, 4 (14). Retrieved 2 May 2017 from <http://www.ijssnet.com>

- Davies, R. (2018, December 7). Analysis: Do we read too much into matric results. *The Daily Maverick*, p.3.
- Davies, L.J., (1991). *Researching the organisational culture context of information systems strategy: A case study of British Army*: In H.E. Nissen, H.K. Klein and R. Hirschhen information systems research: *Contemporary Approach and emergent traditions*, pp.145–167.
- DBE, (2019). *Do you want to make a difference? Then become a teacher*. Pretoria: Government Printers.
- DBE, (2017). *National Senior Certificate school subject report*. Pretoria: Government Printers.
- DBE, (2016). *National Senior Certificate Examination 2015 Diagnostic report*. Pretoria: Government Printers.
- DBE, (2016). *National Senior Certificate school subject report*. Pretoria: Government Printers.
- DBE, (2015). *National Senior Certificate Examination 2015 Diagnostic report*: Pretoria: Government Printers.
- DBE, (2015). *National Senior Certificate school subject report*. Pretoria: Government Printers.
- DBE, (2014). *Department of Basic Education. Education for All (EFA): 2014 Progress report*. Pretoria: Government Printers.
- DBE, (2014). *Minimum norms and standards for provincial teacher development institutes and district teacher development centres in South Africa*. Pretoria: Government Printers.
- DBE, (2013). *Education statistics in South Africa*, Pretoria, Accessed from [www.education.gov.za](http://www.education.gov.za) 17 December 2017
- DBE (2013). *National Senior Certificate school subject report*. Pretoria: Government Printers.
- DBE, (2004). *National norms and standards for school funding*. Pretoria: Government Printers.
- De Beer, J.J.J. (1993). *N Evaluerrende ondersoek na die waarde van praktiese werk in Biologie onderrig op senior sekondêre skoolvlak*. (Unpublished doctoral thesis), Vista University Johannesburg.
- Denscombe, M. (2007). *The good research guide for small-scale social research projects*. (3<sup>rd</sup> ed). Berkshire: Open University Press.
- Denzin, N.K. (1978). *The research act: An introduction to sociological methods*. New York: Mc Graw-Hill.

- Denzin, N.K. (1989). *The Research Act: A Theoretical Introduction to sociological methods*. (3rd ed). Englewood Cliffs, New Jersey: Prentice Hall.
- Denzin, N.K. & Lincoln, Y.S. (2005). *The Sage Handbook of qualitative research*. Thousand Oaks, CA: Sage.
- Denzin, N.K. & Lincoln, Y.S. (2011). *The Sage Handbook of qualitative research*. New Delhi, India: Sage.
- Dello-Lacovo, B. (2009). Curriculum reform and quality education in China. An overview. *International Journal of Education Development*, 29, 241-249.
- De Loo, I. & Lowe, A. (2011). Mixed methods research: Don't – 'just do it'. *Qualitative Research in Accounting and Management*, 8 (1), 22-28.
- Delpont, C.S.L. (2005). Qualitative data collection methods. In De Voss, A.S (Ed) Strydom, H. Fouche, C.B. & Delpont, C.S.L. *Research at grassroots for the social sciences and human services professions*. 3<sup>rd</sup> Edition. Pretoria. Van Schaik.
- Department of Education (2002). Revised National Curriculum Statement for grades R-9 (Schools) - *Natural Sciences*. Pretoria: Department of Education.
- Department of Education, (2003). *National Curriculum Statement Grades 10–12 (General) life sciences*. Pretoria: Government Printers.
- Department of Education, (2003b). *National Curriculum Statement Grades 10–12. Geography*: Pretoria: Government Printers.
- Department of Basic Education. *Reports of Presidents. Education Initiative research project*. Johannesburg Trust.
- Department of Education and Sport Development: North West Province. (2011). *How to play your part in support of quality public education: A guide for QLTC structures?* Mafikeng: Government Printers.
- Department of Basic Education, (2011a). *Programmes in support of transitioning South Africa to a green economy. Working Paper Series 24*. Johannesburg: Developing Planning Division.
- Department of Basic Education, (2011b). *Curriculum News: Improving the quality of learning and teaching. Strengthening curriculum implementation from 2010 and beyond*. Pretoria: Government Printers.

- Department of Basic Education (2011). *Curriculum and assessment policy statement grades 10-12. Physical sciences*. Pretoria: Government Printing Works.
- Department of Basic Education, (2011c). *Government Gazette 34600*. Pretoria: Government Printers.
- Department of Basic Education, (2012). *National Policy Pertaining to the Programme and Promotion Requirements of the NCS Grades R-12*. <http://www.education.gov.za> (accessed on 7 August 2013)
- Department of Basic Education. (2013). *National Education Evaluation and Development Unit Report for 2012: NEEDU National Report for 2012*. Pretoria: Government Printers.
- Department of Basic Education, (2014). *National Senior Certificate Examination: School Subject Report*: Northern Cape Department of Education.
- Department of Basic Education, (2016). *National Senior Certificate Examination: School Subject Report*. Pretoria: Government Printers.
- Department of Basic Education, (2017). *National Senior Certificate Examination: School Subject Report*. Pretoria: Government Printers.
- De Jager, R. (2011). Latest changes in the Technology education curriculum in South Africa. Paper delivered at the 25th Annual PATT: CRIPT 8 Conference, ‘‘Perspective on Learning in Design. 30 June–05 July 2011.
- Delpont, C.S.L. & Roestenburg, W.J.H. (2018). Quantitative data collection methods: questionnaires, checklists, structured observation and structured interviews schedules. In: De Vos, A.S., Strydom, H., Fouché, C.B. & Delpont, C.S.L., eds. *Research at grassroots for the Social Sciences and Human Service Professions*. 4th ed. Pretoria: Van Schaik. pp. 171-205.
- Derrida, J. (1967). *Writing and difference*. London and New York: Routledge publishers.
- De Sousa, L.O., Richter, B., & Raath S.P. (2017). Sustainable Environmental Management Indicators in South African Primary Schools, *Sustainability*, (9), 1-23 doi: 10.3390/su9050854 [www.mdpi.com/journal/sustainability](http://www.mdpi.com/journal/sustainability).
- De Vos, A.S. & Strydom, H. 2011. Intervention research. In: De Vos, A.S., Strydom, H., Fouché, C.B. & Delpont, and C.S.L., eds. *Research at grass roots: for the social sciences and human service professions*. 4th ed. Pretoria: Van Schaik. pp. 473-490.

- De Vos, A.S. Strydm, H. Schulze & Patel, L. (2011a). Combined quantitative and qualitative approach. In De Vos, A.S. (Ed.). *Research at grass roots: For the social sciences and human services professions*. 2nd ed. Pretoria: Van Schaik.
- De Vos, A. S., Strydom, H., Fouche, C. B., & Delpport, C. S. L. (2011b). *Research at grassroots. For the social science and human services professions* (Fourth ed.). Pretoria: Van Schaik.
- De Vos, A.S. & Strydom, H. (2011c). Intervention research. In: De Vos, A.S., Strydom, H., Fouché, C.B. & Delpport, and C.S.L., eds. *Research at grass roots: for the social sciences and human service professions*. 4th ed. Pretoria: Van Schaik. pp. 473-490.
- De Vos, A.S. Strydom, H., Fouché, C.B. & Delpport, C.S.L. (2012). *Research at grass roots for the social sciences and human services professions*. (4th edition). Pretoria: Van Schaik.
- De Vaus, D. (2001). *Research design in social research*. London: Sage.
- De Villiers, R. (2011). Student teachers' views: what is an interesting Life Sciences curriculum? *South African Journal of Education*, 31, 535-548.
- De Waal, T.G. (2005). *Curriculum 2005. Challenges facing teachers in historically disadvantage schools in the Western Cape*. (Master's thesis, University of Pretoria).
- Dewey. J. (1902). *The child and the curriculum*. Chicago: University Press of Chicago.
- Derrida. J. (1967) *Writing and differences*. London and New York: Routledge Publication.
- Dhuramraj, T, (2013). *Contributory factors to poor learner performance in Physical Sciences in KwaZulu- Natal Province with special reference to schools in Pine Town*. (Master's thesis, University of South Africa).
- Dijkstra, M. (1997). *Curriculum plans and processes: Instructional design*. London: Routledge.
- Dillon, W. R. Madden, T. J. and Firtle, N. H. (1994), *Marketing Research in a Marketing Environment*, 3rd edition, Irwin.
- Dilthey, W. (1985). *Selected works: Poetry and experiences*. Princeton, NJ: Princeton University Press.
- Dlova, N. (2019). *Examining the challenges by teachers with the implementation of the Curriculum and Assessment Policy Statement (CAPS) in grade 10 physical science in an education district in the Eastern Cape Province*. (Master's Thesis), University of the Western Cape).

- DoE, (1997). *Higher Education Act 101, 1997. Policy and procedures for measurement of research output in Public Higher Education institutions*. Pretoria: Government Printers.
- DoE, (2007a). *Policy document senior phase. (Grades 7-9)*. Pretoria: Government Printers.
- DoE, (2007b). *Structuring national science education for pre-service teachers*. Pretoria: Government Printers.
- DoE, (2010). *Life Sciences curriculum and assessment policy statement. CAPS*. Department of Education. Available at [www.Thutong.DoE.za](http://www.Thutong.DoE.za). Accessed 22 February 2017
- DoE, (2010). *Curriculum Assessment Policy Implementation Grades 10-12 Life Sciences*. Pretoria: Government Printers.
- DoE, (2011). *National Curriculum Statement (NCS) and Assessment Policy Statement: Further Education and Training Phase. Grades 10-12. Life Sciences*. Pretoria: Government Printers.
- DoE, (2011). *The national curriculum statement for Grades R-12*. Pretoria: Government Printers.
- DoE, (2011). Curriculum News. *Improving the quality of learning and teaching. Strengthening curriculum implementation from 2010 and beyond*. Available from [Http:// www. Education. gov.za? Link=cuck.aspx? File=ticket+R+I+3+Wgih+ToApercent3D](http://www.education.gov.za?Link=cuck.aspx?File=ticket+R+I+3+Wgih+ToApercent3D)
- DoE, (2011). *Integrated strategic planning framework for teacher education and development in South Africa. 2011-2025*. Pretoria: Government printers.
- DoE, (2012). *Action plan to 2014: Towards the realisation of schooling 2025*. Pretoria: Government Printers.
- DoE, (2016). *Diagnostic report*. Pretoria: Government Printers.
- Donnelly, J. 2006. The intellectual positioning of science in the curriculum, and its relationship to reform. *Journal of Curriculum Studies*, 38(6): 623-640.
- Dooley, D. (1990). *Social research methods*. 2nd. Edition. Englewood Cliffs, New Jersey: Prentice Hall.
- Drost, E.A. (2011). Validity and reliability in social science research. *Education Research Perspectives*, 38 (1), 105- 123.
- Driver, R., Newton, P., & Osborne, J. (2000). Establishing the norms of scientific argumentation in classrooms. *Science Education*. 84(3), 287-312.

- Dube, C. (2012). *Implementing education for sustainable development: the role of geography in South African secondary schools*. (Unpublished doctoral thesis) University of Stellenbosch, Stellenbosch.
- Dube, F. (2015). *Exploring teacher education initiatives in preparing trainee teachers for handling gifted learners as a way of ensuring education for all in Zimbabwean primary schools*. (Unpublished master's thesis) University of South Africa, Pretoria.
- DuFour, R. (2002). The learning-centred principal. *Educational Leadership*, May, 2002.
- DuFour, R., & Eaker, R. (1998). *Professional learning communities at work: best practices for enhancing student achievement*. Bloomington, Indiana: National Education Service
- Duschl, R., & Osborne, J. (2002). Supporting and promoting argumentation discourse. *Studies in Science Education*, 38, 39-72.
- Du Plessis, E. (2013a). *Curriculum and policy statement*. Pretoria: Unisa Press.
- Du Plessis, E. (2013b). *Introduction to CAPS*. Pretoria: Unisa Press.
- Eagleton, J. (1983). *Literary theory: An introduction*. Oxford. Basil Blackwell.
- Eash, M.J. (1991) International encyclopaedia of curriculum, 71-73.
- Eddles-Hirsch, K. (2013). Girly girls, tomboys, athletes and nerds: A phenomenological study of social context in the specialised school environment. *Scottish Journal of Arts, Social Sciences and Scientific Studies*, 17 (1), 88-101
- Egan, K. (2003). What is curriculum? *Journal of the Canadian Association for Curriculum Studies*, 1(1), 9-16.
- Ehrich, L. C. (2005). 'Revisiting phenomenology: Its potential for management research', In Proceedings: *Challenges or Organisations in Global Markets*, British Academy of Management Conference, Said Business School, Oxford University, 1 – 13
- Elbaz-Luwisch, F. (2007). Studying Teachers' Lives and Experience. In: D. Clandinin (Ed) *Handbook of Narrative Inquiry: Mapping a Methodology*. Thousand Oaks, CA: Sage.
- Elmore, R. (2004). *Bridging the gap between standards and achievement: A report on the imperative for professional development in education*. Retrieved March 2, 2005, from [http://www.ashankerinst.org/Downloads/Bridging\\_Gap.pdf](http://www.ashankerinst.org/Downloads/Bridging_Gap.pdf)



- Embree, L. (2001). The continuation of phenomenology. A fifth period. *The Indo Pacific Journal of Phenomenology*, 1 (1) 1-9.
- Englander, M. (2012). 'The Interview: Data Collection in Descriptive Phenomenological Human Scientific Research', *Journal of Phenomenological Psychology*, 43, 13 – 35
- Enslin, P. (1984). The liberal point of view. *Education Philosophy Theory*, 16 (2), 1-9.
- Ensor, P. (2004). Modalities of teacher education discourse and the education of effective practitioner's pedagogy, *Culture Society*, 12 (2), 217-232.
- Epstein, L. (1998). Qualitative and quantitative methods in research. In R Grinel, Jr Ed. *Social work and evaluation*. Itasca: Peacock.
- Eskandari, N. Simbar, M. Vadadhir, A. A. and Baghestani, A. R. (2016). 'Exploring the Lived Experience, Meaning and Imperatives of Fatherhood: An Interpretative Phenomenological Analysis', *Global Journal of Health Science*, (8), 9.
- ESRC, (2001). *The Economic and Social Research Council (ESRC) research ethic framework: Detailed guidance on requirements and procedures*: UK: Author.
- ESRC, (2005). *The economic and social research council (ESRC) research ethic framework: Detailed guidance on requirements and procedures*: UK: Author.
- ESRC, (2006). *The economic and social research council (ESRC) research ethic framework: Detailed guidance on requirements and procedures*: UK: Author.
- Evans, L. (2000). The effect of educational change on morale, job satisfaction and motivation. *Journal of educational change*, 1, 173-192.
- Faber, M. (1966). *The aims of phenomenology: The motives, methods and impact of Husserl's thought*. New York: Harper & Row.
- Fabbriciani, A. A. (2010). *Critical reflections on the war of terrorism from an international perspective*. (Unpublished doctoral thesis, Nelson Mandela Metropolitan University). Port Elizabeth
- Fasogile, D. & Mulder, H. (2010). *A curriculum perspective on plurilingual education*: Enschede Coral of Europe.
- Fendt, S. L., Wilson, E., Jenkins, J., Dimmock, K. and Weeks, P. (2014). 'Presenting Phenomenology: Faithfully Recreating the Lived Experiences of Surfer Girls', *Annals of Leisure Research*, 17, (4), 398–416.

- Feagin, J. (2001). Social justice and sociology: Agendas for the twenty-first century. *American Sociological Review*, 66:1-20.
- Fife-Shaw, C. (2006). Questionnaire design. In G.M. Breakwell, S Hammond, C Fife - Shaw and J.A. Smith (Eds) *Research Methods in Psychology* (3<sup>rd</sup> edition). Thousand Oaks, CA: Sage. 210-231.
- Finlay, L. (2009). Debating phenomenological research methods. *Phenomenology and Practice*, 3(1), 6-25. Retrieved from <http://www.phandpr.org>.
- Fleisch, B. (2002). *Managing educational change. The state of school reform in South Africa*. Sandton: Heinemann.
- Forlin, C., Douglas, G., & Hattie, J. (1996). Inclusive Practices - how accepting are teachers? *International Journal of Disability, Development and Education*, 43(2), 119-133.
- Fouche, F. (1993). Phenomenological theory of human science. In J. Snyman (Ed), *conceptions of social inquiry*. Pretoria: South Africa. Human Science Research Council.
- Fouche, C.B. & Delport, C.S. (2001). *Research at the grassroots for social science*. Pro School Publishers.
- Freire, P. (1968). Chapter 2. In: *Pedagogy of the oppressed*. M. B. Ramon, Trans, (pp. 57-74) New York: Herder and Herder.
- Freire. P. (1983). *Pedagogy of the oppressed (Revised edition)*. New York: The continuum Publishing Company.
- Freire, P. (2004). *Pedagogy of hope*. New York: Continuum.
- Frohmann, B. (2004). Documentation redux. Prolegomenon to (another) philosophy of information; *Library Trends*, 52 (3) 387-404.
- Fry, J.P. (2016). *A descriptive phenomenological study of independent midwives' utilisation of intuition as an authoritative form of knowledge in practice*. (Unpublished doctoral Thesis) Bournemouth University.
- Fullan, L. (1992). *The new meaning of educational change*. Teachers College Press. New York.
- Fullan. M., and Hargreaves. A. (1992). *Teacher development and educational change*. Washington, DC: The Falmer.

- Fullan, M. & Hargreaves, A. (2011). *Teacher development and educational change*. *Professional Development in Education*, 38. (2)
- Fullan M., Stiegelbauer S. (1991). *The new meaning of educational change*. London, England: Cassell.
- Fullan M. & Pomfret A. (1997). Research on curriculum and instruction implementation. *Review of Educational Research*, 47, 335–397.
- Garza, G. (2007). Varieties of phenomenological research at the University of Dallas: *Qualitative Research in Psychology*, 4, 313-342. Doi: 10.1080/14780880701551170
- Gadamer, G.H. (1970). *Truth and method*. Second edition. London: Sheed and Ward.
- Gay, L.; Mills, G. & Airasian, P. (2012). *Educational Research Competencies for Analysis and Application (Vol.1)*. New Jersey: Pearson Education. doi: <https://doi.org/10.1017/CBO9781107415324.004>
- Geneallos, R. (1999). A review of the social-political context of adolescent mental and/or teaching for experiences in high school physics. *International Journal of Science Education*, 26 (4), 447-462.
- Gerdes, H. & Mallinckrodt, B. (2003). Emotional, social and academic adjustment of college students: A longitudinal study of retention. *Journal of Counselling & Development*, 72 (3), 281-289.
- Gersten, R., Keating, T., Yovanoff, P., & Harniss, M. K. (2001). Working in special education: Factors that enhance special educators' intent to stay. *Exceptional Children*, 67, 549-553.
- Gess-Newsome, J., Taylor, J. A., Carlson, J., Gardner, A. L., Wilson, C. D., & Stuhlsatz, M. A. (2019). Teacher pedagogical content knowledge, practice, and student achievement. *International Journal of Science Education*, 41(7), 944-963.
- Giles, D. (2008). Phenomenologically researching the lecturer-student teacher relationship. Some challenges encountered. *Indo- Pacific Journal of Phenomenology*, 9 (10), 1-11.
- Gill, M. J (2014). 'The Possibilities of Phenomenology for Organizational Research'. *Organizational Research Methods*, 17 (2), 118-137.
- Given, L.M. 2(008). *The Sage encyclopedia of qualitative research methods*: London: Sage.
- Ghaye, A. & Ghaye K., (1998). *Teaching and Learning through Critical Reflective Practice*, David Fulton Publishers, London.

- Ghebru, S. & Ogunniyi, M.B. (2013). Moving classroom practices beyond the positivist view of scientific knowledge construction. In S.K. Kwofie, M.B. Ogunniyi, O. Amosun, K.R. Langenhoven, & S. Dinie (Eds.). *Proceedings of the 21st Annual meeting of the Southern African association for research in mathematics, science and technology education*. Cape Town: SJR. 468-478.
- Gibson, W. J. & Brown, A. (2009). *Working with qualitative data*. London: Sage.
- Gibson, S. K. and Hanes, L. A. (2003). 'The Contribution of Phenomenology to HRD Research', *Human Resource Development Review*, (2), 181-205.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, P. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. Thousand Oaks, CA: Sage.
- Gilmore, D., Soudien, C. and Donald, D. (1999). Post- apartheid policy and practice: educational reform in South Africa. pp 341-350. In *Education in a global society. A comparative perspective*. Edited by Mazurek Kjas, Winzer and Majorek. Boston Allyn and Bacon.
- Giorgi, A. (1975). An application of phenomenological method. *Dusquesne studies in phenomenological psychology*, II.
- Giorgi, A. (1970). *Psychology as a human science*. New York: Harper & Row.
- Giorgi, A. (1985). Sketch of a psychological and phenomenological method. In A. Giorgi (Ed), *Phenomenological and psychological research*. Pittsburg: Duquesne University Press.
- Giorgi, A. (1989). One type of analysis of descriptive data: Procedures involved in following a scientific phenomenological method. *Methods: A Journal of Human Science*, 40-61.
- Giorgi, A. (1997). 'The Theory, Practice, and Evaluation of the Phenomenological Method as a Qualitative Research Procedure', *Journal of Phenomenological Psychology*, Vol. 28, No.2, Pp 235-260.
- Giorgi, A. 2008. Concerning a Serious Misunderstanding of the Essence of the Phenomenological Method in Psychology, *Journal of Phenomenological Psychology*, 39, 33–58.
- Giorgi, M. (2009). *The descriptive phenomenology method in psychology*. Pittsburgh: P.A. Duquesne University Press.
- Giorgi, A. (2010). Phenomenology and the practice of science. *Existential Analysis*, 21, 3-22. Retrieved from <http://0-web.ebscohost.com.innopac.up.ac.za>

- Giroux, J.J. 1995. *Developing democratic education*. Ticknall: Education Now Books.
- Given, L. M. (2008). *The SAGE Encyclopedia of Qualitative Research Methods* (2 ed.). California: SAGE Publications.
- Glatthorn, A. A. (1987). *Curriculum leadership*. London: Scott Oresman.
- Glatthorn, A. A. (1997). *The principal as curriculum leader: Shaping what is taught and tested*. Thousand Oaks, Corwin.
- Gogebakan-Yildiz, D. (2017). An analysis of attitudes and metaphoric perceptions towards the course of curriculum development in education. *International Journal of Curriculum and Instructional Studies*, 7(14), 113–130.
- Goodlad, J.T. (1994). *Curriculum as a field of study*. Oxford UK: Pargaman.
- Goodlad, J.T. (1979). *Curriculum inquiry. The study of curriculum practice*. New York, Mc Grow-Hill.
- Goodlad, J.T. (1966). *Leading a culture of change*. San Fransico: Jessey Bass.
- Grix, J. (2001). *De-mystifying postgraduate research: From MA to PhD*, Birmingham: Birmingham University Press.
- Gray, L.R. & Airasian, P. (2000). *Educational research: competencies for analysis and application* (6th ed). New Jersey: Merrill Prentice-Hall.
- Gray, D.E. (2011). *Doing research in the real world*. (3rd edition). London: Sage.
- Gray, D.E. (2009). *Doing research in the real world*. 2<sup>nd</sup> Edition: Sage.
- Graven, M. H. (2014). Poverty, inequality and mathematics performance: The case of South Africa's post-apartheid context. *ZDM–International Journal on Mathematics Education*, 46(7), 1039–1049.
- Greco, J. (2014). Episteme: Knowledge and understanding: In Timpe, K & Boyd, C.E (Eds). *Virtues and the Voices*. Oxford: Oxford University Press.
- Greene, J. C., & Caracelli, V. J. (Eds.). (1997). *Advances in mixed-methods evaluation: The challenges and benefits of integrating diverse paradigms*. In *New directions for evaluation*, ed. American Evaluation Association. San Francisco: Jossey-Bass.

- Green, J.C. Caracell, V.J. & Graham, W.F. (1989). Towards a conceptual framework for mix method evaluation designs: *Educational Evaluation and Policy analysis*, 11, 255-274. Doi. 10.3102/01623737011003255
- Grix, J. (2004). Introducing students to the generic terminology of social research. *Politics*, 22(3):175–186.
- Groenewald, T. (2004). A phenomenological research design illustrated. *International Journal of Quantitative Methodology*, 3(1), 1-27. Retrieved (28 September 2017) from [http://www.ualberta.ca/~iiqm/backissues/3\\_/pdf/groenewald.pdf](http://www.ualberta.ca/~iiqm/backissues/3_/pdf/groenewald.pdf)
- Growther, J. (1994). *Oxford advanced learners' dictionary of english*. 5<sup>th</sup> Edition: Oxford University.
- Grundy, S. (1987). *Curriculum product or praxis?* Lieres: Falmer Press.
- Guba, E.G. & Lincoln, Y. (2005). Worldview controversies, contraindications and emergency confluences. In Denzin, N.K. & Lincoln, Y. (Eds). *The Sage handbook of qualitative research* (3rd edition) Thousand Oaks. CA: Sage. 191-215.
- Guignon, C. B. (2006). *The Cambridge companion to Heidegger* (2nd ed.). Cambridge, MA: Cambridge University Press.
- Guion, L. A., Diehl, D. C., & McDonald, D. (2002). Triangulation: Establishing the validity of qualitative. *University of Florida/IFAS*, 1–3.
- Gultekin, M. (2017). Metaphoric perceptions of primary school teachers on the concept of curriculum. *Journal of Education and Future*, 11, 51–73.
- Guskey, T. (2002). Professional development and teacher change. *Teachers and Teaching: theory and practice*, 8(3/4), 381-391.
- Hall, G. E., & Hord, S. M. (2001). *Implementing change: Patterns, principles, and potholes*. Boston: Allyn and Bacon.
- Hall, K., & Giese, S. (2008). Addressing quality through school fees and school funding. In S. Pendlebury, L. Lake, & C. Smith (Eds.), *South African child gauge 2008/2009* (pp. 35–40). Cape Town: Children's Institute, UCT.
- Halloway, J.H. & Todres, K. (2003). *Qualitative research in nursing*. 2nd edition. Oxford: Blackwell.
- Halloway, J.H. & Todres, K. (2002). Extracurricular activities and student motivation. *Educational leadership*, 60 (11), 80-81.

- Hammon, F.B. (2000). A national medical education needs assessment of intern's and the development of an intern education and training programme. *Med Educ* 2000, 34(4), 275-284.
- Haney, J. J., Czerniak, C. M., & Lumpe, A. T. (1996). Teacher beliefs and intentions regarding the implementation of science education reform strands. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 33(9), 971- 993.
- Hargreaves, A. (1994). *Changing teachers, changing times: Teachers work and culture in the postmodern age*: Wiltshire Redwood Books.
- Hargreaves, A. (1995). Development and desire. A postmodern perspective: In T.R. Guskey & M. Huberman (Eds). *Professional development in education. New worldviews & practices*. New York: Teacher College Press.
- Hargreaves, A. R. (2002). 'Teaching and betrayal'. *Teachers and teaching. Theory and Practice, Special issue*, 8 (3): 393-407.
- Harley, K & Wedekind, V. (2004). Political change, curriculum change and social transformation, 1990-2002. In L Chisholm (Ed). *Changing class: Education and social change in post-apartheid South Africa*: HSRC Press.
- Harvey, D. H. P. (1985). Mainstreaming: teachers' attitudes when they have no choice about the matter. *Exceptional Children*, 32, 163-173.
- Hartley, M.S. (2002). *The effectiveness of an outreach programme in science and mathematics for disadvantage Grade 12 students in South Africa*. (Unpublished doctoral thesis). Curtin University of Technology, Australia.
- Hartley, M.S. Treagust, D.F. & Ogunniyi, M.B. (2008). The application of a CAL strategy in Science and Mathematics for disadvantage Grade 12 learners in South Africa. *International Journal of Education Development*, 28, 596-611.
- Heidegger, M. (1962). *Being and time*. London: SCM. Press.
- Heidegger, M. (1967). *Being and Time*. (J. Macquarrie & E. Robinson, Trans). Oxford: Basil Blackwell. (Original work published in 1927).
- Heiman, T. (2001). Inclusive Schooling - Middle School Teachers' Perceptions. *School Psychology International*, 22(4), 451-462.

- Hendricks, D. (2010). *The implementation of the revised National Curriculum Statement in the foundation phase with special reference to integration in the Western Cape*. (Unpublished master's thesis). University of the Western Cape, Belville.
- Henning, E., Van Rosenberg, W., & Smit, B. (2004). *Finding your way in qualitative research* (2nd ed.). Pretoria: Van Schaik.
- Henze, I., Van Driel J.H & Verloop, N. (2008). Development of experienced science teachers' pedagogical content knowledge of models of the solar system and the universe. *International Journal of Science Education*, 30:1321-1342.
- Henze, I., van Driel, J. H., & Verloop, N. (2009). Science teachers' knowledge about teaching models and modelling in the context of a new syllabus on public understanding of science. *Research in Science Education*, 37(2), 99–122.
- Hébert, C. (2015). Knowing and/or experiencing: a critical examination of the reflective models of John Dewey and Donald Schön. *Reflective Practice*, 16(3), 361–371.
- Hesse- Biber, S.N. & Leavy, P. (2011). *The practice of qualitative research*. 2<sup>nd</sup> ed. Thousand Oaks, CA: Sage.
- Hewson, M. & Ogunniyi, M.B. (2011). Argumentation-teaching as a method to introduce indigenous knowledge into science classrooms: Opportunities and challenges. *Cultural Studies in Science Education*, D010.1007/611422-010-9303-5.
- Hill, H., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Education Research Journal*, 42(2), 371-406.
- Hindle, D. (1996). A review of curriculum development structure and processes in South Africa- 1994-1995, *EPU Working paper no.6 education policy unit*, University of Natal, Durban.
- Hoadley, U. & Jansen, J.D. (1998). Curriculum reform in South Africa. A critical analysis of outcomes-based education. *Cambridge Journal of Education*, 28, 321-331.
- Hoadley, U. & Jansen, J.D. (2002). *Curriculum from plans to practices*. Oxford Press.
- Hoadley, U. & Jansen, J.D. (2009). *Curriculum organizing knowledge for the classroom*. 2<sup>nd</sup> Ed. Cape Town. Oxford: South Africa.
- Hoadley, U. & Jansen, J.D. (2012). *Curriculum organizing knowledge for the classroom*. 3<sup>rd</sup> Ed. Cape Town. Oxford: South Africa.
- Holloway, I. (2005). *Qualitative research in health care*. London: Open University Press.



- Holloway, J. H. (2002). Extracurricular activities and student motivation. *Educational Leadership*, 60 (1): 80-81.
- Holloway, I. & Wheeler, S. (1996). *Qualitative research in nursing*, 2<sup>nd</sup> ed. Oxford: Blackwell
- Holcomb, E.L. (1995). *Getting excited about data: How to combine people passion and proof*. Thousand Oaks: CA.
- Hoepfi, M.C. (1997). Choosing qualitative research. A primer for technology education researchers. *Journal of Technology Education*, 9 (1).
- Holme, T. A. (1994). Providing motivation for the general chemistry course through early introduction of current research topics. *Journal of Chemical Education*, 71(11), 919.
- Holstein, J. A., & Gubrium, J. B. (2000). Interpretive Practice and Social Action. In N. Denzin & Lincoln, Y. (Eds.), *Handbook of qualitative research* (3rd ed.) (pp. 483-505). Thousand Oaks, CA: Sage.
- Honan, E. (2004). (Im) plausibilities: A rhizo-textual analysis of policy texts and teachers' work. *Educational Philosophy and Theory*, 36(3), 267-281.
- Hoover, J.J. & Patton, J.R. (2005). *Components of curriculum implementation*. <http://www.Ptgmedia.pearsoncmg.com> Retrieved 20 August 2017
- Houston, J.I.A, Singh, R.I, Ntenza, S.P, Hough, S.M. Grissendorff. S. & Booyse, C. (2014). *What is in CAPS package? A comparative study of the national curriculum statement and CAPS in the FET phase*. Umalusi. Pretoria.
- Huang, F. (2004). Curriculum changes in contemporary China. Seven goals and six strategies. *Curriculum Journal*, 36 (10), 110-117.
- Huberman, A. M. (1989). The professional life cycle of teachers. *Teachers College Record*, 91, (1), 31-57.
- Huberman, A.M., & Miles, B.M. (1994). *An expanded sourcebook: Qualitative data analysis*, 2nd edition. London: Sage.
- Hunter, T. (2005). Interpretive theories: Dworkin, Sunstein and Ely! *Bond Law Review*, 17(2):78-79.
- Hunkins, F.P & Ornstein, A.C. (2016). *Curriculum foundations, principles and issues*, London: Pearsons Education

- Husserl, E. (1967) *The Paris lectures*. (2nd ed.) (P. Koestenbaum, Trans.). The Hague: Netherlands. Martinus Nijhoff Publishers.
- Husserl, E. (1964). *The idea of phenomenology* (WP Alston and G Nakhnikian, Trans) The Hague: Nyhoff.
- Husserl, E. (1970). *The crisis of the European science and transcendental phenomenology: An introduction to phenomenology philosophy* (D. Carrtrans). Evaston. I.L. Northern Western University Press.
- Husserl, E. (1997). *Analysis of the Reorientation from the Psychological Attitude into the Transcendental Attitude – Psychology ‘Before’ and ‘After’ the Phenomenological Reduction (The problem of ‘flowing in’), The Crisis of European Sciences and Transcendental Phenomenology*. USA: North-western University Press.
- Husserl, E (1931). *Ideas: General introduction to pure phenomenology* (W. R. Boyce Gibson, Trans.). London: George Allen & Unwin.
- Husserl, E. (1983). *Ideas pertaining to a pure phenomenology and to a phenomenological philosophy*. (F. Kersten, Trans). The Hague, Netherlands: Martinus Nijhoff Publishers.
- Imenda, S.N. 2002. *Essential Precursors for the Successful Implementation of Outcomes-Based Education in South Africa Higher Education Institutions*. Inaugural Lecture by Professor Sitwala Namwinji Imenda. July 25, 2002. Technikon Pretoria.
- Ismail H, Konting, MM, Ali., WZW, & Hassan, R. (2010). *Comparison of Teachers’ Aspiration towards Change in Teaching and Learning and the Implementation of Their Teaching Practice*. From <<http://www.weas.us/elibrary/conference/2010/Lasi/NNECFS/NNECFS-45.pdf>> (Retrieved on 12 June 2017).
- Ivankova, N.V., Creswell, J.W., & Stick, S.L. (2006). Using mixed-methods sequential explanatory design from theory to practice. *Field Methods*, 18, 3-20. Doi: 10.1111/77/1525822x05282260
- Ivankova, N.V., Creswell, J.W., & Stick, S.L. (2006). Student’s persistence in a distributed doctoral program in educational leadership in higher education: *A Mixed-methods Study*, 48 (1), 93-135.
- Ivankova, N.V., Creswell, J.W., & Plano Clark, V.L. (2016). Foundations and approaches to mix-methods research. *First steps in research* 2nd edition. (pp. 306-336). Pretoria. Van Schaik.

- Izalan, Z., & Yildiz, D. G. (2018). A comparative study of classroom teachers' educational beliefs and metaphorical perceptions of curriculum. *International Online Journal of Educational Sciences*, 10 (4), 199–214.
- Jacobs, M., Vakalisa, N. & Gawe, N. (2004). *Teaching-learning dynamics: A participative Approach for OBE (3rd ed.)*. Sandown, South Africa: Heinemann.
- Jacobs, M., Vakalisa, N.G., & Gawe, N. (2011). *Teaching and learning dynamics*: Heinemann.
- Jacobs, H. & Brand, C. (2012). Opening up a third space to innovative curriculum. *Journal of Social Science*, 8 (30), 420-428.
- Jackson, W. (1995). *Methods: Doing social research*. Scarborough. Ontario Prentice Hall Canada.
- Jansen, J.D. (1994). Essential Alterations? A critical analysis of the state's syllabus revision process. *Perspectives in education*, 17 (2), 1-11.
- Jansen, J.D. & Christie, P. (1999). *Changing curriculum studies on outcomes-based education in South Africa*. Pretoria: Juta.
- Jansen, J.D. (1999). Curriculum Reform in South Africa: a critical analysis of outcomes-based education [1]. *Cambridge Journal of Education*. 28(3), 321-331.
- Jansen, J.D. (1999). The school curriculum since apartheid: intersections of politics and policy in the South African transition. *Journal of Curriculum Studies*, 31(1), 57-57.
- Jansen, J.D. (2002). Political symbolism as policy craft: explaining non-reform in South African education after apartheid. *Journal of Education Policy*, 17(2), 199-215.
- Jansen, J. & Taylor, N. (2003). *Educational change in South Africa 1994-2003*. Case studies in large scale education reform.
- Jansen, J.D. (2007). Curriculum reform in South Africa. A critical assessment of outcomes-based – education. *Cambridge Journal of Education*, 28 (3), 321-337.
- Jansen, J. (2008). Bearing whiteness: A pedagogy of compassion in a time of troubles. *Education as Change*, 12(2), 59-75.
- Jansen, J.D. (2012). *Opinion analysis*. University of the Free State [online]. Available at [http://www.sachshigh.org.za/wp-content/uploads/2010/06/Grade12-results\\_opinion\\_analysis\\_9\\_Januaryy-2012-1.pdf](http://www.sachshigh.org.za/wp-content/uploads/2010/06/Grade12-results_opinion_analysis_9_Januaryy-2012-1.pdf). Accessed 20 September 2019

- Jasper, M. (1994). Issues in phenomenology for researchers in nursing. *Journal of Advance Nursing*, 19, 309-314.
- Jegede, O.J. (1996). *Fostering Students' Understanding of Science Concepts. A special Keynote paper for the 37th Annual Conference of the Science Teachers' Association of Nigeria*, Uyo, Akwam Ibom State, 12 – 17 August 1996.
- Jegede, O.J. (1997). School science and the development of scientific culture: a review of Contemporary science education in Africa. *International Journal of Science Education*, 19(1), 1-20.
- Jensen, L. (2001). *Planning lessons. In Celce Marcia, Marianne (Ed), teaching English as a second or foreign Language*. United States: Heinle & Heinle.
- Johnson, K. B. (2009). *Biology and its re-contextualisation in the school curriculum: a comparative analysis of post-apartheid South African Life Sciences curricula*. (Unpublished master's thesis, University of KwaZulu-Natal, Durban
- Johnson, R. B. (2009). Toward a More Inclusive “Scientific Research in Education”. *Educational Researcher*, 38, (6), 449-457. DOI: 10.3102/0013189X09344429. AERA.HTTP://er.aera.net Retrievedfromwww.mkoebler.educ.msu.edu/hybridphd/hybridphd\_summer\_2010/wp-content/uploads/2010/06/Johnson-2009.pdf
- Johnson, R.B. Christensen, L, B. (2004). *Educational research. Quantitative, qualitative and mix approaches*. Boston: Allyn and Bacon.
- Johnson, R.B. Onwugubuzie, A, J. & Turner, A. (2007). Proposed there are three mayor types of mix-methods studies. *Journal of Mixed-methods Research*, 1(2), 112-133.Doi:10 1177/1558689806298224
- Johnson, R.B. Onwugubuzie, A, J. & Turner, A. (2007). Toward a definition of mix methods research. *Journal of Mixed-methods Research*, 1(2), 135-145.
- Johnson, R.B. Onwugubuzie, A, J. (2010). *Educational research: quantitative, qualitative and mix approaches*. UK: Sage.
- Johnson, B. & Turner, F. (2003). Data collection strategies. In Tashakkori, A. & Teddlie, C. (Eds.). *Handbook of Mixed-methods in Social and Behavioural Research*. Thousand Oaks: Sage.
- Johl, S.K. & Renganathan, L. (2011). Strategies for gaining access in doing fieldwork: A reflection of two research projects. *Electronic Journal Business Research Methods*, 8 (11), 42-50.

- Jones, A., Bunting, C., & De Vries, M. (2011). The developing field of technology education: A review to look forward. *International Journal of Technology and Design Education*, 23(2), 191–212.
- Jonas, M. (2019). *After dawn. State capture.* Johannesburg: Panmacmillan.
- Kafle, N. (2013). Hermeneutic phenomenological research method simplified. *Bodhi: An Interdisciplinary Journal*, 5, pp 181-200. Available at <http://www.nepjol.info/index.php/BODHI/article/view/8053>
- Kallaway, P. (1988). *From Bantu Education to Peoples' Education*. Cape Town: UCT.
- Kallaway, P. (2002). *The history of education under apartheid*. New York: Peter Lang.
- Keeves, J.P. (1972). The IEA science project: Science achievement in three countries- Australia, the Federal Republic of Germany and the United States. *Implementation of the Curriculum in Science education*, 158- 178.
- Keane, M. (2008). Science education and worldview. *Cultural Studies of Science Education*, 3, 587-621.
- Kelly, A.V. (1999). *The curriculum theory practice*. 4<sup>th</sup> Edition. London: Sage.
- Kemper, E.A., Stringfield, S. & Teddlie, C. (2003). Mix method sampling strategies in Social Science Research. In: Tashakkori, A. & Tedllie, C., eds. *Handbooks of Mix methods in Social and Behavioural Research*. Thousand Oaks: Sage.
- Kennedy, J. (1996). Teachers' role in curriculum reform. English language teacher. *Education and Development*, 2(11), 77-89.
- Kennedy, C., & Kennedy, J. (1996). Teacher attitudes and change implementation. *Elsevier Science Ltd*, 24), 351-360.
- KhitieyiImonje, R. Wang, P. (1999). Methodologies and methods for user behavioural research. *Annual Review of Information Science and Technologies*, 34, 53-99.
- Killen, R. (2003). Validity in Outcomes-based assessment. *Perspectives in Education*, 21 (1) 1-14.
- Killen, R. (2010). *Teaching strategies for quality teaching and learning*. Juta: Claremont.
- Killion, J. & Kaylor, B. (1991). Follow-up: The key to training for transfer. *Journal of Staff Development*, 12(1), 64-67.

- Kimberlin, C. L., & Winterstein, A. G. 2(008). Validity and Reliability of Measurement Instruments Used in Research. *American Journal of Health-System Pharmacists*, 65(1), 2276-2284.
- Kinsella, E. (2010). The art of reflective practice in health and social care: reflections on the legacy of Donald Schon. *Reflective Practice: International and Multidisciplinary Perspectives*, 11(4), 565-575.
- Klein, P. & Westcott, M. R. (1994). The changing character of phenomenological psychology. *Canadian Psychological Association*, 35,133-157. Retrieved from <http://0-web.ebscohost.com.innopac.up.ac.za>
- Koch, T. (1995). Interpretive approaches in nursing research: The influence of Husserl and Heidegger. *Journal of Advanced Nursing*, 21, 827-836. doi: 10.1046/j.1365-2648.199521050827
- Koch, T. (1996). Implementation of a hermeneutic inquiry in nursing: Philosophy, rigour and representation. *Journal of Advanced Nursing*, 24, 174-184. Doi: 10.1046/j.1365-2648.1996.17224
- Kolari, S. Savander – Rann, C. & Viskari, and E.L. (2008). Learning needs time and effect a time-use of study of engineering students. *European journal of engineering education*, 33(1), 483-498. Accessed from [http:// dx.doi.org/10.1080/03043790802564046](http://dx.doi.org/10.1080/03043790802564046)
- Kolkelmans. J. J. (Ed.), (1967) *Phenomenology*. Garden City, NY: Doubleday.
- Koopman, O. (2013). *Teachers' experiences of implementing the further education and training (FET) physical science curriculum*. (Unpublished doctoral thesis) Stellenbosch University, Stellenbosch.
- Koopman, O. (2017). *Science education and curriculum in South Africa*. Springer International Publishing.
- Koopman, K.J. (2018). *A phenomenological investigation into the lived experience of selected accounting teachers in the Western Cape Province*. (Unpublished doctoral thesis) Stellenbosch University, Stellenbosch.
- Koopman, O & Koopman, K. (2018). A Curriculum of Inclusivity: Towards a "Lived-Body" and "Lived-Experience" Curriculum in South Africa. *Indo-Pac. j. phenomenol.* (Online) vol.18 n.2 Grahamstown Nov. 2018.  
<http://dx.doi.org/10.1080/20797222.2018.1536360>

- Kondowe, C. & Booyens, M. (2014). A student's experience of gaining access for qualitative research.
- Kriek, J & Basson, I. (2008). Implementation of the new FET Physical Science curriculum: teachers' perspectives. *African Journal of Science, Mathematics and Technology Education, Special edition: 63-76.*
- Kraak, A. (2001). *HSRC annual report 2000/2001.* HSRC.
- Kraak, A. (2001). *HSRC annual report 2002/2003.* HSRC.
- Kruger, D. (1988). *An introduction to phenomenological psychology.* Cape Town: Juta.
- Kruger, D. (1979). *An introduction to phenomenological psychology.* Cape Town: Cape Town: Juta.
- Kruger, D. (1998). *An introduction to phenomenological psychology (2<sup>nd</sup> Ed).* Cape Town: Juta.
- Kruger, R. A. (1998). *Focus group: A practical guide for applied research.* London: Sage.
- Kruger, R. A. & Casey, M.A. (2009). *Focus groups: A practical guide for applied research.* (4<sup>th</sup> Edition). Thousand Oaks, CA: Sage.
- Kruger, M, Won, M & Treagust, D.F. (2013). Teachers' Perceptions on the Changes in the Curriculum and Exit Examinations for Biology and Human Biology. *Australian Journal of Teacher Education, 38(3), 41-58.*
- Kruger, D.J. Fouche C.B. & Venter, L. (2005). Quantitative data analysis and interpretation. (In De Vos, A.S., Strydom, H., Fouche, C.B. & Delpont, C.S.L. *Research at grassroots. For the social sciences and human service professions.* 3<sup>rd</sup> ed. Pretoria: Van Schaik.
- Kuester, V. M. (2000). 10 Years on: Have teacher attitudes toward the inclusion of students with disabilities changed? Paper presented at the ISEC 2000: London.
- Labaree, D.F. (2003). The peculiar problems of preparing educational researchers. *Educational Researcher, 32 (4).* 13 -22.
- Lacey, A & Luff, D. (2001), Trent focusses for research and development in primary healthcare. An introduction to qualitative analysis. *Trent Focus, 2001.*
- Lakateb, P. (2014). Hermeneutic phenomenology to explore the student teacher. *Professional Experience, In pp. 606–611.*

- Lampropoulou, V., & Padelliadu, S. (1997). Teachers of the Deaf as compared with other groups of Teachers: Attitudes toward people with disability and inclusion. *American Annals of the Deaf*, 142(1), 2633.
- Langenhoven, K, R. (2014). The effectiveness of an argumentation instructional model in enhancing pre-service science teachers' efficacy to implement a relevant science-indigenous knowledge curriculum in Western Cape classrooms. (Unpublished doctoral thesis). University of the Western Cape, Bellville.
- Langdridge, D. (2007). *Phenomenological psychology: Theory, research and method*. Harlow: Pearson Education.
- Latourelle, S.M., Poplawsky, A., Shamaefsky, B. & Musante, S. (2012). Using socio-scientific Issues-based instruction. *Pedagogy in Action*. [Online] available at <http://serc.carleton.edu/sp/library/issues/index/.html>
- Lauridsen, D.A. (2003). *What are teachers' perceptions of the curriculum development process?* (Unpublished Doctoral thesis, Ohio State University).
- Lau, P., Yuen, M., & Chan, R. 2005. *Do demographic characteristics make difference to burnout among Hong Kong secondary school teachers?* *Social Indicator Research*, 71, 491-516.
- Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, England: Cambridge University Press.
- Laverty, S. M. (2003). Hermeneutic phenomenology and phenomenology: A comparison of historical and methodological considerations. *International Journal of Qualitative Methods*, 2, 21-32. Retrieved from <http://www.ualberta.ca>
- Laverty, S. (2008). Hermeneutic phenomenology and phenomenology: A comparison of historical and methodological considerations. *International journal of qualitative Research*, 2(1994), pp.1–29. Available at: <http://wigan-ojs.library.ualberta.ca/index.php/IJQM/article/view/4510>
- Layder, D. (1996). *Breaking Free and Burning Bridges, Understanding Social Theory*. London Sage.
- Leonardo, Z. (2003). *Ideology, discourse, and school reform*. London: PRAEGER.
- Leedy, L.E. & Ormrod, P.D. (2005). *Practical research, planning and design*. New Jersey: Pearson Prentice Hall.
- Leedy, P.D. & Ormond, J.E. (2010). *Practical research, planning and design*: New York: Mc Millan.



- Leedy, P.D. & Ormond, J.E. (2013). *Practical research: planning and design*. (10<sup>th</sup> ed.). New Jersey: Pearson Education.
- Leedy, P. (1997). *Practical research: Planning and design* (6<sup>th</sup> ed). Upper Saddle River: N-J Prentice Hall.
- Le Grange, L. (2000). Is research a meaningful term for describing the cross fertilization of ideas which characterize contemporary educational research? *South African Journal of Education*, 20(3) 192-195.
- Le Grange, L. (2001). *Pedagogical practices in higher education: A case study in environmental and science education*. (Unpublished doctoral thesis) Stellenbosch University, Stellenbosch.
- Le Grange, L. (2007). (Re) Imagining methods in educational leadership and management research. *South African Journal of Education*, 27, 184-190.
- Le Grange, L. (2008). Challenges for enacting an indigenised science curriculum: A reply to Ogunniyi and Ogawa. *SAJHE*, 22(4), 817-826.
- Le Grange, L. (2012). Ubuntu, Ukama and the healing nature self and society. *Education Policy Theory*, 44 (52), 56-67.
- Le Grange, L. (2012). Veranderinge in skoolbiologie in Suid Afrika na apartheid. *Suid Afrikaanse tydskrif vir Natuurwetenskap en Tegnologie*. 31 (11). [Http://dx.doi.org/1046385/3att\\_ntt.v.311-385](http://dx.doi.org/1046385/3att_ntt.v.311-385)
- Lemon, A. 2004. "Redressing School Inequalities in the Eastern Cape, South Africa." *Journal of Southern African Studies* 30 (2): 269–290.
- Levering, B. (2006). Epistemological issues in phenomenological research: How authoritative are people's accounts of their own perceptions? *Journal of Philosophy of Education*, 40(4), 451-463.
- Lim, J. (2007). *Definitions of successful implementation of the curriculum*. Video conferencing. Available: [www.eprints.vocoutonalim.org](http://www.eprints.vocoutonalim.org). (Accessed 05.10.2017)
- Lincoln, Y.S. (2005). Perspective 3: *Constructivism as a theoretical and interpretive stance*. In J.L. Paul (Ed).
- Lincoln, Y.S., Lynham, S.A & Guba, E.G. (2011). *Worldview at controversies, contractions and emerging confluences, revisited*, In N.K. Denzin & Y.S. Lincoln (eds). *The sage handbook of qualitative research*. Fourth edition. Thousand Oaks, CA. Sage, 97-128.

- Lipinge, S.M. & Kasanda, C.D. (2013). Challenges associated with curriculum alignment, change and assessment reforms in Namibia. *Assessment in education: Principles, Policy & Practice*, 20(4): 424-441.
- Lock, T. (1996). The future biology beyond the compulsory schooling age or wither post. *Biology Journal of Education*, 20 (1), 28-32.
- Lovat, T.J. & Smith D.C. (2003). *Curriculum actions and reflections*. Fourth edition, NSW: Social Science Press.
- Lovit, K. (2001). An analysis of elementary teachers' beliefs regarding the teaching and learning of science education. *Journal of Science Education*, 86 (1), 1-22.
- Lombard, (2010). Outcomes-based education in South Africa: *South African Teacher*. 1-29.
- Lopez, K.A., & Willis, D. G. (2004). Descriptive versus interpretive phenomenology. *Qualitative Health Research*, 5, 726-735. Doi: 10.1177/1049732304263638
- Loughran, J. J. (1996). *Developing reflective practice: Learning about teaching and learning through modeling*. London: Falmer Press.
- Luo, X. (2011). Curriculum Reform in The Course of Social Transformation. *Cultural Studies*, 25(1): 42-54.
- Mabusela, S.M., Ngidi. D.P. & Imenda, S.N. (2016). Implementing the national curriculum statement in the further education and training band: Educators experiences in South Africa. *Journal of Soc Sci*, 46 (11), 61-70.
- MacDonald, C. (2012). Understanding participatory action research: a qualitative research methodology option. *The Canadian Journal of Action Research*, 13(2), 34-50.
- Mack, L. (2010). The philosophical; underpinnings of educational research. *Polyglossia*, 19, 5-11.
- Magrini, M. J. (2015). Phenomenology and curriculum implementation: Discerning a living curriculum through the analysis of Ted Aoki's situational praxis. *Curriculum Studies*, 47(2): 274-299.
- Maphalala, M. C. (2006). Experiences of Educators in Implementing the Revised National Curriculum in the GET Band. (DEd Thesis). KwaDlangezwa: University of Zululand.
- Mapp, T. (2008). 'Understanding Phenomenology: The Lived Experience', *British Journal of Midwifery*, (16), 5, 308.

- Maree, K. & Pietersen, J. (2016). *The qualitative research processes*. In Maree, K., ed. 2nd ed. First steps in Research. Pretoria: Van Schaik Publishers.
- Mason, M. (1999). Outcomes-based education in South African curriculum reform. A response to Jonathan Jansen. *Cambridge Journal of Education*, 29 (1), 137-143.
- Masondo, S. (2020, January, 06). The system is on the rise. Matric pass rate hits 80%. *City Press*. Retrieved from <https://www.news24.com/citypress/News/the-system-is-on-the-rise-matric-pass-rate-hits-80-20200105>
- Mbata, M.G. (2016). *Teachers' experiences of implementing the Curriculum and Assessment Policy Statement (CAPS) In Grade 10 in selected schools at Ndwedwe in Durban*. (Unpublished master's thesis) University of South Africa, Pretoria.
- Mabodoko, M.J. (2017). *A phenomenological investigation into the lived experience of Grade 12 physical Science learners from selected schools in the Western Cape*. (Unpublished master's thesis) Central Peninsula University of Technology.
- Mail & Guardian 17 August 2012. *Teachers unprepared for the curriculum*. Bongani Nkosi.
- Maodzwa–Taruvunga, M and Cross, M. (2012). Jonathan Jansen and the curriculum debate in South Africa: An essay review of Jansen's writings between 1999 and 2009. *Curriculum Inquiry*, 42(1): 126-152.
- Ma. X, (2015). The skills of teacher questioning English classes. *International Educations Studies*. 1(4). 1-9
- Maree, K.J.W, Creswell, Ebersöhn, L., Eloff, R., Ivankova, N.V., Jansen, D., Niewenhuis, J., Pietersen, & J., Clarck, V.L. (2016). *First steps in research* 2nd edition: Pretoria. Van Schaik.
- Maree, K. & Pietersen, J. 2016a. The qualitative research processes. In Maree, K. *First steps in Research*. (pp. 162-172-236). Pretoria: Van Schaik.
- Maree, K. & Pietersen, J. 2016a. Standardisation of a questionnaire. In Maree, K., ed. 2nd ed. *First steps in Research*. (pp. 220-236). Pretoria: Van Schaik.
- Maree, K, & Pietersen, J. (2016). Statistical analysis: Inferential statistics. In K. Maree, (Eds). *First steps in research* 2<sup>nd</sup> edition. (pp. 220-236). Pretoria. Van Schaik.
- Marsh. C.J. (1997). London: The Falmer Press.
- Marsh, C.J., & Willis, G. (2007). *Curriculum: alternative approaches, ongoing issues*. (4<sup>th</sup> ed.). New Jersey, NJ: Pearson/Merrill Prentice Hall.

- Marsh, C. J. & Wills, G. (2003). *Curriculum alternative approaches, ongoing issues*. Second Edition. Upper Saddle River: N.J. Prentice Hall. International.
- Marsh, C.J. & Stafford, K. (1998). *Curriculum practices and issues*. Second Edition. New York McGraw-Hill Books: Sydney.
- Marton, A.M. (2006a). The cultural politics of curriculum reform in China. A case study of geographical education in Shanghai. *Journal of Contemporary China*, 15, (47). 244-245.
- Marton, A. (2006b). *Second interval handbook of science education*. Springer.
- Marton, F. (1986). Phenomography- A research approach to S investigating different understandings of reality. *Journal of Thought*, 21(3), 28-49 doi: 10.2307/42589189
- Martiny, K.M., Toro, J, & Høffding, S. (2021). Framing a Phenomenological Mixed Method: From Inspiration to Guidance. *Front. Psychol.* 12:602081. doi: 10.3389/fpsyg.2021.602081
- Marsh, C. (1993). *Key concepts for understanding curriculum*. London: The Falmer Press.
- Mathison, S; Ross, E.W; Cornet, J.W. (1993). Considering ethical issues in fieldwork. In *Ethical Issues in Qualitative Research*. Res. Sig. AERA.
- Maxwell, J.A. (1996). *Qualitative research design. An interactive approach*. London: Sage.
- Mayer, D. P. (1999). Measuring Instructional Practice: Can Policy makers trust survey data? *Educational evaluation and policy analysis*, 21(1), 29-45.
- Mayoh, J & Onwuegbuzie, A.J. (2003). *Surveying the Landscape of Mixed-methods Phenomenological Research*. Unpublished manuscript, Bournemouth University, England.
- Mayoh, J. & Onwuegbuzie, A.J. (2012). Mix Methods surveying the landscape of mix methods phenomenological research. *International Journal of Multiple Research Approaches*, 8, 1-32.
- McConnel-Henry, T., Chapman, Y., & Francis, K. (2009) Husserl and Heidegger: Exploring the disparity. *International Journal of Nursing Practice*, 15, 7-15
- McMillan, J.H. & Schumacher, S. (2001a). *Research in Education: A conceptual introduction*. 5<sup>th</sup> Edition. New York: Addiso Wesley Longman.
- McMillan, J.H. & Schumacher, S. (2001b). *Research in Education: A conceptual introduction*. New York: Harper Collins.
- McMillan, J.H. & Schumacher, S. (2014). *Research in education: evidence-based inquiry*. 8<sup>th</sup> ed. New York: Pearson.

- Mc Neill, P. (1990). *Research methods*. 2<sup>nd</sup> Edition. London: Routledge.
- McNiff, J. (1996). *You and your action research project*. London: Routledge.
- Mdunge, P.M. (2014). *Improving my professional practice by infusing values of social justice as a teacher educator*. (Unpublished masters' thesis) University of the Free State, Bloemfontein.
- Mellville, W., Hardy, I., & Bartley, A. (2011). Bourdieu, department chairs and the reform of science education. *International Journal of Science Education*, 33 (16): 2275-2293.
- Merriam. S. (1998). *Case study in education research: A qualitative approach*. San Francisco: Jossey-Bass.
- Merriam, S. (2009). *Qualitative research. A guide to design and implementation*. San Francisco
- Merleau-Ponty. M. (1964). *Phenomenology and the sciences of man*. In M. Merleau-Ponty, the primacy of perception. Evanston, I.L: North-Western University Press.
- Mertens, D.M. (2003). Mix methods and the politics of human research. The transformative emancipator perspective in Tashakari, A & Teddie, C. Ed. *Handbook of mix method research in social science and behavioural research*. Thousand Oaks: Sage.
- Michie, M. (2002). Why Indigenous science should be included in the school science curriculum. *Australian Science Teachers Journal*, June, 48, (2,) pp 36-40.
- Miles, M.B. & Huberman, A.M. (1994) *Qualitative data-analysis: an expanded source-book*, 2<sup>nd</sup> ed. Thousand Oaks, CA: Sage.
- Mills, J. & Birks, M. (2014). *Qualitative methodology: A practical guide*. London: Sage.
- Mnguni, L.E. (2011). *The relationship between the Grade 11 Biology curriculum and HIV and AIDS behaviour transformation of students*. (Unpublished doctoral thesis). University of Pretoria, Pretoria.
- Moadza, –Taruvinga, M & Cross, M. (2012). Jonathan Jansen and the curriculum debate in South Africa: An essay review of Jansen's writings 1999-2009. *Curriculum Inquiry*, 42(1), 126-152.
- Moerer-Urdahl, T. & Creswell, J. (2004). Using transcendental phenomenology to explore the ripple effect in a leadership mentoring program. *International Journal of Qualitative Methods*, 3(2), 1-28.

- Mogashoa. T. (2013). The role of school management teams in curriculum implementation and management of selected schools in the Gauteng Province. *Mediterranean Journal of Social Science*, 4 (14), 2013.
- Mogashoa. T. (2013). *Teaching and learning policies in South African schools in the new democratic dispensation: A critical discourse analysis*. (Unpublished master's thesis). University of South Africa, Pretoria.
- Mohajan, H.K. (2017). Two criteria for good measurement in research: Validity and Reliability. *Annals of Spiru Haret University*, 17(3) 58-82.
- Mokgota, M. & Mji, A. (2006). Factors associated with high school learner's poor performance: A spotlight on mathematics and physical science. *South African Journal of Education*, 26(2) 253-266.
- Martiny, K.M., Toro, J & Høffding, S. (2021). Framing a phenomenological mixed-method: From inspiration to guidance: *Psychol.* 12:602081. doi: 10.3389/fpsyg.2021.602081
- Moll, A. (1999). *Unpublished paper presented at research seminar for M. Ed Students*. University of South Africa: Pretoria.
- Momennasab, M, & Zah-Tab, T. (2002). The survey on knowledge, attitudes and implementation of faculty members of Lorestan University of Medical Sciences about lesson planning. *Journal of EDC (Educational Development Centre)*, (2), 1-6.
- Moran, D. (2000). *Introduction to phenomenology*. London. New Fetter Lane.
- Morgan, D.L. (1998) *Practical strategies for combining quantitative and qualitative methods applications to health research*, 8, 362-376. Doi: 10.1177/104973239800800307
- Morrel, R., D. Epstein, E. Unterhalter, D. Bhana, and R. Moletsane. 2009. *Towards Gender Equality: South African Schools during the HIV and AIDS Epidemic*. Scottsville: University of KwaZulu-Natal Press.
- Morris, S.C. (2013). *A short guide to phenomenology. Dissertation*. University of Maryland. Maryland.
- Motala, E. & Pampallis, J. (Eds). (2001). *Education and Equity: The Impact of State Policies on South African Education*. Cape Town: Heinemann.

- Motwani, J. Subramanian, R & Gopalakrishna, P. (2011). Critical factors for successful ERP implementation: Exploratory findings from four case studies. *Computers in Industry* 56 (6). 529-544 <https://doi.org/10.1016/j.compind.2005.02.005>
- Moustakas C. (1994). *Phenomenological research methods*. Thousand Oaks, CA: Sage.
- Mourshed, M., Chijikoe, C., & Barber, M. (2010) *How the world's most improved school systems getting better*. McKinsey & Company. Retrieved May 23, from: <http://mckinseysociety.com/how-the-world-most-improved=school-system-keep-gettingbetter>
- Mphalala, S. (2015). *Sadtu Teachers forum*, Northern Cape Province
- Mpanza, N.M. (2013). *A case study of teachers' implementation of the Grade Four Natural Science Curriculum*. (Unpublished master's thesis UKZN) University of KwaZulu Natal, Pietermaritzburg.
- Msila, V.T. (2007). From apartheid education to the Revised National Curriculum Statement. Pedagogy for identity formation and nation building in South Africa. University of South Africa. *Nordic Journal of African Studies*, 16 (2), 146-160.
- Mthembu, P.E. (2013). *Phenomenological study of the lived experiences of women primary school principals in Umgungundlovu District*. (Unpublished master's thesis UKZN) University of KwaZulu Natal, Pietermaritzburg
- Muller, J. (1998). NQF and outcomes-based education: Pedagogic models and hard choices, in Centre for Education Policy Development (Eds.). *Reconstruction, development and the National Qualifications Framework: Conference proceedings*. Johannesburg: CEPD.
- Muller, J. & Taylor, N. (1995). School development and everyday life. Knowledge's sacred and profane. *Social Epistemology*, 9, 257-275.
- Mulkeen, A. (2010). *Teachers in Anglophone Africa: Issues in teacher supply, training, and management*. Washington D. C: The World Bank.
- Mulaudzi, F. & Ngunyulu, R.N. (2009). Indigenous practices regarding postnatal care at Sikhuyani village in the Limpopo Province of South Africa and midwifery. *Journal of Nursing (1)* pp 48-64.
- Muthivhi, A. (2010). *Ploughing new fields of knowledge: culture and the rise of community schooling in Venda*.

- Muwanga-Zakes, J.W.F. (2000). Is science education in South Africa in a crisis? The Eastern Cape experience. *Africa Journal of Research in Mathematics, Science and Technology education*, 4(13), 1-11.
- Muenda, G., Gitaar, E., Nyaga, G., Matha, G & Reche, G. (2013). Factors contributing to students' poor performances in Mathematics in public schools in Tharaka South district Kenya. *Journal of Education and Practice*, 4(7), 93-99.
- Naidoo, I. (2017). *Quality of the grade 12 life sciences curriculum: perceptions and possibilities for lifelong learning*. (Unpublished doctoral thesis). Durban University of Technology, Durban.
- Nakabugo, M.G. & Siebörger, R. (2001). Curriculum reform and teaching in South Africa: making a paradigm shift? *International Journal of Educational Development*, 21, 53–60.
- Nakedi, E. M. (2014). *Physical science teachers' responses to curriculum challenges in South Africa- pedagogical content knowledge focused case studies*. (Unpublished doctoral thesis). University of Witwatersrand, Johannesburg.
- National Council of Teachers of Mathematics. (1991). *Professional standards for teaching mathematics*. Reston, VA: Author.
- Ndawi, O. & Maravanyika, O. (2011). *Curriculum and the building blocks: Concepts and processes*. Gweru. Mambo Press.
- Nel, B.F. 1984: Education: a social science. *South African Journal of Education*. 4(1): 1-11.
- Neill, J. (2007) *Qualitative versus quantitative research: Key points in a classic Debate*. [http://wilderdom.com/research/qualitative versus quantitative Research.html](http://wilderdom.com/research/qualitative%20versus%20quantitative%20Research.html)14/4/07
- Negumbo, T.A. (2018). *An investigation of teachers experiences in relation to Junior Secondary School Social Science Curriculum in the // Kharas Region, Namibia*. (Unpublished doctoral thesis). University of Stellenbosch, Stellenbosch.
- Nelson, D. (2008). *Technology Education: classroom Management. Madison Metropolitan School District: Vern Laufenberg*. [tokiweb.mason.k12.wi.us/articles](http://tokiweb.mason.k12.wi.us/articles) Accessed 17 Feb 2012.
- Neuman, N. (2000). *Social research methods: Qualitative and quantitative approach*. 4th edition. Allyn & Bacon.
- Neuman, W.L. (2002). *Social science research methods*. Pearson's Education.



- Neville, J. (2007). *Qualitative versus quantitative research: Key points in classic debate*. <http://gifted.uconn.edu>
- Newton, P., Driver, R. & Osborne, J. (1999). The place of argumentation in pedagogy of school science. *International Journal of Science Education*, 21, 513-576.
- Ng, S.W. (2009). Why did principals and teachers respond differently to curriculum reform? *Teacher Development: An International Journal of Teachers' Professional Development*, 13(3): 187-203.
- Ngulube, P. & Ngulube, B. (2015). Mix methods research in the South African Journal of Economic Management Sciences: An investigations of trends in the literature (SAJEMS). *South African Journal of Education Management Sciences*, 18(1)1-13.
- Nicolini, D. (2016). *Knowing in Organizations: A Practice-Based Approach: A Practice-Based Approach*. Routledge.
- Nieuwenhuis, J. (2007). Qualitative research designs and data collection techniques Ivankova, N.V., Creswell, J.W., & Stick, S.L. In K. Maree (Ed.). *First steps in research* (pp. 72-102). Pretoria: Van Schaik.
- Nieuwenhuis, J. (2016). Qualitative research designs and data collection techniques. In K. Maree (Ed.), *First steps in research* (pp. 72-102). Pretoria: Van Schaik.
- Northern Cape Department of Education, (2017). *Statistics for the Northern Cape Department of Education*.
- Northern Cape Department of Education. (2017). Circular.L.2. 13. (21 September 2017). *Indicative resource allocations to public ordinary schools for the 2017/2018 Departmental financial year*.
- Nkomo, G.M. (1995). *Curriculum implementation, change and innovation*. University of Zimbabwe, Centre for Distance Education: University of Zimbabwe: Harare.
- Nkopodi, N. & Sunday, B. (2013). Developing a theoretical for investigating the mathematics and science teachers' pedagogical content knowledge in South Africa and Zimbabwe. *Mediterranean Journal of Social Science*, 4(14) 470-482.
- Ntshaba, L.P. (2012). *A study of technology education Instructional practices in Grade nine classrooms: A case study of three Senior Secondary schools in the King William's Town district*. (Unpublished master's thesis). Fort Hare University. Bisho.

- Ntshingila-Khoza, R. (1996). *Teachers' pedagogical practices: Studies in Soweto classrooms*. Durban: The Improving Education Quality Project.
- Nunnally, J. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Njeru, H. N. & Orodho A. J (2003). *Access and Participation in Secondary School Education in Kenya: Emerging Issues and Policy Implications*. IPAR Discussion paper No. 037/2003 ISBN 9966-948-27-9
- Nzimande, B. (1992). The national educational policy initiative. *Transformation Journal*, 18:161-165.
- Ogbonnaya, U.I. & Awuah, F.K. (2019). Quintile ranking of schools in South Africa and learners' achievement in probability. *Statistics Education Research Journal*, 18(1), 106–119, Retrieved from <http://www.stat.auckland.ac.nz/serj>
- Ogunniyi, M. B. (2004). The challenge of preparing and equipping science teachers in higher education to integrate scientific and indigenous knowledge systems for learners, *SAJHE* 18(3) 2004
- Ogunniyi, M.B. (1986). *Teaching science in Africa*. Ibadan: Salem Media (Nig) Ltd.
- Ogunniyi, M.B. (1996). Science, technology and mathematics: The problem of developing human capital in Africa. *Journal of Science Education*, 18 (3), 267-284.
- Ogunniyi, M.B. (1997). *Curriculum 2005: A panacea or a Pandora's box?* (Vol. Seminar series 1). Bellville: Published by the School of Science and Mathematics Education at the University of the Western Cape.
- Ogunniyi, M.B. (1993). *Understanding research in the social sciences*. Ibadan: University Press Ltd.
- Ogunniyi, M.B. (2003). *Understanding quantitative research. Lecture notes*. University of the Western Cape.
- Ogunniyi, M.B. (2004). The challenges of preparing and equipping science teachers in higher education to intergrate scientific and indigenous knowledge systems for subjects. *South African Journal of Higher Education*, 18(3), 239-304.
- Ogunniyi, M. (2007a). Teachers' stances and practical argumentation regarding a science-indigenous knowledge curriculum: Part 1. *International Journal of Science Education*, 29(8), 963-986.

- Ogunniyi, M. (2007b). Teachers' stances and practical argumentation regarding a science-indigenous knowledge curriculum: Part 2. *International Journal of Science Education*, 29(10), 1189-1027.
- Ogunniyi, M.B. (2011a). Science and Indigenous Knowledge in the melting Pot: Prospects and Challenges. *The 3rd International Conference on Science and IKS, University of the Western Cape, Science-IKS Project Group*. Cape Town: University of the Western Cape.
- Ogunniyi, M.B. (2011b). The context of training teachers to implement a socially relevant education in Africa. *African Journal of Research in Mathematics, Science and Technology Education*, 15 (3), 98-121.
- Ogunniyi, M.B. (2012). Evaluating Skills, Knowledge and Values of learners exposed to a dialogical argumentation instruction and the traditional lecture method on fermentation. *SAARMSTE 2012 Conference to be held in Malawi, Crossroads Hotel from 16th to 19th January 2012*.
- Ogunniyi, M.B. (2015). Using an ubuntu-driven argumentation instruction to awaken science teachers' and educators' awareness about the value of indigenous knowledge. *2015 Inaugural Conference of the African Association for the Study of Indigenous Knowledge (AASIKS)* (pp. 191-204). Windhoek, Namibia: University of Namibia.
- Ogunniyi M.B. (2020) Tapping the Potential of Ubuntu for a Science that Promotes Social Justice and Moral Responsibility. In: Yacoubian H.A., & Hansson L. (eds.) *Nature of Science for Social Justice. Science: Philosophy, History and Education* (pp.157-167). Springer, Cham. [https://doi.org/10.1007/978-3-030-47260-3\\_9](https://doi.org/10.1007/978-3-030-47260-3_9)
- Ojikutu, R.B. (2017). *An exploration of the Nigerian skilled workers' lived experiences under the Strategic Human Resource Model* (Unpublished doctoral Thesis), Heriot Watt University. Edinburgh
- Okyere, M. (2018). Curriculum and its implementation in the lens of Ted Aoki: Implications for Ghanaian mathematics education. *African Educational Research Journal*, 6(2): 94-98.
- O' Leary, L. (2004). *The essential guide to research*. London Sage Publications.
- Olson, M. & Craig, C. (2001) Opportunities and challenges in the development of teachers' knowledge: The Development of narrative authority through knowledge communities, *Teaching and Teacher Education*, (17)6, 667-684.

- Onwuegbuzie, A.J., Leech, N.L., & Collins, K.M.T. (2007). Innovative data collection strategies in qualitative research. *The Qualitative Report*, 15 (3). 696-726 [Online] available at: [http 15-3/onwuegbuzie.pdf](http://15-3/onwuegbuzie.pdf)
- Onwuegbuzie, A.J & Collins, K.M.T. (2007). A typology of mixed-methods sampling designs in social science research. *The qualitative report* 12 (2) 281-316.
- Onwuegbuzie, A.J & Leech, N.L (2006). Linking research questions to mix methods data analysis procedures. *The qualitative Report*, 11(3), 474-498.
- Ornstein, A.C. & Huskins, F.P. (2004).
- Ornstein, A.C. & Huskins, F.P. (2009). *Curriculum foundations, principles and issues*. (6th ed.). Boston, MA: Pearson Education.
- Ornstein, A.C. & Hunkins, F.P. (2013). *Curriculum: Foundations, principles and issues* (6<sup>th</sup> edition). Boston: Pearson's Education.
- Orten, D., & Erginer, E. (2016). Metaphoric perceptions of the pioneering scholars in the field of curriculum development in Turkey in regard of curriculum development in education. *Uluslararası Toplum Araştırmaları Dergisi*, 6, 387-414
- Osborne, J.W. (1994). Some similarities and differences among phenomenological and other methods of psychological qualitative research. *Canadian Psychology Association*, 35, 167-189. Retrieved from <http://0-web.ebscohost.com.innopac.up.ac.za>.
- Østergaard, E., Dahlin, B., & Hugo, A. (2008). Doing phenomenology in science education: A research review. *Studies in Science Education* 44 (2): 93-121.
- Ozdemir, M. S. (2012). Metaphoric perceptions of prospective teachers regarding the concept of curriculum. *Journal of Theoretical Educational Science*, 5 (3), 369–393.
- Padilla-Diaz, M. (2015). Phenomenological in educational qualitative research. *Philosophy as Science*, 1 (2); 101-110.
- Pandor, N. (2006). *Making sense of the new life sciences curriculum*. Address by the Minister of Education, Naledi Pandor MP, University of the Western Cape, Bellville, Thursday, 2 March 2006. Available at <http://www.info.gov.za/speeches/2006/06030908151001.htm>. Accessed 3 August 2010
- Pallant, J. (2005). *SPSS survival manual. A step-by-step guide in data analysis using SPSS for windows* (Version 1.2). Second Edition. Maidenhead, Berkshire: Open University Press.

- Pang, M.F. (2003). Two faces of variation: On continuity in the phenomenographic movement. *Scandinavian Journal of Educational Research*, 47(2), 145-156 doi: 10.1080/00313830308612
- Paul, J.L. (2005). *Introduction to the philosophies of research and criticism in education and the social sciences*. Upper Saddle River, NJ: Pearson.
- Patton, M.Q. 1990. *Qualitative evaluation and research methods*. 2nd ed. Newbury Park, CA: Sage.
- Patton, M.Q. (2001). *Qualitative evaluation and research methods*. (3<sup>rd</sup> edition). Thousand Oaks, CA: Sage.
- Patton, M.Q. (2002). *Qualitative evaluation and research methods*. (2<sup>nd</sup> edition). Thousand Oaks, CA: Sage.
- Patton, M.Q. (2015). *Qualitative research and evaluation methods*. 4th ed. London: Sage.
- Pesanayi, T. & O' Donoghue, R. (2019). Think piece. Situating Education for Sustainable Development in Southern African philosophy and contexts of social- ecological change to enhance curriculum relevance and the common good. *Southern African Journal of Environmental Education* (35)1-9 ISSN 2411-5959 | DOI 10.4314/sajee. v35i1.15
- Petrovi, J. (2010). An approach to difference and repetition. *Journal of Philosophy: A Cross Disciplinary Inquiry*, Winter, 5 (11): 35-43.
- Pitso, V. & Maila, M. (2013). Re-thinking teacher professional development through Schön's Reflective Practice and Situated Learning Lenses. *Mediterranean Journal of Social Sciences* 4 (3). 211-218.
- Pfaff, K.A., Baxter, P.E., Jack, S.M. & Ploeg, J. (2014). Exploring new graduate nurse confidence in inter professional collaborations: A mix methods study. *International Journal of Nursing Studies*, 51, 1142-1152.
- Pickard, A.J. (2013). *Research methods in information*. London: Facet.
- Pinar, W.F. (1991). Reconceptualist approach in Lewy, Arie Ed. *The interval encyclopaedia of curriculum*. Oxford: Pergmon Press.
- Pinar, W.F. Reynolds, W.M., Slattery, P. & Taubman, P.M. (2008). *Understanding curriculum*. New York: Peter Lang.

- Pinnock, A.J.E. (2011). *A practical guide to implementing CAPS: A toolkit for teachers, schools' managers and education officials to use to assist in managing the implementation of a new curriculum*. NAPTOSA.
- Plano Clark, V. L., & Creswell, C. (2008). *The mixed methods reader*. USA: Sage.
- Plano Clark, V. L., & Ivankova, N. V. (2016). *Mixed methods research: A guide to the field*. London: Sage.
- Plewis, I. (2010). Curriculum coverage and classroom grouping as explanations of between teacher differences in pupils' mathematics progress: *Education Research and Evaluation*. <http://www.tandfonline.com/edre>. (Retrieved: 18 June 2017)
- Polkinghorne, D. E. (2005). Language and meaning. Data collection in qualitative research *Journal of Counselling Psychology*, 52(2), 137-145.
- Polkinghorne, D. E. (1983). *Methodology for human science*: New York State University: New York.
- Polkinghorne, D. E. (1989). Phenomenological research methods: In R.S Valle & S. Halling (Eds), *Existential phenomenological perspectives in psychology. Exploring the breath of human experiences*. (41-60) New York: Plenum Press.
- Pooley, J. A., Breen, L., Pike, L. T., Cohen, L., & Drew, N. M. (2008). Critiquing the school community: A qualitative study of children's conceptualization of their school. *International Journal of Qualitative Studies in Education*, 21(2), 87-98.
- Posner, C.J. (2009). *Analysing the curriculum*. Third Edition, Boston, Mc Graw Hill Education.
- Potenza, E & Monyokolo, M. (1999). A destination without a Map: premature implementation of curriculum 2005? In J. Jansen and P. Christie (Eds.) *Changing Curriculum: Studies on Outcomes-based Education in South Africa*, 181 – 200. Juta and Co: South Africa.
- Pratt, D. (1994). *Curriculum planning: A handbook for professionals*, San Diego, CA. Houghton Mifflin.
- Priestly, M. & Humes, W. (2010). The development of Scotland's curriculum for excellence: Amnesia and De ja vu, *Oxford Review of Education*, 36 (3), 345-361. Retrieved from <https://doi.org/10.80/03054980903518951>

- Priestly, M. (2011). Whatever happened to curriculum theory? Critical realism and curriculum change. *Pedagogic, Culture & Society*. 19 (2), 221-237. Retrieved from [https:// doi.org/10.1088/14681366.2011382258](https://doi.org/10.1088/14681366.2011382258)
- Pudi, T. (2007). 'From OBE to C2005 to RNCS': Are we still on track? *Africa Education Review*, 3(1-2): 100-112.
- Punch, K.F. (2005). *Introduction to social research: Quantitative and qualitative approaches*. 2nd edition. Los Angeles: Sage.
- Punch, K., (1998). *Introduction to social research: Quantitative and qualitative research approaches*, London: SAGE.
- Racher, F.E & Robinson, S. (2003). Are phenomenology and post positivism strange bedfellows? *Western Journal of Nursing Research*.25 (5), 464-481.
- Raath, S. & Hay, A. (2016). Self-efficacy: A South African case study on teachers' commitment to integrate climate change resilience into their teaching practices. *Cogent Education* (2016), 3: 1264698 <http://dx.doi.org/10.1080/2331186X.2016.1264698>
- Ramabula, N.S. (2017). *Teachers' perceptions of the curriculum assessment policy statement in the Nzhelele West circuit*. (Unpublished masters' thesis) University of South Africa, Pretoria.
- Rampersad, R. (2001). A strategy for teacher involvement in curriculum development. *South African Journal of Education*, 21 (4), 287-292.
- Raselimo, M, G. (2010). *Curriculum reform in Lesotho: Exploring the interface between environmental education and Geography in selected schools*. (Unpublished Doctoral thesis) Rhodes University.
- Raselabe, M.J. (2006). *Foundation phase educators' perception of curriculum 2005 in the Nzhelele west circuit* (Unpublished masters' thesis) University of Stellenbosch, Stellenbosch.
- Reading, C., & Shaughnessy, J. M. (2000). *Student perceptions of variation in a sampling situation*. In T. Hakahar & M. Koyama (Eds.), *Proceedings of the 24th Conference of the International Group for the Psychology of Mathematics education*, 4, 89-96.
- Reeves, T. & Hedberg, J.G. (2003). *Interactive learning systems evaluation*. Engelwood Cliffs, NJ. Educational Technology Publications.

- Reddy, V., Dlamini, N., & Ntshilinga-Khoza, R. (2004). *Investigate the reasons for the low pass rate in Grade 10 in 2003*. Final report from the Department of Education Task Team. Pretoria. Department of Education.
- Reiman A.J. (1999) *Guided reflective practice*, N.C. State University, Raleigh.
- Remillard. J.T. (2005). Can curriculum material support teachers' learning? Two fourth grade teachers' use of a new mathematics text. *The Elementary School Journal*, 100 (4) 331-350.
- Remillard, J.T. (2005). Examining key concepts in research on teachers' use of mathematics. *Review of Educational Research*, 75 (2), 21-246.
- Rensburg, I. (2000). Reflections from the inside: key policy assumptions and how they have shaped policy making and implementation in South Africa, 1994-2000, in: A. Kraak & M. Young (Eds) *Education in retrospect- policy and implementation since 1990*. Pretoria: HSRC.
- Resnik, D.B. (2010). What is ethics in research and why is it important? Adapted from Shamoo, A. & Resnik, D. (2010). *Responsible conduct of research 2<sup>nd</sup> ed*. Ney York: Oxford University Press. [Online] available at [http:// www, niehs.nih.gov/research/resources/bioethics/what is: cfm](http://www.niehs.nih.gov/research/resources/bioethics/what_is_cfm) Accessed 29 February 2020
- Ritchie, J. & Lewis, J. (2003). *Qualitative research practice*: London: Sage.
- Riffel. A.D. (2020). *Social and cultural relevance of aspects of Indigenous knowledge systems (IKS), meteorological literacy and meteorological science conceptions*. (Unpublished doctoral dissertation). The University of the Western Cape, Bellville.
- Rikowski, G. (2004). Marx and the education of the future. *Policy Futures in Education*, 2(3), 6(4):565-577.
- Rivkin, S. G. (2005). Teachers, Schools and Academic Achievement. *Econometrica* 73(2): 417 – 458.
- Robin Wood Johnson foundation (2012). *Qualitative research guideline project*.[www.qualres.org](http://www.qualres.org). Retrieved 20 August 2017.
- Robson, J. (2002). *Mentoring and teacher development: a case study*. (Unpublished doctoral thesis). The University of the Western Cape, Bellville.
- Robitaille, D.F. Mcknight, C.C, Schmidt, W.H. Britton, E.D. Raison, S.A. & Nicol, C. (1993). TIMSS Monograph. Curriculum Frameworks for Mathematics and Science. Vancouver, BC. *Pacific educational press*.



- Roche, M. (1973). *Phenomenology, language and the social sciences* First edit., London: Routledge & Kegan Paul Ltd.
- Rogan, J.M. (2007). An uncertain harvest: A case study of implementation of innovation. *Journal of Curriculum Studies*, 39(1), 97-121.
- Rogan, J.M. & Aldous, C. (2005). Relationship between the constructs of a theory of curriculum implementation. *Journal of Research in Science Teaching*, 42 (3), 313-336.
- Rogan, J.M. & Aldous, C.M. (2009). The implementation of the Natural Science outcome3. Embedding in the learning of science and environmental issues. *African Journal for Research in Mathematics, Science and Technology Education*, (3) 1.
- Rogan, J. (2004). The implementation of 2004. Out of the frying pan.....? Case studies of some science classrooms. *African Journal of Research in Mathematics and Science and Technology Education*, 8,165 -179.
- Rogan, J. M. & Grayson, D. J. (2003). Towards a theory of curriculum implementation with particular reference to science education in developing countries. *International Journal of Science Education*, 25(10), 1171 – 1204. [Http:// www.Tandf.co.uk/journal](http://www.Tandf.co.uk/journal). Accessed 14 September 2018
- Rogan, J. (2000). Strawberries, cream and the implementation of C2005. Towards a research agenda. *South African Journal of Education*, 20, 118-125.
- Rondinelli, D. (1990). “Decentralization, territorial power and the state: A critical response.” *Development and Change*, 21, 3, 491-500.
- Roth, M. W. (1995). *Authentic school science: Knowing and learning and in open-inquiry science laboratories*. Dordrecht. The Netherlands: Kluwer.
- Roth, W. M., & Bowen, G.M. (1999). Complexities of graphical representations during ecology lectures: An analysis rooted in semiotics and hermeneutic phenomenology. *Learning and Instruction*, 9, 235–256.
- Roth, W. M., McRobbie, C., Lucas, K. B., & Boutonné, S. (1997). The local production of order in traditional science laboratories: A phenomenological analysis. *Learning and Instruction*, 7, 107-136.
- Rossmann, G.B. (1995). Numbers and words: combining qualitative and quantitative methods in a single large evaluation study. *Evaluation Review*, 9(5), 627-643.

- Rosetti, C. W. and Henderson, S. J. (2013). 'Lived experiences of adolescents with learning disabilities', *The Qualitative Report*, (18), 47,1-17.
- Rubin, H.J. & Rubin, I.S. (1995). *Qualitative interviewing. The art of hearing data*. London: Sage.
- Saayman, W. (1991). 'Who owns the schools will own Africa' Christian mission, education and culture in Africa. *Journal for the Study of Religion*, 4(2), 29-44. Retrieved December 4, 2020, from <http://www.jstor.org/stable/24764244>
- SAHO (Sahistory online) (2011). South Africa in the 1900's (1900-1997). Retrieved from Saayman, W. (1991). Who owns the schools will own Africa? Christian mission education and culture in Africa. *Assessment for the study of Religion in Southern Africa*, 4(2) 29-44.
- Saberian, M., Aghajani, S., Ghorbani, R., & Malek, M. (2003). Medical faculty members' attitude on lesson planning. Semnan University of Medical Sciences. *Journal of Medical Education*, 2 (2). Retrieved from: [http:// www.sbm.ac.ir](http://www.sbm.ac.ir)
- Salvano-Pardieu, V., Fontaine, R., Bouazzaoui, B. & Florer, F., 2009. Teachers' sanction in the classroom: Effect of age, experience, gender and academic context. *Teaching and Teacher Education*, 25(1), 1-11.
- Sapsford, R. (1999). *Survey research*. London: Sage.
- Sargent. T. (2011). New curriculum reforms, implementation and the transformation of educational beliefs practices and structures in Gansa Province. *Education and Societies*, 44 (91), 47-72.
- Savage, G.C & O'Connor, K. (2015). National agendas in global times: curriculum reforms in Australia and the USA since the 1980s. *Journal of Education Policy*, 30(5): 609-630.
- Sayed, Y. & Motala, S. (2012). "Getting in and Staying There: Exclusion and Inclusion in South African Schools." *Southern African Review of Education* 18 (2): 105–118.
- Sayed, Y. & Ahmed, R. (2015) Education quality and teaching and learning in the post 2015 education agenda. *International Journal of Educational Development*, 40 330-338.
- Southern African Review of Education* 18 (2): 105–118.
- Schensul, S.L. & Schensul, J.J. (1999). *Essential ethnographic methods: observations, interviews and questionnaires*. Walnut Creek, CA. Alyamira Press.
- Schön, D.A. (1970). *Jossey – Bass higher education series. Educating the reflective practitioner: Toward a new design for teaching and learning for professionals*. Jossey- Bass.

- Schon, D. (1983). *The Reflective Practitioner: How Professionals Think in Action*, Basic Books, New York.
- Schön, D. (1987). *Educating the Reflective Practitioner: Towards a New Design for Teaching in the Professions*, Jossey-Bass, San Francisco.
- Schon, D. (1991). *The reflective practitioner: How professionals think in action*. Aldershot: Ashgate Publishing Ltd.
- Schuemann, K.B. (2014). *A phenomenological study into how students experience and understanding the university presidency*. (Unpublished Doctoral thesis) Western Michigan University.
- Schumacher, L.A. (2010). *The caregivers' journey: A phenomenological study of the lived experience of leisure for caregivers in the sandwich generation who care for a patient with Dementia*. (Unpublished masters' thesis) University of Iowa.
- Schunk, D.H. (2000). *Learning theories. An educational perspective 3<sup>rd</sup>* (ed) Upper Saddle River. N.J. Merrill.
- Schweitzer, R.D. (1983). *A phenomenological explication of dream interpretation among rural and urban Nguni people*. Unpublished doctoral dissertation. Rhodes University.
- Scott, J & Marshall, G. (1998). *A dictionary of sociology*. Oxford University Press.
- Scott, P.H. & Mortimer, E.F. (2003). *Meaning making in secondary science classrooms*. Maidenhead: Open University Press.
- Seale, C. (2000). *The quality of qualitative research*: London: Sage.
- Sedio, Z. (2013). *Educator's interpretation of the intended technology education curriculum in the General Education and Training Phase*. (Unpublished master's thesis). University of Pretoria, Pretoria.
- Seikkula-Leino, J. (2011). The implementation of entrepreneurship education through curriculum reform in Finnish comprehensive schools. *Journal of Curriculum Studies*, 43(1), 69-85.
- Seleti, Y. (1997.) *From history to human social science. The new curriculum framework at the end of history for General Education and Training level*. Retrieved 20 January 2016.
- Shan, D. (2002). Curriculum reform aimed at promoting curriculum reform and quality in education. *International Journal of Contemporary Development*, 29, 241-249.

- Shan, C.C. (2002). Explaining crossover and superiority as left to right evaluation. *A Linguistic and Philosophy*. 29 91-134. Doi 10.1007/5109880056380-7
- Shaw, R. K. (2010). *Husserl's Phenomenological Method in Management*, In *Proceedings of the ANZAM Conference*, Adelaide, Australia, and New Zealand Academy of Management
- Sherman, E. (1987). *Meaning in mid-life transitions*. New York: State University of New York Press.
- Sherman, E. & Reid, W. (1994). *Qualitative research in social work*. New York: Columbia.
- Sherman, E. (1997). *Meaning in midlife transitions*. New York: State University of New York Press.
- Shriner, M., Schlee, B. M., & Libler, R. (2010). Teachers' perceptions, attitudes and beliefs regarding curriculum integration. *The Australian Educational Researcher*, 37 (1), 51–62.
- Shulman, L.S. (1986). Those who understand knowledge growth in teaching. *Educational Researcher*, 15 (2) 4-14.
- Shulman, L.S. (2004). *Teaching as community property. Essays on higher education*. USA: Jossey Bass Wiley.
- Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15, 4-14.
- Shulman, L.S. (1987a). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57, 1-22.
- Shulman, L.S. (1987b). Assessing for teaching: An initiative for the profession. *Phi Delta Kappan*, 69 (1), 38-44.
- Sibanda, I. & Blignaut, S. (2020). Implementing a new history curriculum: The Zimbabwean experience. *Curriculum Perspectives*, Smith, D.W. & Thomasson, A.L. (2005). *Phenomenology and philosophy of Mind*. Oxford: Oxford University.
- Sibanda, I. (2016). *An investigation into the factors associated with high school learner's performance in physical science in the Libode district in the Eastern Cape* (Unpublished doctoral dissertation).
- Silverman, (2010). *Diong qualitative research- A practical handbook*. Sage Publications. Limited, 3<sup>rd</sup> Edition, London, UK.
- Smith, M. K. (2000). *Curriculum theory and practice*. The encyclopaedia of internal education. [www.infed.org/biblio/curriculum.htm](http://www.infed.org/biblio/curriculum.htm). Accessed 13 April 2017

- Smith, J.A. (2004). Reflecting on the development of interpretive phenomenological analysis and its contribution to qualitative research in psychology. *Qualitative Research in Psychology*, 1, 39-54. doi: 10.1191/1478088704qp004oa
- Smith, J.A. (2008). *Qualitative Psychology: A practical guide to research methods* (2nd ed.). London, England: Sage.
- Smith, G. D. (2009). 'East Africa: Extended Families with Many Rights', *Entrepreneurship: Theory and Practice*, (33), 6, 1239 – 1244
- Smith, L. & Southerland. S. (2007). Reforming practice or modifying reforms? Elementary teachers' responses to the tools of reform. *Journal of Research in Science Teaching*, 44 (3), 396-423.
- Smith, D. L. & Lovat, T. J. (2006). *Curriculum action reflection*. Australian Social Science Press.
- Smyth, R. (2006). Explore congruence between Habermasian philosophy, mix methods research and managing data using Navivo. *International Journal of Qualitative Methods*, 5 (2), 1-15.
- Snively, G. & Corsiglia, J. (2001). Discovering indigenous science: Implication for science education, *Science Education*, 85 (1), 6-34.
- Somekh, B. (2011). Observation. In B. Somekh & C, Lewin (Eds), *Theory and methods in social science research*. (2<sup>nd</sup> edition) London: Sage.
- Somekh, B. (2011). Teacher development: *Critical discourses on teacher development*. Typo Graphic.
- Soule, K. E. 2013. *Connected: A phenomenology of attachment parenting*. (Unpublished doctoral dissertation). The University of Georgia, Georgia.
- South African Schools Act no 84 of 1996. <http://www.education.gov.za>. Accessed 17 December 2017.
- South African Institute for Race Relations (SAIRR). 1967. *A survey of race relations*. [Online]. Available: <https://www.sahistory.org.za/sites/default/files/SAIRR%20Survey%201967.pdf> [2016, November 10].
- Southworth, G. (2004). Learning- Centred leadership. In B. Davies (ed). *The essentials of school leadership*. London. Paul Chapman.
- Sokolowski, R. (2000). *Introduction to phenomenology*. Cambridge. Cambridge University Press.

- Spady, W. (2004). Using the SAQA critical outcomes to empower learners and transform education, *Perspectives in Education*, 22 (2), 165-177.
- Spady, W. and Marshall, K. 1991. Beyond traditional outcome-based education. *Educational Leadership*, 46 (2): 67-72.
- Spady, W. & Marshall, K. (1994). Light not heat on OBE. *The American School Board Journal*, 18, 29-33.
- Sparapani, E.F., Callejo, D., Gould, J., Hillman, S. & Clark, L. (2014). A global curriculum? Understanding teaching and learning in the United States, Taiwan, India and Mexico. *International Student Assessment 4* (2): 1-15
- Spaul, N. (2012). *Equity & Efficiency in South African primary schools: A Preliminary analysis of SACMEQ III South Africa*. (Unpublished master's Thesis). Stellenbosch University. Stellenbosch.
- Spaull, N. (2013a). "Poverty & Privilege: Primary School Inequality in South Africa." *International Journal of Educational*
- Spaul, N. (2013b). *South African education crisis. The quality of education in South Africa*. Report commissioned by CDE. *Development* 33 (5): 436-447.
- Spaul, N. (2015). *Schooling in South Africa: How low-quality education becomes a poverty trap*. University of Stellenbosch.
- Spaul, N. (2019). *Equity: A price too high to pay?* Department of Economics, Stellenbosch University, Cape Town, South Africa.
- Spaul, N. & Jansen, J. (2019) *South African schooling: The enigma of inequality a study of the present situation and future possibilities*. Retrieved <http://www.springer.com/series/11212>
- Spillane, J. P., Reiser, B. J., & Reimer, T. (2002). Policy implementation and cognition: reframing and refocusing implementation research. *Review of Educational Research*, 72(3), 387-431.
- Stake, R.E. (2000). Case studies. In Denzin, N.K. & Lincoln Y.S. (Eds). *Handbook of qualitative research* 2<sup>nd</sup> Ed. California: Sage: 435-454.
- Statistics South Africa (2007a). *Labour force survey, March 2007*. Pretoria, Statistics South Africa.
- Statistics South Africa (2018). *Gross domestic product (GDP), 4<sup>TH</sup> quarter 2018*. Pretoria, Statistics South Africa.

- Stenhouse, L. (1975). *An introduction into curriculum research and development*. London: Heineman.
- Sternberg, B.J. (2000) Making high schools' better communities for our children: *The Education Digest*, 65 (9):32-39. Ann Arbor: Prakken.
- Stoler, R. D. (1992). Perceptions of regular teachers towards inclusion of all handicapped students in their classrooms. *Clearing House*, 66(1), 60-62.
- Stein, M., & Wang, M. (1988). Teacher development and school improvement: The process of teacher change. *Teaching and Teacher Education*, 4, 171- 187.
- Streubert, Speziale, H.J. & Carpenter, D.R. (2003). *Qualitative research in nursing*: Philadelphia: Lippincott.
- Steyn, A. (2007). The education system in relation to its Environment. In Van der Westhuizen, PC. ed.). *Schools as Organizations*. Third Edition. Pretoria: Van Schaik.
- Strauss, A. & Corbin, J. (1990). *Basics of qualitative research: grounded theory procedures and techniques*. Newbury Park. CA: Sage.
- Suskie, L.A. (1996). *Questionnaires, survey research: What works?* 2<sup>nd</sup> edition, Florida: The Association for institutional research.
- Taba, H. (1962). *Curriculum development: Theory and practice*. New York, NY: Harcourt, Brace & World Inc.
- Tafai, M.G. (2017). *Teachers' concerns about the implementation of the new curriculum in Lesotho*. (Unpublished master's Thesis). University of the Free State. Bloemfontein.
- Tan, H., Wilson, A., & Oliver, I. (2009). Ricoeur's theory of interpretation: An instrument for data interpretation in hermeneutic phenomenology. *International Journal of Qualitative Methods*, 8 (4), 1-15.
- Tanner, D & Tanner, L (1995). *Curriculum development: Theory into practice*. New York: MacMillan.
- Tashakkori, A. & Teddlie, C. (2003). *Handbook on mixed methods in the behavioural and social sciences*. Thousand Oaks, CA: Sage.
- Tawana, L. (2009). Identifying relevant factors in implementing a chemistry curriculum in Botswana. (Doctoral Thesis, University of the Witwatersrand).

- Taylor, N. (2008). "What's wrong with South African Schools?" *JET Education Services*. Available: [http://www.jet.org.za/events/conferences/Whatpercent20workspercent20inpercent20schoolpercent20development/Papers/Taylorpercent20Whatspercent20wrongpercent20withpercent20SApercent20schoolspercent20JETpercent20Schoolspercent20Confpercent20final.pdf/at\\_download/file](http://www.jet.org.za/events/conferences/Whatpercent20workspercent20inpercent20schoolpercent20development/Papers/Taylorpercent20Whatspercent20wrongpercent20withpercent20SApercent20schoolspercent20JETpercent20Schoolspercent20Confpercent20final.pdf/at_download/file) [18 May 2011]
- Taylor, C. (2001). Patient's experiences of the feeling on their own following a diagnosis of colorectal cancer: A phenomenological approach. *International Journal of Nursing Studies*, 38 (6), 65-66.
- Taylor, N. & Vinjevold, P. (1999). *Getting learning right. Report of the President's education initiative*, Johannesburg: Joint Education Trust.
- Taylor, N. (1999). Curriculum 2005. Finding balance between school and everyday knowledge. In Taylor & Vinjevold (Eds). *Getting the learning right*.
- Taylor, R.W. (1999). *Basic principles of curriculum and instruction*. Chicago. University of Chicago.
- Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioural sciences*. Thousand Oaks, CA: Sage.
- Thatcher, R. (2010). Validity and reliability of quantitative electroencephalography. *Journal of Neurotherapy*, 14, 122-152.
- Tirosh, D. (2000). Enhancing prospective teachers' knowledge of children's conceptions: The case of division of fractions. *Journal for Research in Mathematics Education*, 31(1), 5-25.
- Teddlie, C. & Yu, F. (2007). Mix methods sampling: A typology with examples. *Mixed-methods Research*, 1(1) 77-100.
- Teise, K.L.G. (2013). *Education for sustainable development: Exposing social sustainable policy imperatives for South African education*. (Unpublished doctoral thesis). University of the Free State, Bloemfontein.
- Tembo, C. (2016). Phenomenological inquiry as a methodology for investigating the lived experience of being critically ill in intensive care. *The Place of Phenomenology. Phenomenology and Nursing Existential*, 1-5.



- Terre Blance, M. & Kelly, K. (2004). Interpretive methods: In M.S. Terre Blance, & K. Durrheim (Eds), *Research in practice: Applied methods for social sciences*. (Pp 96-123). Cape Town. University of Cape Town Press.
- Terre Blance, M. & Durrheim, K. (1999). *Research in practice*. Cape Town. UCT Press.
- Tessmer, M. (1993). *Planning and conducting formative evaluations: Improving the quality of education and training*. Kogan Page. London. Philadelphia.
- Tight, M. (2015). Phenomenography the development and application of an innovative research design in higher education research. *International Journal of Social Research methodology* (ahead of print). 1-20.
- The World Bank, (2008). *World Bank working paper no 128: Curricula, examinations, and assessment in secondary education in Sub-Saharan Africa*. Washington World Bank.
- Themba, A. (1989). Black education in South Africa: Issues, problems and perspectives. *Per Linguam*, 5 (1), 2-8.
- Thompson, E. & Zahavi, D. (2007). Philosophical issues: Phenomenological in P.D. Zelazo, M. Moscovitch & E. Thompson (Eds) *The Cambridge handbook of consciousness*. Cambridge: Cambridge University Press.
- Tlakudi, M. (2016, July 20). Empowering teachers. *New Age*. P.15.
- Todres, L. (2005). Clarifying the life world: descriptive phenomenology. In: Holloway, I., ed. *Qualitative research in health care*. Buckinghamshire: Open University Press, 104-124.
- Todres, L. & Holloway, I. (2006). Phenomenological research. In K, Gerrish & A. Lacey (Eds). *Research Process in Nursing*. Oxford, England. Blackwell.
- Todres, L. and Holloway, I. (2004). Descriptive phenomenology: life world as evidence. In: Rapport, F., ed. *New Qualitative Methodologies in Health and Social Care Research*. London: Routledge, 79-98.
- Tolich, M. (2014). What can Milgram and Zimbardo teach ethics committees and qualitative researchers about minimizing harm? *Research Ethics*, 10(2):86–96.
- Tong, S.Y.A. (2012). Applying the theory of variation in teaching reading. *Australian Journal of Teacher Education*, 37(10), 1-19.

- Thomson, N. (2003). Science education researchers as orthographers: documenting Keiyo (Kenya) knowledge, learning and narratives about snakes. *International Journal of Science Education*, 25 (1), 89-115.
- Trochim, W.M. (2006). *Research methods knowledge base*. 2nd Edition. Cincinnati. Atomic Dog.
- Treagust, D.F. (1991). A case study of two exemplary biology teachers. *Journal of Research in Science Teaching*. 28 (1) 329-342.
- Tubaundule, G.M. (2014). *Evaluative research of the implemented secondary school curriculum in Namibia*. (Unpublished doctoral Thesis). University of the Free State, Bloemfontein.
- Tyler, R. (1949). *Basic principles of curriculum instruction*. Chicago, IL: University of Chicago press.
- Ussher, B. (2001). 'Reflective practice: Evaluative lecturers empowering Students during Teaching Practicum Interviews'. Paper presented at ATEA Conference, Melbourne Sept. 24- 26
- Vagi, O. & Green, R. (2012). The challenges of developing a mathematics curriculum for training elementary teachers in Papua New Guinea. *Early Childhood Development and Care*, 174 (4), 313-319.
- Valle, R.S. & Halling, S.H. (1989). *Existential phenomenology perspectives in psychology: Explaining the breath of human experience*. New York: Plerum Press.
- Valle, R.S. King, M. & Halling, S.H. (1989) *Existential phenomenology perspectives in psychology: Explaining the breath of human experience*. New York: Plerum Press.
- Van den Akker, J., de Boer, W., Folmer, E., Kuiper, W., Nieven, N., & Thijs, M. (2009). *Curriculum in Development*. Enschede: Axis Media Ontwerpers.
- Van den Berg, H. (2005). Reanalysing qualitative interviews from different angles: The risk of decontextualization and other problems of sharing qualitative data. *Qualitative Social Research*, 6(1).
- Van der Berg, S. (2007). "Apartheids Enduring Legacy: Inequalities in Education." *Journal of African Economies* 16 (5): 849–880.
- Van den Berg, S., Taylor, S., Gustafsson, M., Spaull, N., & Armstrong, P. (2011). *Report for the national planning commission*. Department of Economics. University of Stellenbosch. Stellenbosch.

- Van Dyk H. & White, C.J. (2019). Theory and practice of the quintile ranking of schools in South Africa: A financial management perspective. *South African Journal of Education, Volume 39*, Supplement 1, September 2019 <https://doi.org/10.15700/saje.v39ns1a1820>.
- Van der Nest, A. (2012). *Teacher mentorship as professional development: Experiences of a Mpumalanga primary school*. (Unpublished master's thesis). University of South Africa, Pretoria.
- Van Manen, M. (1995). On the epistemology of reflective practice. *Teachers and Teachings: theory and practice*, 1, pp. 33-50. Retrieved 2 July 2020 from <http://www.phenomenologyonline.com/max/articles/epistpractice.html>
- Van Manen, M. (1997). *Phenomenological pedagogy and the question of meaning*. In D. Vandenberg (Ed), *Phenomenology and education discourse* (pp. 41-68). Johannesburg, South Africa: Heineman.
- Van Manen, M. (1990). *Researching lived experience*. London: The University of Western Ontario.
- Van Manen, M, (1984). "Doing" Phenomenological research and writing: An Introduction Monograph No. 7. *Department of Secondary Education*, (7).
- Vasconcelos, C., Tores, J., Moutinho, S., Martins, I & Costa, N. (2015). Uncovering Portuguese teachers' difficulties in implementing science curriculum. *Cogent Education* 2(1): 3-13. <https://doi.org/10.2331186x.2015.1060755>
- Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, 18(248), 1-18. doi: <https://doi.org/10.1186/s12874-018-0594-7>
- Venter, M.I. (2005). Business intelligence: Failures versus success. *Interdisciplinary Journal*, 4 (1): 149-163.
- Verspoor, A. (2006). Schools at the centre of quality. ADE Newsletter. *The Biennale Libreville*, 18(1) 2.
- Vorster, J. (2016). *Curriculum in the context of transformation: Reframing traditional understanding and practices*. Rhodes University.

- Volkman, M. J., & Zgagacz, M. (2004). Learning to teach physics through inquiry: The lived experience of a graduate teaching assistant. *Journal of Research in Science Teaching*, 41, 559-579.
- Vygotsky's philosophy: *Constructivism and its criticism examined*. <http://ehlt.flinders.edu.au/education/iej/articles/v6n3/liu/paper/pdf>. International Education Journal 2005, 6(3), 386-399
- Wallen, N. E., & Fraenkel, J. R. (2001). *Educational research: A guide to the process* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum.
- Wallace, C.S and Priestley, M. (2011). Teacher beliefs and the mediation of Curriculum innovation in Scotland: A socio-cultural perspective on professional development and change. *Journal of Curriculum Studies*, 43(3), 357-381.
- Wandera, N. S. JumbaAkala, W. (2019). Influence of Teacher Academic Qualification on Pupils' Performance at Kenya Certificate of Primary Education Examination in English subject in Kenya. *IOSR Journal of Research & Method in Education (IOSR-JRME) e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 9, Issue 3 Ser. IV. (May. - June .2019), PP 01-07* [www.iosrjournals.org](http://www.iosrjournals.org)
- Watson, J.M. (2001). Profiling teachers' competence and confidence to teach particular mathematics topics: The case of chance and data. *Journal of Mathematics Teacher Education*, 4, 305-337.
- Welch, A. (1995). The self-efficacy of primary teachers in art education. *Issues in educational Research*, 5, 71-84.
- Wertz, F. J. (2005). Phenomenological research methods for counselling psychology. *Journal of Counselling Psychology*, 52 (2), 167-177.
- Whiting, M. & Young, J. (1995). *Integration: Social justice for teachers*. Paper presented at the Australian Association for Research in Education Conference., Hobart, Tasmania.
- Williams, P.J. (1998). Design the only methodology for technology. *Journal of Technology Education*, 11(2), <http://scholars.lib.edu/journals/JET/v11n2/> William: Retrieved 28 September 2017.
- Williams, M. (2000). Interpretivist and generalisation. *Sociology*, 34 (2), 209-224.
- William, M.K. (2006). *The qualitative debate*. Trochim: Research methods knowledge base. Cornell: University Press.

- Williams, J. (2012). *Research Methodology*. Retrieved on 24 November 2019 from <http://www.howto.do.thesishelpservice.com/what-is-research>
- Williams, H. (2021). The Meaning of “Phenomenology”: Qualitative and Philosophical Phenomenological Research Methods. *The Qualitative Report*, 26(2), 366-385. <https://doi.org/10.46743/2160-3715/2021.4587>
- Willig, C. (2008). *Introducing qualitative research in psychology* (2nd ed.). New York, NY: McGraw-Hill.
- Willis, J.W. (2007) *Foundations of Qualitative Research: Interpretive and Critical Approaches*. Thousand Oaks, CA: Sage Publications Inc. doi: 10.1016/j.soscij.2007.07.009
- Wimmer, R. & Dominick, J. (2000). *Mass media research: An introduction*. Belmont: Wadsworth.
- Whipple, S. (1998). *Information application of research methodologies*. Prepared for the commonwealth of Massachusetts. Massa: Hingham.
- Wilson, T.D. (2002). *Alfred Schultz, phenomenology and research methodology for information behaviour research*. <http://information.net/tdw/publ/pages/Schultz.html>. Retrieved 02 August 2017
- Whitehead, J. & McNiff, J. (2010). As an educator and educational researcher. How do I improve what I am doing and contribute to educational theories that carry hope for the future of humanity? *Inquiry in Education*, (1), 1-11.
- Woodruff, S.D. (2013). "Phenomenology", *the Stanford Encyclopaedia of Philosophy*. URL = <<http://plato.stanford.edu/archives/win2013/entries/phenomenology/>>. (Accessed on 29 September 2018).
- Wojnar, D.M., & Swanson, K.M. (2007). Phenomenology: An exploration. *Journal of Holistic Nursing*, 25, 172-180. doi: 10.1177/0898010106295172
- Wolf, E. (2014). *The integration of green economy content into the Life Sciences curriculum*. (Unpublished master’s thesis). University of Pretoria, Pretoria.
- Wolf, A. (1991). *Competence based assessment*. Buckingham Open University Press.
- Xaba MI 2012. A qualitative analysis of facilities maintenance — a school governance function in South Africa. *South African Journal of Education*, 32(2):215–226. <https://doi.org/10.15700/saje.v32n2a548>

- Yala, P. O. & Wanjohi, W. C. (2011). Performance Determinants of KCSE in Mathematics in Secondary Schools in Nyamira Division, Kenya. *Asian Social Science*, 7(20): 107-112.
- Yanow, D. & Tsoukas, H. (2009). What is Reflection-In-Action? A Phenomenological Account. *Journal of Management Studies* 46:8. doi: 10.1111/j.1467-6486.2009.00859.x
- Yin, R. (1994). *Case study research: Design and methods*. (2<sup>nd</sup> ed). Beverly Hills, CA: Sage.
- Yin, R.K. (2003). *Case study research. Design and methods*. 3<sup>rd</sup> Edition. New Delhi. Sage.
- Yin, R.K. (2011). *Qualitative research from start to finish*. New York: The Guildford Press.
- Yin, R.K. (2013). *Applications of case study research: 2nd Edition*. Thousand Oaks. C.A. Sage.
- Yu, W. (2003). A survey of teaching reform in the national curriculum reform pilot project areas. In B. Dello- Lavaco (Eds). Curriculum reform aimed at promoting curriculum reform and quality in education. *International Journal of Contemporary Development*, 29, 241-249.
- Yurdakul, B. (2015). Perceptions of elementary school teachers concerning the concept of curriculum. *Educational Sciences: Theory & Practice*, 15 (1), 125–139.
- Zano, K. (2015). *Exploring teachers' enactment of the Curriculum and Assessment Policy Statement (CAPS) in selected Free State schools*. (Unpublished master's thesis). University of the Free State, Bloemfontein.
- Zerafa, I & Gatt, S. (2014). Implementing a science curriculum reflecting an inquiry-based approach in Upper primary years. (2014). *International Student Assessment*. 1 (2): 13-26. [https:// doi. 009.1177/215082440145360406](https://doi.org/10.1177/215082440145360406).
- Zint, M. & Montgomery, N. (2007). *Purposeful sample*. London: Sage.

## **APPENDIX A: LETTER OF CONSENT TO CONDUCT RESEARCH**

The District Director: Northern Cape Department of Education

Pixley ka Seme District

De Aar

7000

Attention: Mr Petswha

### **REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SELECTED SCHOOLS: PIXLEY KA SEME DISTRICT**

Dear Sir

My name is Barry Booysen and currently registered for the Ph.D. degree in Science Education at the University of the Western Cape. My thesis is entitled: *Examining teachers' experiences of implementing the Grade 12 life sciences curriculum.*

The study will be conducted under the supervision of Prof. Shaheed Hartley of the **Science Learning Centre for Africa of the University of the Western Cape**. I am hereby seeking consent to conduct research in selected schools in the district and approach Grade 12 life sciences teachers, to participate in the study.

Herewith I provide a copy of my research proposal and a copy of proof of registration for the 2017 academic year from the University of the Western Cape.

Upon completion of the study, I undertake to provide the Northern Cape Department of Education with a bound copy of the report and a summary on a computer disc. I understand that costs relating to the study are my own responsibility.

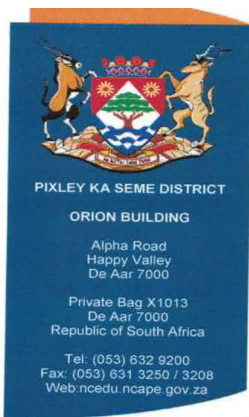
If you require any further information, please do not hesitate to contact my supervisor, Prof. Shaheed Hartley on 021 959 2680/1 or [shartley@uwc.ac.za](mailto:shartley@uwc.ac.za).

Thank you for your time and consideration in this matter.

Yours sincerely

Mr. B. Booysen

## APPENDIX B: CONSENT LETTER TO CONDUCT RESEARCH



### DEPARTMENT OF EDUCATION

Enquiries : Mr D.M. Petshwa  
Reference :  
Date : 27 February 2017

Mr. Barry Booyen  
PhD Student

Sir,

#### Re: PERMISSION TO CONDUCT RESEARCH.

You are hereby granted permission to select and /or sample participants (teachers) from selected schools in the Pixley ka Seme District to participate in your project - as part of your PhD degree studies.

Please note that permission is granted on condition that you adhere to your expressed undertaking that you will ensure, among others, that:

- Participation of teachers will be voluntary,
- Given the nature of this project - the data generated from it will be handled confidentially and the identity of individual participants (and schools) will be protected at all times,
- There will be no cost implications to the Department and the schools, and
- The normal academic programmes of the participating teachers and schools will not be compromised as a result of it

I wish to extend to you my best wishes in your research endeavour.

Yours truly,

Dick M. Petshwa  
District Director: Pixley Ka Seme





## APPENDIX C: LETTER OF REQUEST TO CONDUCT RESEARCH

The Principal and Chairperson of the SGB:

XXXXXXXXX High School

XXXXXXXXX High School

XXXXXXXXX High School

XXXXXXXXX High School

Dear Sir/ Madam

My name is Barry Booyesen and currently registered for the Ph.D. degree in Science Education at the University of the Western Cape. I herewith wish to request your permission for the Grade 12 life sciences teachers to participate in this research. My thesis is entitled: *Examining teachers' experiences of implementing the Grade 12 life sciences curriculum.*

I hereby request permission to conduct research in the school. I already apply for permission to the Northern Cape Department of Education to conduct research in the school. By seeking your consent to conduct research in the school I will furnish you with a copy of the approval letter from the Northern Cape Department of Education to conduct research in the school. I will adhere to the following conditions:

Approach teachers for their permission and consent to take part in this study.

I undertake to and will make every effort to obtain the goodwill and cooperation of teachers. The research will be conducted after school hours so that the normal school hours are not interrupted.

If you have any questions about the study, or if you would like additional information to assist you in reaching a decision, please contact my supervisor, Prof. Shaheed Hartley on 021 959 2680/1 or at [shartley@uwc.ac.za](mailto:shartley@uwc.ac.za).

Thank you for supporting me in the study.

Yours sincerely

Mr. B. Booyesen

*(Doctoral candidate)*

## **APPENDIX D: CONSENT FORM TO PARTICIPATE IN THE STUDY**

### **CONSENT TO PARTICIPATE IN RESEARCH**

You are hereby asked to participate in a research study conducted by *Mr Barry Booysen* from the Faculty of Education at the University of the Western Cape. You have been selected to be a participant in this study.

### **PURPOSE OF THE STUDY**

The purpose of my proposed study is to explore teachers' experiences of implementing the Grade 12 life sciences curriculum.

### **PROCEDURES**

As a participant in this study, I request you to do the following:

Complete a questionnaire on the implementation of the Grade 12 life sciences curriculum; and

Be willing to be interviewed by me.

### **POTENTIAL RISKS AND DISCOMFORTS**

This research poses no risks or discomfort to any of the participants.

### **PAYMENT FOR PARTICIPATION**

There is no remuneration for the participants in this study.

### **CONFIDENTIALITY**

Information obtained through this study will remain confidential and will only be made available with your consent or if required by law enforcement agencies. Confidentiality will be maintained at all times and coding procedures will be used. The data will be kept safe, and only me and the supervisor will have access to it. The interview is to be audio-taped, and the participants will have a right to listen to the tapes, which will only be used for research purposes and destroyed five years after completion of this study.

### **PARTICIPATION AND WITHDRAWAL**

As a participant in this study, you may withdraw from the study at any time without any prejudice whatsoever. You are in your right to refuse to answer any question/s you are not comfortable with.

### **IDENTIFICATION OF RESEARCHER**

If you have any questions about the research, feel free contact my supervisor, Prof. Shaheed Hartley on 021 959 2680/1 or [shartley@uwc.ac.za](mailto:shartley@uwc.ac.za).

**SIGNATURE OF THE PARTICIPANT IN THIS STUDY**

The above-mentioned information was explained to me by Mr Barry Booyesen in English. As a participant, I hereby give my full consent to be a participant in this study.

Name of participant

---

Signature of participant

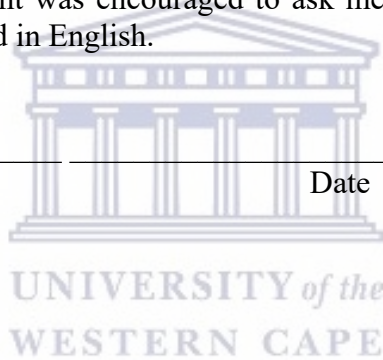
Date

**SIGNATURE OF THE RESEARCHER**

I, Barry Booyesen, hereby declare that I explained the information as contained in this document to the participant. The participant was encouraged to ask me any questions about the research. This conversation was conducted in English.

Signature of researcher  
*(Doctoral candidate)*

Date



## APPENDIX E: CONSENT FORM TO PARTICIPATE IN THE INTERVIEW

### CONSENT TO PARTICIPATE IN AN AUDIO-TAPED INTERVIEW

---

My name is Barry Booysen and currently registered for the Ph.D. degree in Science Education at the University of the Western Cape. My thesis is entitled: *Examining teachers' experiences of implementing the Grade 12 life sciences curriculum.*

I hereby agree and commit myself to participate in an audio-taped interview about *Examining teachers' experiences of implementing the Grade 12 life sciences curriculum*, for the purpose of data generation as part of this research. I agree that Mr B. Booysen may audio-tape this interview.

I have been told that I have the right to listen to the recordings of the interview before it is used. I have declared that I:

want to listen to the recording

do not want to listen to the recording

Signature..... (Participant)

Date .....



## APPENDIX F: LETTER OF REQUEST TO TEACHERS

Dear Colleagues

I am a registered student at the University of the Western Cape, who is currently engage in research as part of the requirements for the Ph.D. degree in Science Education. My thesis is entitled: *Examining teachers' experiences of implementing the Grade 12 life sciences curriculum.*

The purpose of this questionnaire is to examine the experiences of Grade 12 life sciences teachers of implementing the Grade 12 life sciences curriculum.

This study has been approved by the Research Ethics Committee of the Faculty of Education of the University of the Western Cape and will be conducted according to the ethical guidelines of this committee. Permission was obtained from the Northern Cape Department of Education and the School Governing Body as well as the school principal.

To inform my research, your experiences and expertise are essential. I humbly request you to complete the accompanying questionnaire. It is important that you answer all the questions as honest as possible. Your answers in this questionnaire will be treated confidentially. Please don't write your name on the questionnaire to protect your identity. This essentially means that no school or teacher will be identifiable in the thesis.

If you have any further questions with regard to your participation in this research, please contact me or my supervisor for more information.

Yours sincerely

Mr. Barry Booysen  
(*Doctoral candidate*)

## APPENDIX G: TEACHER QUESTIONNAIRE

This questionnaire is about examining teachers' experiences of implementing the Grade 12 life sciences curriculum.

This questionnaire consists of eight sections: A, B, C, D, E, F, G and H.

It should not take longer than 20 minutes to complete this questionnaire.

You are kindly requested to respond to all the items in this questionnaire.

Information gathered will be treated as confidential as possible, therefore please do not write your name or the name of the school on this questionnaire.

Please read the statements below. Choose a corresponding answer you think best suits the question or statement and mark it with a X in the corresponding block.

---

**Please cross (X) in the appropriate box.**

### SECTION A – BIOGRAPHICAL INFORMATION

#### 1. Gender

Male

1

Female

2

#### 2. Age

20-25 years

1

26-30 years

2

31-35 years

3

36-40 years

4

41-45 years

5

46-50 and above

6

51 and above

7

#### 3. Experience as a life sciences teacher

2-3years

1

4-5 years

2

6-10 years

3

11-15 years

4

16-20 years

5

20 years and above

6

#### 4. Are you a



Principal	1
Deputy principal	2
DH	3
Post level1 teacher	4

**5. Qualifications – What is the highest level of education that you have**

Diploma in Education	1
ACE	2
B Ed	3
B. Ed (Hons)	4
Degree +PGCE	5
M. Ed	6
Ph.D.	7

**6. How would you classify your school? You are allowed to choose more than one option.**

A suburban school	1
A township school	2
A school in an informal settlement	3
A secondary school	4
A combined school	5
A school in a large rural town	6
A school in a small rural town	7



**SECTION B**

**CURRICULUM AND ASSESSMENT POLICY STATEMENT SCALE (CAPS)**

Below are statements concerning your experiences with the implementation of the Grade 12 life sciences curriculum. Please make a cross (X) through the letter that best describe your position.

Kindly use one of the following codes:

**SA = Strongly agree**

**A = Agree**

**D = Disagree**

**SD = Strongly disagree**

No	STATEMENT	Codes			
		SA	A	D	SD
1	The CAPS assist me in designing my own lesson plans	4	3	2	1

2	The CAPS is helpful in developing classroom activities	4	3	2	1
3	The CAPS assist me with planning and preparation	4	3	2	1
4	I find the simplified concepts of CAPS easy to understand	4	3	2	1
5	CAPS have a negative impact on my planning in general	4	3	2	1
6	I have difficulty in achieving the specific aims of life sciences	4	3	2	1
7	I have particularly difficulty in exposing learners to Specific Aim 3	4	3	2	1
8	I cannot develop the necessary scientific skills in my learners	4	3	2	1
9	In my class I enhance inclusivity	4	3	2	1
10	In my teaching I address social justice issues	4	3	2	1

### SECTION C KNOWLEDGE AND UNDERSTANDING OF THE CURRICULUM

11	The CAPS curriculum comprises of general aims for life sciences	4	3	2	1
12	I am aware of the 3 subject-specific aims for life sciences	4	3	2	1
13	I am aware that the Grade 12 curriculum should be completed in a specific time	4	3	2	1
14	The resources needed for life sciences is necessary for teaching	4	3	2	1
15	Teaching concepts in life sciences is an important part of the Grade 12 life sciences curriculum	4	3	2	1
16	I am comfortable with the concepts and content of the Grade 12 life sciences curriculum	4	3	2	1
17	I am aware of the content progression framework for life sciences	4	3	2	1
18	I am aware that only three of the four knowledge strands are taught in Grade 12	4	3	2	1

### SECTION D IMPLEMENTATION OF THE CURRICULUM

No	STATEMENT	Codes			
		SA	A	D	SD
19	I have received adequate training to implement CAPS	4	3	2	1
20	I need more support for the implementation of CAPS	4	3	2	1
21	I need further professional development in the implementation of CAPS	4	3	2	1
22	I have taken steps to upskill my knowledge on the implementation of CAPS, because I need it	4	3	2	1
23	I receive teaching and learning support material to implement CAPS from the Department of Education (DoE)	4	3	2	1



24	I am not satisfied with the quality of support material for the implementation of CAPS	4	3	2	1
<b>STATEMENT</b>		<b>CODES</b>			
		<b>SA</b>	<b>A</b>	<b>D</b>	<b>SD</b>
25	I find the material for the implementation of CAPS supplied by the DoE to be useful	4	3	2	1
26	I am able to design my own material for the implementation of CAPS to augment those supplied by DoE	4	3	2	1
27	I think the implementation process of CAPS has stabilised	4	3	2	1
28	I will support the introduction of a new curriculum by the DoE at any time	4	3	2	1
<b>SECTION E THE POLICY DOCUMENTS IN SUPPORT OF IMPLEMENTATION</b>					
29	I find the CAPS policy document to be clear and unambiguous	4	3	2	1
30	I find the CAPS policy document to be more streamlined	4	3	2	1
31	Going back to subjects instead of learning areas help with the implementation of CAPS	4	3	2	1
32	I find the Grade 12 life sciences CAPS curriculum to be less loaded	4	3	2	1
33	I think the content volume in the Grade 12 curriculum is adequate	4	3	2	1
34	I find the lack of resources and equipment to contribute to hinder the successful implementation of CAPS	4	3	2	1
35	I have my own hard copy of the CAPS policy documents ( <i>National Curriculum and Assessment Policy Statement Grade 10,11 and 12</i> ); <i>National Policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R – 12</i> ; and the policy document, <i>National Protocol for Assessment Grades R – 12 (January 2012)</i> .	4	3	2	1
36	Some of the policy documents is available at school but in electronic format in the office of the principal/deputy principal /clerk/departmental head	4	3	2	1
37	The time table in our school is aligned to the CAPS policy document	4	3	2	1
38	I have an Annual Teaching Plan (ATP) in my file	4	3	2	1
39	I have the required files in possession to implement the curriculum (Subject File, Teachers File and Assessment File)	4	3	2	1
40	I have the required documents in possession to implement the curriculum	4	3	2	1

**SECTION F IMPLEMENTATION AT SCHOOL LEVEL**

41	life sciences teachers have regular subject meetings	4	3	2	1
42	The departmental head monitors the implementation of CAPS	4	3	2	1
43	I am satisfied how the life sciences curriculum is implemented	4	3	2	1
44	I attend all subject related meetings organised by the school	4	3	2	1
45	I attend subject meetings/ clinics/workshops/community of practice meetings organised by the DoE	4	3	2	1
46	I am a National Senior Certificate (NSC) marker	4	3	2	1
47	The fact that I mark in the NSC examination helps me with the implementation of the Grade 12 life sciences curriculum	4	3	2	1

**SECTIONM G PLANNING FOR THE IMPLEMENTATION OF CAPS**

48	In our school we have a structured time for planning	4	3	2	1
49	In our school teachers plan alone	4	3	2	1
50	In our school teachers plan as part of the life sciences subject group	4	3	2	1
51	In our school teachers plan according the prescripts of CAPS	4	3	2	1
52	Generally, planning help with the implementation of the Grade 12 life sciences curriculum	4	3	2	1

**SECTION H PERCEPTIONS TOWARDS THE CURRICULUM**

53 Which of the following options best describe your perceptions about the implemented Grade 12 life sciences curriculum? Please cross (X) only one choice that applies to you. Use the scale below

1	2	3	4	5
Not sure	Extremely negative	Fairly negative	Positive	Extremely positive

STATEMENT	YES (1)	NO (2)
54 I am satisfied with the Grade 12 life sciences curriculum		
55The Grade 12 life sciences curriculum contribute to the performance of learners		
56 The current Grade 12 life sciences curriculum is too loaded with content		
57 I understand how to implement the Grade 12 life sciences curriculum		
58 I am committed to teaching the Grade 12 life sciences curriculum		

## APPENDIX H: OBSERVATION SCHEDULE FOR TEACHERS

Grade		
Date of observation		
No of learners in class		
Lesson starts	Start	End
Lesson topic		
Classroom organisation		
Classroom setting		
Comments		
CAPS feature of lesson	Lesson procedure	Comments

My idea of what was observed

Date and Time	Situation in class	Participants	Actions observed	Reflection

UNIVERSITY of the  
WESTERN CAPE

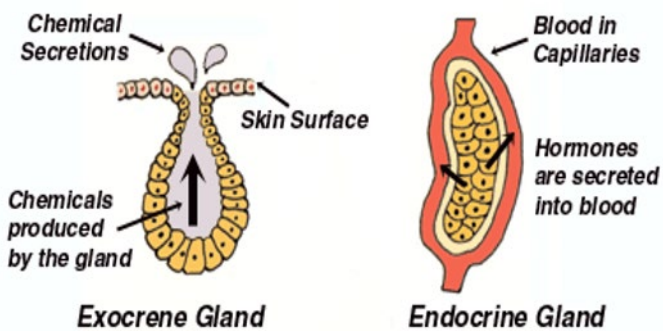
1. Important aspects of the lesson	Expected competencies	Yes	No
1.1. Learning outcomes	Are these applicable and relevant to the lesson and activities?		
1.2. Lesson preparation			
1.3. Classroom arrangement			
Researcher comments			
2. Important documentation for teaching life sciences		Yes	No
2. CAPS POLICIES AVAILABLE			
2.2. National Policy pertaining to the programme and promotion requirements			
2.2. National protocol on assessment			
2.3. Programme of assessment/ATP			
2.4 CAPS for life sciences policy			
Researcher comments			
3. Important aspects of the lesson	Expected competencies	Yes	No
3.1. Problem challenge	Are these applicable and relevant to the		

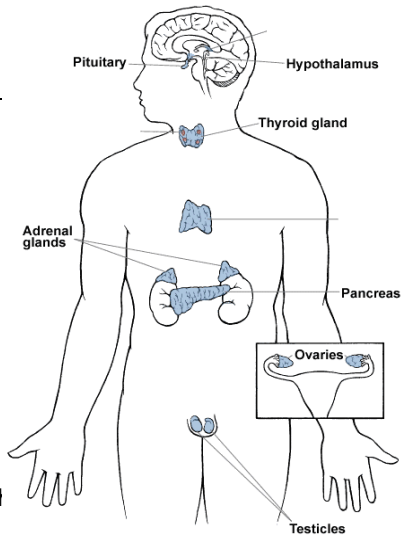
3.2. Organisation Overview of lesson Paced lesson according the ATP Presented lesson in sequence Link present lesson to previous lesson Summarise major points in lesson.	lesson and activities?		
4. Presentation of lesson Introduce lesson Defined concepts and write on board Explain the simple and build up to the complex Highlight important points Use different teaching strategies			
5. Pedagogical content Knowledge of the relevance Lesson is appropriate for the Grade Display strong command of subject matter	Is strong subject matter knowledge of the educator evident?		
6. Assessment strategies	Are the strategies useful, reliable transparent? Does it obtain information required?		
<b>Important aspects of the lesson</b>	<b>Expected competencies</b>	<b>Yes</b>	<b>No</b>
7. Learning resources Researchers notes	Are learning resources available? Does every learner have a textbook, study guide? Are the resources relevant to the task (micrographs, models, photographs, reference books, charts, microscopes and ultra sound pictures, DVD's?)		
8. Extra material Researchers notes	Does the teacher have extra learning material available?		
9. Educator support Researchers notes	Does the subject adviser support the teacher? Does the department make provision for subject clinics, in-service training workshops, content workshops, professional development workshops and does the educator attend these initiatives by the Northern Cape Department of Education?		

## APPENDIX I: THE LESSON

<b>GRADE</b>	12	<b>SUBJECT</b>	LIFE SCIENCES	<b>WEEK</b>	19	<b>TOPIC</b>	<b>STRUCTURE OF ENDOCRINE SYSTEM</b> Time: 55 min	<b>Lesson</b>	1
--------------	----	----------------	---------------	-------------	----	--------------	--	---------------	---

<b>LESSON SUMMARY FOR: DATE STARTED:</b>		<b>DATE COMPLETED:</b>	
<b>LESSON OBJECTIVES</b>	<p><b>The learners must be able to:</b></p> <ul style="list-style-type: none"> <li>Identify the characteristics of hormones</li> <li>Identify location of the most important endocrine glands</li> <li>State the functions of hormones produced by endocrine glands</li> <li>Tabulate the differences between endocrine and exocrine glands.</li> </ul>		

TEACHER ACTIVITIES	LEARNER ACTIVITIES	TIMING	RESOURCES NEEDED
<p>Lesson presentation using blackboard / transparencies</p> <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>Distinguish between endocrine and exocrine glands using the pancreas as an example.</li> <li>Teacher explains the distinguishing characteristics using diagrams suitable for learner understanding.</li> </ul>  <p><b>Exocrine Gland</b>                      <b>Endocrine Gland</b></p> <p><b>Main Body (Lesson presentation)</b></p> <ul style="list-style-type: none"> <li>Teachers writes the following <b>words in bold</b> on blackboard / transparency</li> </ul> <p><b>CHARACTERISTICS OF HORMONES.</b></p> <ol style="list-style-type: none"> <li><b>Organic chemical substance.</b></li> <li>Most are <b>proteins.</b></li> <li>Operates in <b>very low concentrations.</b></li> <li>Transport in <b>blood stream</b></li> <li>Effects <b>target cells / organs.</b></li> <li>May <b>stimulate</b> or <b>inhibit</b> functioning of cells / organ</li> </ol> <ul style="list-style-type: none"> <li>Teacher provides mind map to each learner and diagram sheet showing location of various endocrine glands.</li> <li>Teacher discusses location of endocrine glands.</li> </ul>	<p>Learners draw a table indicating differences between endocrine and Exocrine glands in their books.</p> <p>Learners create spider diagram (study technique) with listed characteristics.</p> <p>Learners completes labelling of endocrine glands during lesson.</p> <p>Learners list the hormone Produced on the mind map.</p>	<p>10 min</p> <p>15 min</p>	<p>CAPS Solutions for All Life Sciences Gr 12</p> <p>Question paper booklets</p> <p>Worksheets</p> <p>Understanding Life sciences Gr.12 by T Isaac – 3<sup>rd</sup> Edition</p> <p>Life Sciences Gr 12 – Top Class by Shutter's.</p> <p>Via Afrika Life Sciences GR 12 (CAPS)</p>

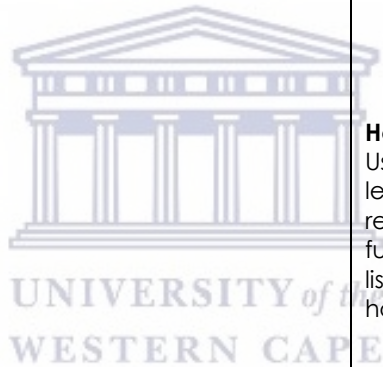


• **Teachers lists the following endocrine glands:**

- Hypothalamus (ADH)
- Pituitary ( GH, TSH, FSH, LH, prolactin)
- Adrenal ( Adrenalin, aldosterone)
- Pancreatic Islets of Langerhans (insulin, glucagon)
- Ovary (oestrogen, progesterone)
- Testis (testosterone)
- Thyroid glands (thyroxin)

**2.3 Conclusion**

- Give learners homework.



**Home work:**

Using textbook, learners research functions of the listed hormones.

10 min

5 min

**Reflection/Notes:**

<b>Name of Teacher:</b>		<b>DH:</b>	
<b>Sign:</b>		<b>Sign:</b>	
<b>Date:</b>		<b>Date:</b>	

## APPENDIX J: DOCUMENT ANALYSIS PROTOCOL

Theme	Examples of statement related to the category	Frequency of statement
Social justice and transformation	Ensuring that the educational imbalances of the past are reviewed and that equivalent opportunities are provided for the entire the population.	
Knowledge and skills	The National Curriculum Statement Grade R-12 offers articulation to the knowledge, skills and values worth learning in South African schools. Securing knowledge and skills in ways that are important in their own lives.	
Role of IKS	Valuing IKS: recognises the rich history and legacy of this nation as significant contributors of sustaining the qualities as set out in the constitution.	
Environment (ESD)	Develop in the learner: Competence and confidence and create awareness in learners.	
Pedagogical content knowledge	The curriculum aims to ensure that “children acquire and apply knowledge and skills in a way that are meaningful to their own lives”.	

Theme	Examples of statement related to the category	Frequency of statement
Role of IKS	Valuing IKS: recognises the rich history and legacy of this nation as significant contributors of sustaining the qualities set out in the constitution.	
Social transformation and social justice	Correcting the educational imbalances and guarantee that equal educational opportunities are provided for all. Understand contribution of science to social justice and societal development.	
Knowledge and skills	The National Curriculum Statement Grade R-12 gives expression to the knowledge, skills and values worth learning in South African schools. Acquiring knowledge and skills in ways that are meaningful to their own lives.	
Awareness, confidence, citizenship	Develop in the learner: Competence and confidence and create awareness in learners p 7,8	
Connection to learner's world	The curriculum aims to ensure that “children acquire and apply knowledge and skills in a way that are meaningful to their own lives”. Interconnectedness of live p8, 10, 11,16	

## **APPENDIX K: INTERVIEW SCHEDULE**

Examining teachers' experiences of implementing the Grade 12 life sciences curriculum

I need to make you aware that you are participating in a consent audio tape interview.

The interview should not take longer than 30 minutes.

The content of this interview is confidential.

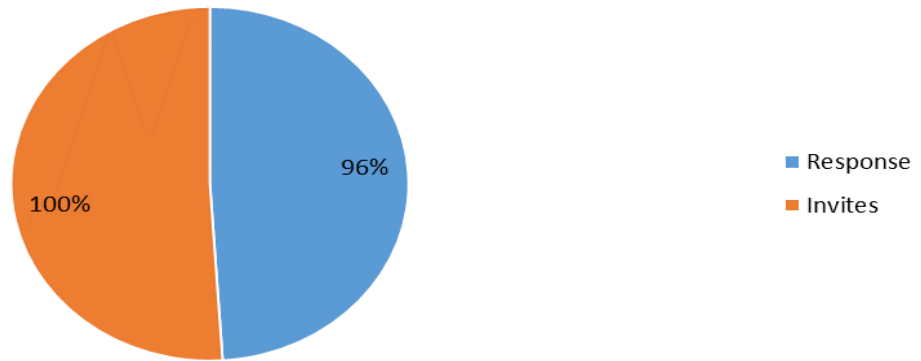
- 1.1 Please tell me more about yourself.
- 1.2 At which institution did you studied at. Explain why you choose that institution.
- 1.3 What was your majors for your qualification?
- 1.4 What was your experience as learner in life sciences/biology?
- 1.5 Your experience of teaching life sciences.
2. What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are the right track in terms of the implementation process?
3. What are your perceptions regarding curriculum change? Given that we come from OBE, to NCS and RNCS and now CAPS?
4. In your reflection what do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?
5. In your view as a life sciences teacher do you think the Grade 12 life sciences curriculum address the intentions of the CAPS curriculum?

**Thank you for participating in the study.**



## APPENDIX L: GRAPH OF TEACHER DETAILS

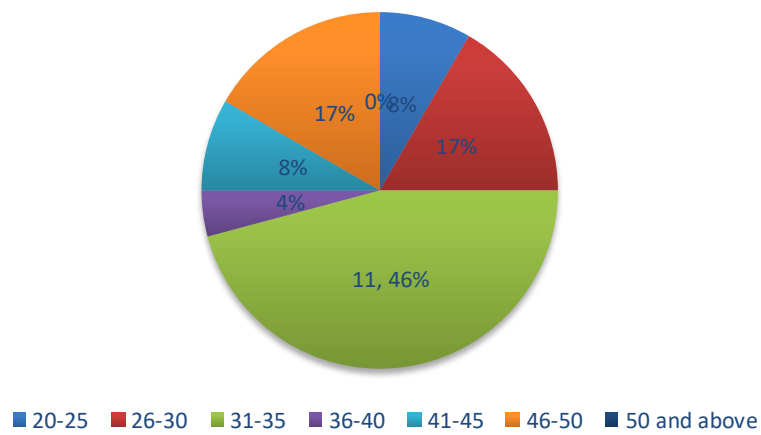
Fig 4.1 RESPONSE RATE OF TEACHERS



Response rate of teachers



Age groups



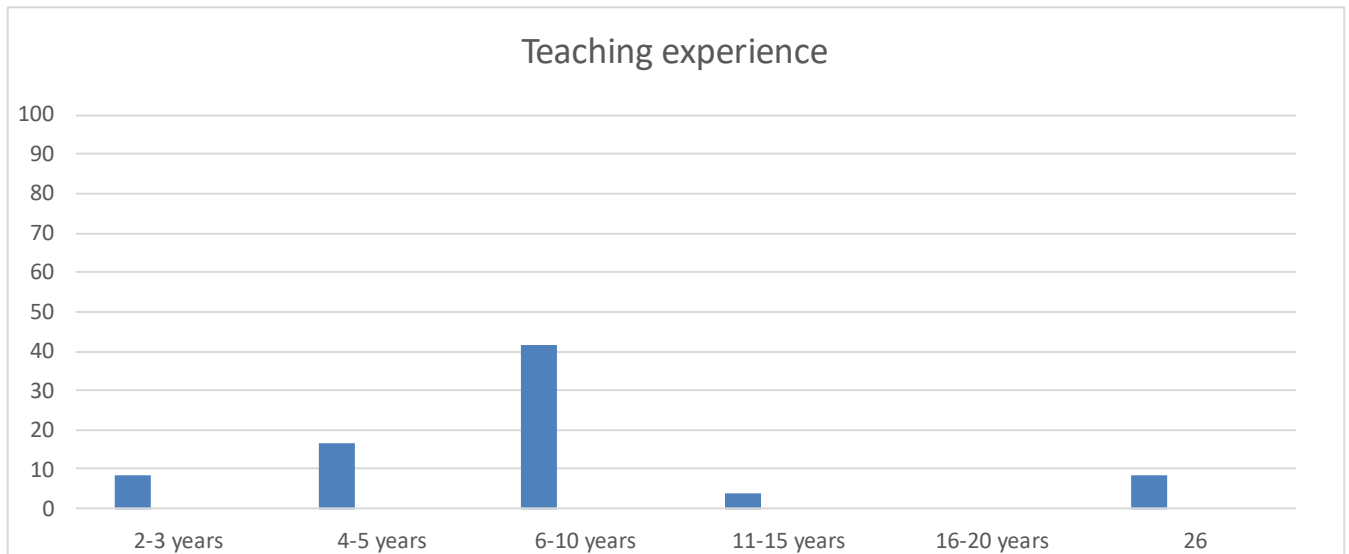
Age groups of participants (N=24)

## APPENDIX M- DETAILS OF PARTICIPANTS

		N	%
Gender	Male	17	70.8
	Female	7	29.2
		N	%
Age	20–25	2	8.3
	26–30	4	16.6
	31–35	11	45.8
	36–40	1	4.1
	41–45	2	8.3
	46–50	4	16.6
	51 and above	0	00.0
		N	%
Teaching experience	2–3 years	2	8.3
	4–5 years	4	16.6
	6–10 years	10	41.6
	11–15 years	5	20.8
	16–20 years	1	4.1
	26 and above	2	8.3
		N	%
Teaching designation	Principal	1	4.1
	Deputy principal	1	4.1
	DH	4	16.6
	PL 1 Teacher	18	75
		N	%
Life sciences experience	2–3 years	2	8.3
	4–5 years	4	16.6
	6–10 years	10	41.6
	11–15 years	5	20.8
	16–20 years	1	4.1
	26 and above	2	8.3
		N	%
Qualifications	Diploma in education (REQV	1	4.1
	B.Ed. - (REQV 14)	18	75.0
	B.Ed. (Hons) - (REQV 15)	2	8.3
	Degree + PGCE	2	8.3
	M.Ed. - (REQV 17)	1	4.1
	PhD	0	0.0

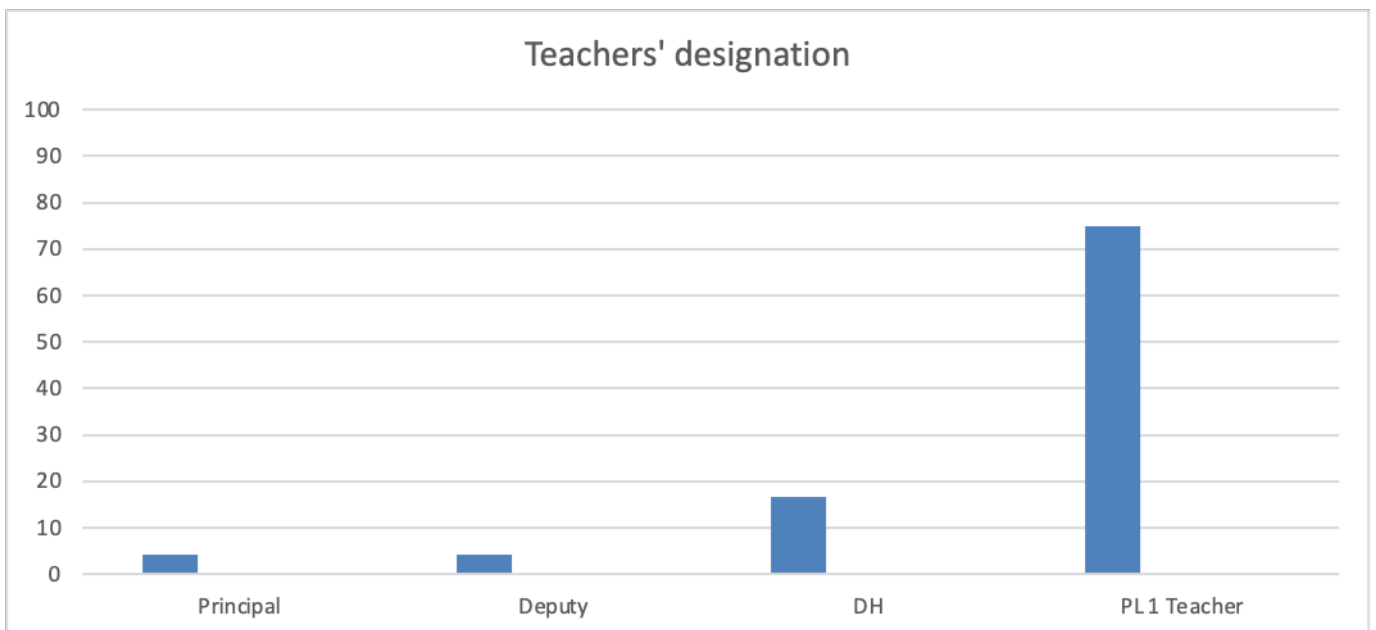
		N	%
School type	Suburban school	5	20.84
	Township school	19	79.16
	School in an informal	0	0.0
	Secondary school	0	0.0
	Combined school	0	0.0

Biographic details of participants (N=24)

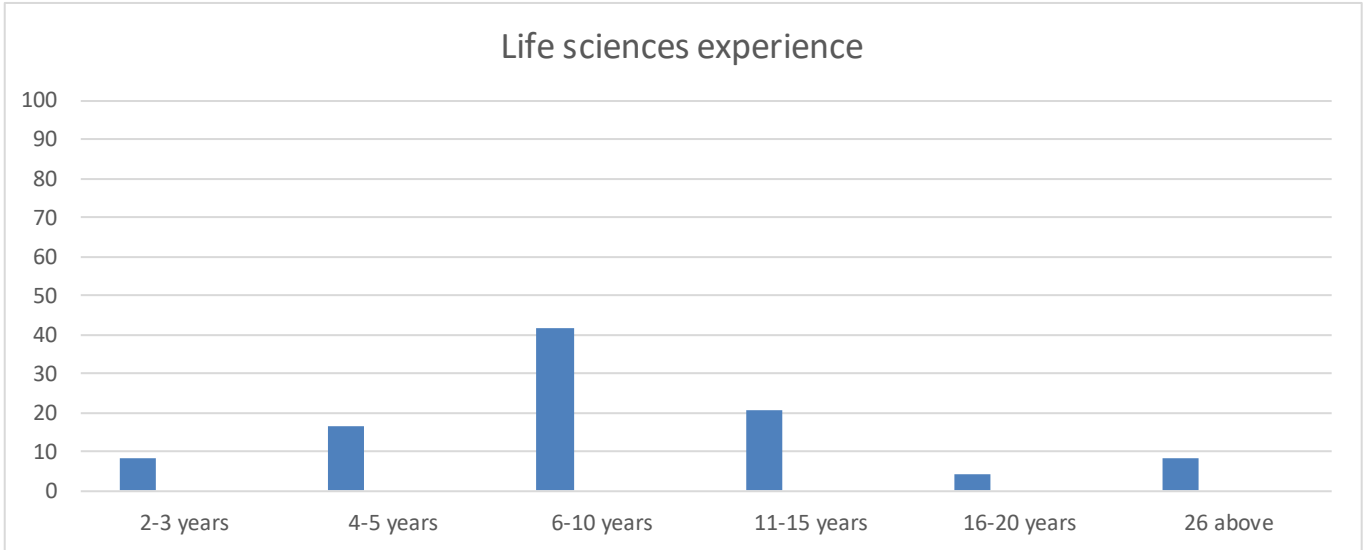


Teaching experience of participants (N=24)

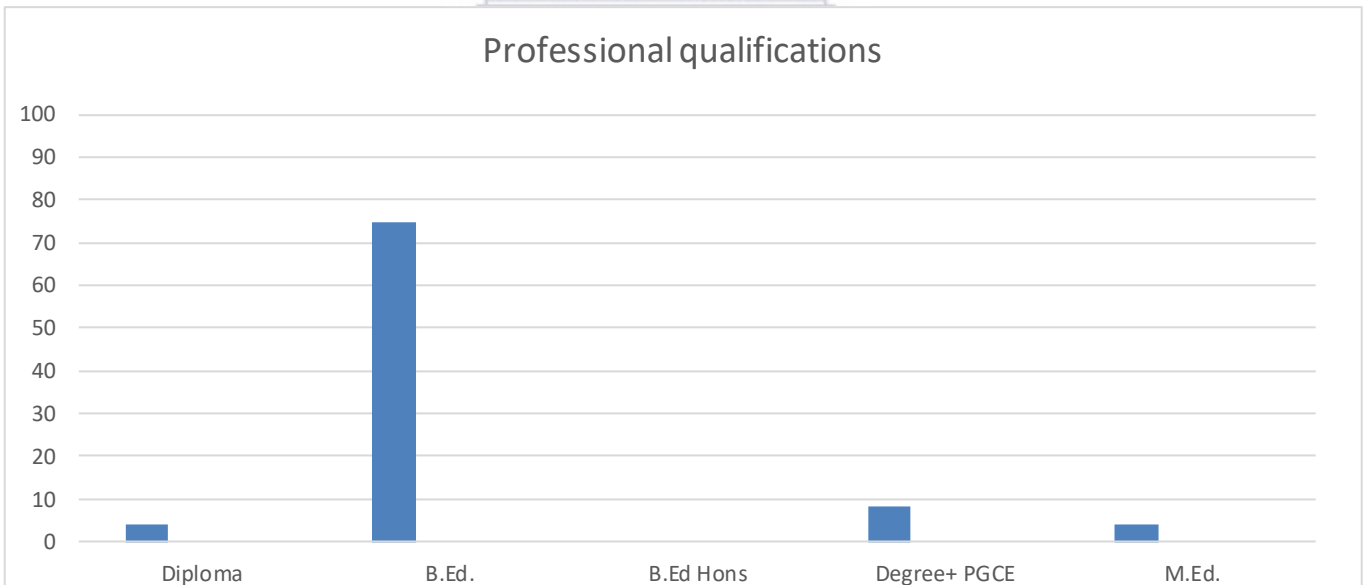
UNIVERSITY of the  
WESTERN CAPE



Designation of participants –current post level (N=24)

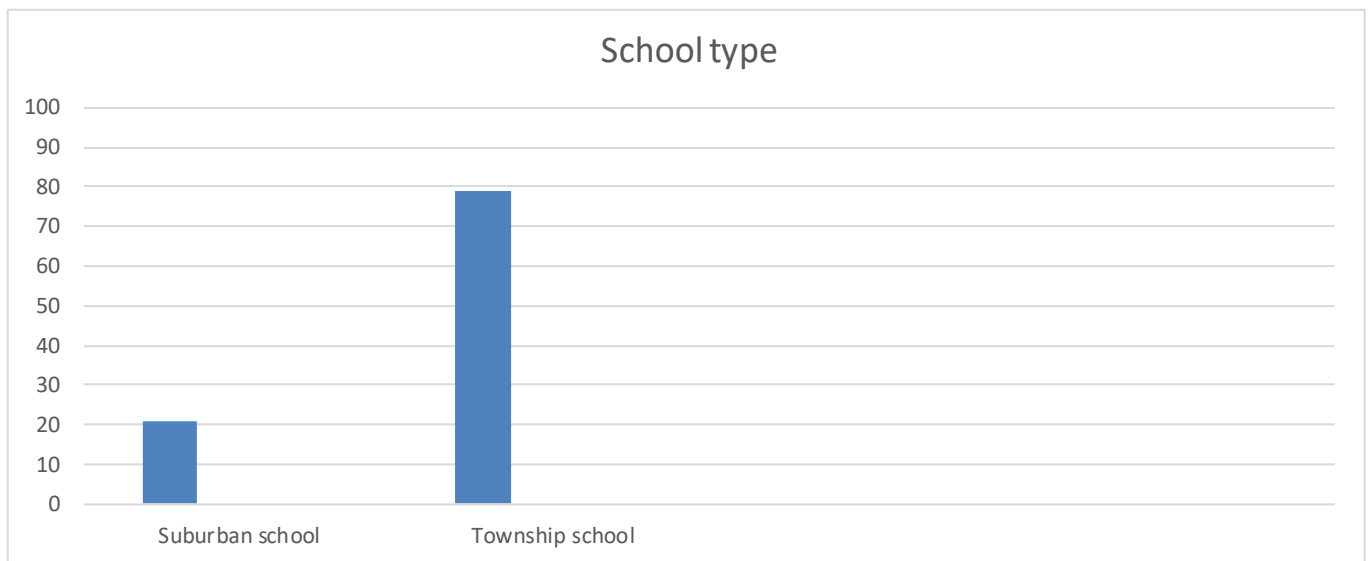


**Life sciences teaching experience of participants (N=24)**



**Professional qualifications of participants (N=24)**

### Type of schools of participants (N=24)



### APPENDIX N: Analysis of results

B1					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	24	100.0	100.0	100.0
B2					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	24	100.0	100.0	100.0
B3					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	23	95.8	95.8	95.8
	4	1	4.2	4.2	100.0
	Total	24	100.0	100.0	
Table 4.7:					
B4					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	5	20.8	20.8
	3	18	75.0	75.0	95.8
	4	1	4.2	4.2	100.0
	Total	24	100.0	100.0	
B5					

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	18	75.0	75.0
	3	6	25.0	25.0	100.0
	Total	24	100.0	100.0	
B6					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	14	58.3	58.3
	3	10	41.7	41.7	100.0
	Total	24	100.0	100.0	
B7					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	5	20.8	20.8
	3	19	79.2	79.2	100.0
	Total	24	100.0	100.0	
B8					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	1	4.2	4.2
	2	22	91.7	91.7	95.8
	3	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

C9					
		Frequency	%	Valid percent	Cumulative %
Valid	3	24	100.0	100.0	100.0
C10					
		Frequency	%	Valid %	Cumulative %
Valid	3	24	100.0	100.0	100.0
C11					
		Frequency	%	Valid %	Cumulative %
Valid	3	21	87.5	87.5	87.5
	4	3	12.5	12.5	100.0
	Total	24	100.0	100.0	
C12					
		Frequency	%	Valid %	Cumulative %
Valid	3	20	83.3	83.3	83.3
	4	4	16.7	16.7	100.0
	Total	24	100.0	100.0	
C13					
		Frequency	%	Valid %	Cumulative %
Valid	3	19	79.2	79.2	79.2
	4	5	20.8	20.8	100.0
	Total	24	100.0	100.0	
C14					
		Frequency	%	Valid %	Cumulative %
Valid	3	21	87.5	87.5	87.5
	4	3	12.5	12.5	100.0
	Total	24	100.0	100.0	
C15					
		Frequency	%	Valid %	Cumulative %
Valid	3	20	83.3	83.3	83.3
	4	4	16.7	16.7	100.0
	Total	24	100.0	100.0	
C16					
		Frequency	%	Valid %	Cumulative %
Valid	3	19	79.2	79.2	79.2

	4	5	20.8	20.8	100.0
	Total	24	100.0	100.0	
C17					
		Frequency	%	Valid %	Cumulative %
Valid	3	18	75.0	75.0	75.0
	4	6	25.0	25.0	100.0
	Total	24	100.0	100.0	
B18					
		Frequency	%	Valid %	Cumulative %
Valid	3	19	79.2	79.2	79.2
	4	5	20.8	20.8	100.0
	Total	24	100.0	100.0	

D19					
		Frequency	%	Valid %	Cumulative %
Valid	1	2	8.3	8.3	8.3
	2	22	91.7	91.7	100.0
	Total	24	100.0	100.0	
D20					
		Frequency	%	Valid %	Cumulative %
Valid	3	19	79.2	79.2	79.2
	4	5	20.8	20.8	100.0
	Total	24	100.0	100.0	
D21					
		Frequency	%	Valid %	Cumulative %
Valid	3	19	79.2	79.2	79.2
	4	5	20.8	20.8	100.0
	Total	24	100.0	100.0	
D22					
		Frequency	%	Valid %	Cumulative %
Valid	2	5	20.8	20.8	20.8
	3	19	79.2	79.2	100.0
	Total	24	100.0	100.0	



D23					
		Frequency	%	Valid %	Cumulative %
Valid	3	22	91.7	91.7	91.7
	4	2	8.3	8.3	100.0
	Total	24	100.0	100.0	
D24					
		Frequency	%	Valid %	Cumulative %
Valid	2	19	79.2	79.2	79.2
	3	5	20.8	20.8	100.0
	Total	24	100.0	100.0	
D25					
		Frequency	%	Valid %	Cumulative %
Valid	2	2	8.3	8.3	8.3
	3	22	91.7	91.7	100.0
	Total	24	100.0	100.0	
D26					
		Frequency	%	Valid %	Cumulative %
Valid	3	24	100.0	100.0	100.0
D27					
		Frequency	%	Valid %	Cumulative %
Valid	2	9	37.5	37.5	37.5
	3	15	62.5	62.5	100.0
	Total	24	100.0	100.0	
D28					
		Frequency	%	Valid %	Cumulative %
Valid	1	17	70.8	70.8	70.8
	2	2	8.3	8.3	79.2
	3	5	20.8	20.8	100.0
	Total	24	100.0	100.0	

E29					
		Frequency	%	Valid %	Cumulative %
Valid	3	22	91.7	91.7	91.7
	4	2	8.3	8.3	100.0

	<b>Total</b>	<b>24</b>	<b>100.0</b>	<b>100.0</b>	
<b>E30</b>					
	<b>Valid</b>	<b>3</b>	<b>22</b>	<b>91.7</b>	<b>91.7</b>
	<b>4</b>	<b>2</b>	<b>8.3</b>	<b>8.3</b>	<b>100.0</b>
	<b>Total</b>	<b>24</b>	<b>100.0</b>	<b>100.0</b>	
<b>E31</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	<b>3</b>	<b>22</b>	<b>91.7</b>	<b>91.7</b>
	<b>4</b>	<b>2</b>	<b>8.3</b>	<b>8.3</b>	<b>100.0</b>
	<b>Total</b>	<b>24</b>	<b>100.0</b>	<b>100.0</b>	
<b>E32</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	<b>3</b>	<b>22</b>	<b>91.7</b>	<b>91.7</b>
	<b>4</b>	<b>2</b>	<b>8.3</b>	<b>8.3</b>	<b>100.0</b>
	<b>Total</b>	<b>24</b>	<b>100.0</b>	<b>100.0</b>	
<b>E33</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	<b>3</b>	<b>21</b>	<b>87.5</b>	<b>87.5</b>
	<b>4</b>	<b>2</b>	<b>8.3</b>	<b>8.3</b>	<b>95.8</b>
	<b>33</b>	<b>1</b>	<b>4.2</b>	<b>4.2</b>	<b>100.0</b>
	<b>Total</b>	<b>24</b>	<b>100.0</b>	<b>100.0</b>	
<b>E34</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	<b>3</b>	<b>22</b>	<b>91.7</b>	<b>91.7</b>
	<b>4</b>	<b>2</b>	<b>8.3</b>	<b>8.3</b>	<b>100.0</b>
	<b>Total</b>	<b>24</b>	<b>100.0</b>	<b>100.0</b>	
<b>E35</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	<b>3</b>	<b>22</b>	<b>91.7</b>	<b>91.7</b>
	<b>4</b>	<b>2</b>	<b>8.3</b>	<b>8.3</b>	<b>100.0</b>
	<b>Total</b>	<b>24</b>	<b>100.0</b>	<b>100.0</b>	
<b>E36</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	<b>2</b>	<b>6</b>	<b>25.0</b>	<b>25.0</b>

	3	17	70.8	70.8	95.8
	4	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

<b>E37</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	3	22	91.7	91.7
	4	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

<b>E38</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	3	22	91.7	91.7
	4	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

<b>E39</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
	<b>Valid</b>	3	22	91.7	91.7
	4	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

<b>E40</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
	<b>Valid</b>	3	22	91.7	91.7
	4	2	8.3	8.3	100.0
	Total	24	100.0	100.0	

<b>E41</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
Valid	1	4	16.7	16.7	16.7
	2	19	79.2	79.2	95.8
	3	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

<b>F42</b>					
		<b>Frequency</b>	<b>%</b>	<b>Valid %</b>	<b>Cumulative %</b>
Valid	1	3	12.5	12.5	12.5
	2	18	75.0	75.0	87.5

	3	3	12.5	12.5	100.0
	Total	24	100.0	100.0	

F43

		Frequency	%	Valid %	Cumulative %
Valid	2	3	12.5	12.5	12.5
	3	21	87.5	87.5	100.0
	Total	24	100.0	100.0	

F44

		Frequency	%	Valid %	Cumulative %
Valid	1	1	4.2	4.2	4.2
	2	4	16.7	16.7	20.8
	3	19	79.2	79.2	100.0
	Total	24	100.0	100.0	

F45

		Frequency	%	Valid %	Cumulative %
Valid	2	8	33.3	33.3	33.3
	3	16	66.7	66.7	100.0
	Total	24	100.0	100.0	

F46

		Frequency	%	Valid %	Cumulative %
Valid	1	2	8.3	8.3	8.3
	2	7	29.2	29.2	37.5
	3	15	62.5	62.5	100.0
	Total	24	100.0	100.0	

F47

		Frequency	%	Valid %	Cumulative %
Valid	1	2	8.3	8.3	8.3
	2	8	33.3	33.3	41.7
	3	14	58.3	58.3	100.0
	Total	24	100.0	100.0	

F48

		Frequency	%	Valid %	Cumulative
Valid	1	5	20.8	20.8	20.8
	2	19	79.2	79.2	100.0

	Total	24	100.0	100.0	
--	-------	----	-------	-------	--

G49

		Frequency	%	Valid %	Cumulative
Valid		1	1	4.2	4.2
	2	2	8.3	8.3	12.5
	3	21	87.5	87.5	100.0
	Total	24	100.0	100.0	

G50

		Frequency	%	Valid %	Cumulative
Valid		1	1	4.2	4.2
	2	19	79.2	79.2	83.3
	3	4	16.7	16.7	100.0
	Total	24	100.0	100.0	

G51

		Frequency	%	Valid %	Cumulative
Valid		2	2	8.3	8.3
	3	22	91.7	91.7	100.0
	Total	24	100.0	100.0	

G52

		Frequency	%	Valid %	Cumulative
Valid		3	24	100.0	100.0

H53

		Frequency	%	Valid %	Cumulative
Valid	1	4	16.7	16.7	16.7
	3	1	4.2	4.2	20.8
	4	19	79.2	79.2	100.0
	Total	24	100.0	100.0	

H54

		Frequency	%	Valid %	Cumulative
Valid	1	24	100.0	100.0	100.0

H55

		Frequency	%	Valid %	Cumulative
Valid	1	24	100.0	100.0	100.0

H56					
		Frequency	%	Valid %	Cumulative
Valid	1	24	100.0	100.0	100.0
H57					
		Frequency	%	Valid %	Cumulative
Valid	2	24	100.0	100.0	100.0
H58					
		Frequency	%	Valid %	Cumulative
Valid	1	24	100.0	100.0	100.0



## APPENDIX O: TRANSCRIPT OF THE INTERVIEW

Reflective notes	Transcription of the interview	Theme
<p>RQ: 1) Please tell me more about yourself...2) At which institution did you study? Explain why you chose that institution....3) What are your major subjects for your qualification.... 4) What was your experience as learner in life sciences/biology? 5) How many years have you been teaching Grade 12 life sciences? 6) What was your personal experience (difficulties, challenges) while implementing the grade 12 life science?</p>		
<p><i>He had teaching experience both of OBE and the new curriculum. With no laboratory at his school, he still wanted to become a biology teacher. He got a good foundation in biology teaching and that is why he chose biology. He could relate to the subject matter. A career that spans over more than two decades. He is a great asset to the school and wants to improve his community. With a wealth of experience and so many years in teaching, he must have seen all in terms of curriculum reform and the implementation of curricula.</i></p>	<p>My name is Vuyo, principal of this high school. I am 50 years of age with 24 years teaching experience. For the past 17 years, I have been the principal of this school. I grew up in Gugulethu, in the Western Cape, and attended the University of the Western Cape where I obtained my BA and a HDE. Posts were scarce when I finished my training, and therefore I came to the Northern Cape Province. I also hold a Master's degree in Education and majored in biology and IsiXhosa. Teaching was what I always want to do when I grew up. My experience as a learner was that biology, as it was called then, was fun to learn and I could relate to the content that was taught. I started my career some 24 years back. My aim was to help learners grasp the content and see some of them going to university. Teaching now is very different to what it was during the apartheid era.</p>	<p>Personal background and context</p> <p>My experience of science</p>
<p><i>Carol is adequately qualified to teach life sciences in the FET phase. Carol received training in CAPS at university and understands CAPS. Her early engagement with life sciences as a learner might have resulted in her having a positive perception of the subject, and her training at university prepared her for teaching life sciences. She has positive experiences of life sciences but stressed that the content was too much for her to comprehend. Carol wants her learners to have a thorough understanding of life sciences.</i></p>	<p>My name is Carol. I grew up in a small town in the Northern Cape Province. My age is my secret, sorry sir! I am a novice teacher and hold a B. Ed from the University of North West. I only have two years of teaching experience and still grapple with the Grade 12 life sciences curriculum and content. My majors at university were life sciences and mathematical literacy. My experience of life sciences is that it was practical and a lot of content to comprehend. I studied life sciences during the implementation of the NCS. I don't really know the subject biology, because when I was in the FET phase, we referred to it as a learning area. I start my career as a life sciences teacher in 2014, and my aim is to impart the knowledge of life sciences to my learners and have a good pass percentage in Grade 12 because this is how the DoE measures if a school is functional or not. There is too much pressure on us to perform.</p>	<p>Personal background and context</p> <p>My experience of science</p>
<p><i>Brady received training in CAPS at the university and understands CAPS. His early engagement with life sciences as a learner might have resulted in him having a positive perception of the subject and his training at university prepared him for teaching life sciences. It is his objective as a life sciences teacher to make a difference in the lives of his learners and he does not want them to suffer like he did, with no practical work done in life sciences.</i></p>	<p>My name is Brady. I grew up in a small town in the Northern Cape Province. I am an experienced teacher and hold a B.Ed. from the CPUT. I have nine years of teaching experience. I teach both the Afrikaans and English streams in the school. My experience of life sciences is that it was too theoretical because we did not have any laboratories at school. My life sciences teacher and lecturer were very passionate about the subject despite the fact that he had minimal resources. I studied life sciences during the implementation of the NCS. We were trained in the NCS curriculum. I started my career as a life sciences teacher in 2008. My aim is to educate our learners and make a difference in their lives.</p>	<p>Personal background and context</p> <p>My experience of science</p>
<p><i>He is proud to be from the region. As he grew up, he faced a lot of difficulties in the township and in his life. He grew up under apartheid and most of his school career was under apartheid. His dream is to send a learner into the world who is developed in all aspects.</i></p>	<p>My name is Neill, I grew up in this region and attended the same school where I am a teacher for the past 26 years. I went to Southern Cape Teachers College and completed my teaching diploma and returned to my alma mater to take up a teaching post. My main subjects at college were biology and Physical Training. I started my teaching career in 1991. My aim as a life sciences teacher is to focus on education and developing learners in a more rounded</p>	<p>Personal background and context</p>

<p><i>Because he grew up in apartheid with limited opportunities for black learners, he realised he should contribute to change that narrative.</i></p>	<p>way as full human beings. I think I reach my aims as a science teacher. I think a review of the curriculum is necessary to change the curriculum to get rid of our apartheid baggage since we have a history of oppression and to reduce historical inequalities. My aim is to do well in my job and help my learners become something in life.</p>	
<p><i>He never intended to become a teacher. He was very politically aware from a very early stage. His entire school and tertiary education were spent under apartheid. Wants to help his own people to become emancipated. He makes it his mission to make a difference in lives of the youth who enter his class.</i></p>	<p>My Name is Dawid, I grew up in De Aar and I am 50 years of age. I have 26 years of teaching experience in teaching life sciences and biology, as it was known then. I studied at the Southern Cape Teachers College, completing my three-year diploma in teaching, specialising in mathematics and biology. The political climate of the day forced me into teaching. My main subjects at college were biology and mathematics. I started my teaching career in 1991. My aim as a life sciences teacher is to focus on providing learners with the necessary skills and knowledge to fit into the world of work. I want to emancipate and educate my people.</p>	<p>Personal background and context</p>
	<p>Researcher: What are your views regarding the implementation of the Grade 12 life sciences curriculum? Do you think teachers are coping and are you on the right track in terms of the implementation process? What was your preparation for the curriculum?</p>	
<p><i>The participant is happy with the Grade 12 life sciences curriculum implementation.</i></p> <p><i>The participant is still inexperienced and her expectations of the implementation were not met.</i></p> <p><i>The participant experienced problems during the implementation process. The DoE had unrealistic expectations.</i></p> <p><i>Participants experience problems during implementation process. Poor training.</i></p> <p><i>Does not meet the expectation of the respondent. Content gap on the part of the teacher.</i></p>	<p>I think the curriculum was implemented fairly well. For me, the transition was OK! I think teachers adjust to the Grade 12 life sciences curriculum quite well, and, yes, I think they are on the right track with the implementation of the curriculum. Continuous support and training is needed to ensure effective implementation of the life sciences curriculum.</p> <p>I still experience some problems in terms of the implementation of the Grade 12 life sciences curriculum. I think more experienced teachers understand what is expected from them. I think most teachers cope, but new teachers like me need mentoring and guidance in terms of the implementation of the Grade 12 life sciences curriculum.</p> <p>The Grade 12 life sciences curriculum implementation was not without challenges. For me at least. Uhm ... I think the curriculum is loaded and too much is expected from us in terms of curriculum delivery. The department focus too much on Grade 12 results and neglect other grades. I think we are on the right track with the implementation of the curriculum.</p> <p>The implementation of the Grade 12 life sciences curriculum in my view was full of challenges. I think the quality of training we receive was not adequate. Well ... Ja, eh ... (laughing) I think as teachers we try our best with the implementation of the curriculum.</p> <p>The implementation of CAPS and specific the Grade 12 life sciences curriculum was not what we expected. There was content in the Grade 12 curriculum that I was not trained on during my initial teacher training. The departmental training, we</p>	<p>Implementation went well, teachers are coping, training did take place</p> <p>Teacher experienced some problems with the implementation of the curriculum. Teachers are coping well.</p> <p>More support needed.</p> <p>Implementation Challenges. Unrealistic Expectation of DoE</p> <p>Implementation challenges. Poor teacher training. Teacher trying his best</p> <p>Implementation Challenges. No support. Lack pedagogical content knowledge (PCK).</p>



	received was not good at all. As a district, we were lucky enough to receive content training from UWC to help us cope with the curriculum content especially on the section of evolution.	
	Researcher: What are your perceptions regarding curriculum reform? Given that we come from OBE, to NCS and RNCS and now CAPS?	
<p><i>Participant is not in favour of curriculum change</i></p> <p><i>No curriculum changes for participant</i></p> <p><i>No curriculum changes</i></p> <p><i>Curriculum changes happen to soon after one another, but willing to implement if curriculum change</i></p> <p><i>No curriculum reform for participant who wants to see the results of current curriculum</i></p> <p><i>Opposed to curriculum change</i></p>	<p>Please no curriculum changes in the near future. I am not against curriculum change per se, but if it happens to soon and regular, teachers become resistant to change. Sometimes it is necessary to revisit the curriculum, but this curriculum is still in its early stages of implementation. <i>"I am of the opinion that the government is using education to transform our society, but there were too many changes the past decade. Once you get used to the curriculum, the government affect changes to the curriculum. Sometimes it will be small changes like altering or shifting content. But to bring about wholesale changes, I think it is not good for education at all"</i></p> <p>No curriculum changes for now. There is absolutely no need to change the curriculum in the foreseeable future. Too much changes in the curriculum bring resistance. The more things change the more they stay the same. The curriculum is just fine as it is, thank you. <i>"I am still new in teaching but we must be involved. At the end of the day, curriculum reforms affect us as teachers."</i> (Carol)</p> <p>In my view I think teachers are really ... umh how can put it. They are overburdened. From where I am seated there is no need for a curriculum change now in South Africa, but I will support whatever changes are made to strengthen the curriculum.</p> <p>Let us stabilise the current Grade 12 curriculum and do an assessment after 10 years or so to see what we can change. But if they need to amend certain sections of the curriculum, I will support and implement it.</p> <p>I am totally against the curriculum reform soon after implementing a new curriculum. Like my colleague say let the curriculum stabilise. <i>"I never changed the way I teach. As much as I embrace changes to the curriculum, my problem is that as soon as we acclimatised to the changes, new changes are on the cards."</i></p>	<p>No curriculum changes</p> <p>No curriculum changes</p> <p>No curriculum changes</p> <p>No curriculum changes</p> <p>No curriculum changes</p> <p>No curriculum changes</p> <p>No curriculum changes</p>
	Researcher: What do you think was the intention of the implemented Grade 12 life sciences curriculum? Can you mention a few?	
	In my view, as I see it, the curriculum was intended to bring about transformation and social reform and expand our curriculum knowledge. Also, to teach our learners about where we come from and the knowledge that we as Africans have – indigenous knowledge. <i>It is not easy to achieve social cohesion in social transformation in schools, but we have a progressive constitution that promoted social justice and put human rights high on the agenda. In life sciences, under Specific Aim 3, we can further enhance social cohesion through studying science. Life sciences exposed us to the history of IKS and other cultures and other cultural groups in South</i>	<p>Transformation</p> <p>Indigenous knowledge,</p> <p>PCK</p>

	<p><i>Africa.</i></p> <p>To promote social justice and to send out a learner that is responsive and sensitive to the needs of others. I think it is to teach difficult and complex life sciences concepts to the learners and transfer content knowledge to the learners.</p> <p>The intention of the curriculum is to promote Specific aim 3 of the life sciences curriculum and to make us aware of environment and its benefits to humans; to bring total transformation to the curriculum. As a country, we acknowledge where we are coming from and understand the injustices that was done to people of colour by the apartheid government and how they used the curriculum to indoctrinate society to gain their political objectives. With CAPS, we want to see a curriculum that is free from racial prejudices that is aimed at transforming our society. <i>"I never changed the way I teach. As much as I embrace changes to the curriculum, my problem is that as soon as we acclimatised to the changes, new changes are on the cards."</i></p> <p>To promote a green environment curriculum and promote education for sustainable development. To create social awareness in our learners. To help teachers with their content knowledge. <i>In their quest to promote IKS in schools, the DoE should include more training on IKS since we did not have it in our teacher training. By so doing we can incorporate it into our science lesson at school and understand our cultures.</i></p> <p>The curriculum wants to promote a sustainable environment. To develop learners' scientific skills and expose them to indigenous knowledge systems. I want to add that it intends to develop learners' knowledge and skills so that they can become valuable members of society.</p>	<p>Social justice</p> <p>Diversity</p> <p>PCK</p> <p>Indigenous knowledge systems</p> <p>Social justice</p> <p>Education for Sustainable development</p> <p>Indigenous knowledge systems</p> <p>Sustainability</p> <p>Process skills</p> <p>Indigenous knowledge systems</p>
	<p>Researcher: In your view, as a life sciences teacher, do you think the Grade 12 life sciences curriculum addresses the intentions of the CAPS curriculum?</p>	
	<p>I definitely think so. If you read your CAPS document, you will come across the issues we just mentioned.</p> <p>The Grade 12 curriculum addresses the intended curriculum.</p> <p>Yes, I agree that it met the needs of the curriculum. The Grade 12 life sciences curriculum addresses the intention of the curriculum.</p> <p>I am of the view that the Grade 12 life sciences curriculum does not only address the issues mentioned, but also serve the purpose for which it was created. Therefore, I agree that the Grade 12 life sciences curriculum addresses the intention of the curriculum.</p>	<p>Address the intention</p> <p>Address the intention</p> <p>Address the intention</p> <p>Address the intention</p> <p>Address the intention</p>

## APPENDIX P: RESULTS OF NSC EXAMINATIONS – 2011- 2018

LIFE SCIENCES	YEAR	NATIONAL	PROVINCIAL	DISTRICT
	2011	73.2	68.6	73.9
	2012	69.5	61.9	68.2
	2013	73.7	58.2	59.7
	2014	73.8	63.5	67.2
	2015	70.4	57.2	61.6
	2016	70.5	67.9	71.0
	2017	74.4	66.4	69.5
	2018	76.3	61.9	56.5

School	Year	No of candidates	No of candidates passed	Pass percentage
A	2011	40	30	75%
	2012	36	17	47.2%
	2013	50	21	64%
B	2011	40	30	75%
	2012	12	10	83%
	2013	15	11	73.3%
C	2011	60	39	65%
	2012	80	48	60%
	2013	74	21	29%
D	2011	18	10	55%
	2012	20	11	55%
	2013	17	7	41.2%
School	Year	No of candidates	No of candidates passed	Pass percentage
A	2014	39	30	76.9%
	2015	74	39	53%
	2016	68	38	56%
	2017	45	36	80%

	2018	62	45	72.6%
<b>B</b>	2014	17	41	41.2%
	2015	25	20	80%
	2016	28	20	71%
	2017	15	12	80%
	2018	10	8	80%
<b>C</b>	2014	91	26	28.6%
	2015	77	33	43%
	2016	51	33	65%
	2017	55	26	47%
	2018	50	13	26%
<b>D</b>	2014	17	5	29.4%
	2015	22	7	32%
	2016	14	8	57%
	2017	21	10	48%
	2018	9	6	66.7%

WESTERN CAPE

## APPENDIX Q: PARTICIPANT RESPONSES TO PCK

To make complex concepts comprehensible to learners	Description/ theme	
Vuyo	<i>I am adequately qualified to teach life sciences. I have a good understanding and grasp of life sciences subject matter. I am aware that PCK stand central in effectively teaching life sciences. My view is that effective teaching is depended on adequate PCK. Learner success is dependent on PCK.</i>	
Carol	<i>I would not say that I possess deep content knowledge and I am not too confident with the subject matter. As a teacher teaching life science, you need to demonstrate deep PCK. My level of content knowledge assisted me in teaching life sciences. In order for learners to achieve, teachers need to have PCK.</i>	
Brady	<i>My name is Brady, I believe it is necessary to have content knowledge to teach life sciences. My PCK helps me to expose the learners' misunderstanding of concepts. My subject knowledge assisted me in giving the correct explanation and also to deal with learners' perceptions misconceptions.</i>	
Neill	<i>I am of the opinion that in order for me to be effective in my teaching, I need to display knowledge (content knowledge) to probe learners with regard to assessing whether they understood my lesson. In order for me to improve my life sciences teaching practice, it is important to understand that there is a link between learner attainment and PCK. PCK is important to implement the life sciences curriculum effectively.</i>	
Dawid	<i>While I agree that PCK is needed in teaching life sciences, it is also my view that you need to understand and have the skill to deal with difficult concepts in the subject. You might possess deep content knowledge but have no idea to transfer that knowledge to your learners in class. You must understand the context and milieu of the school.</i>	
Themes from the interviews	Examples of statement related to the category	Frequency of statement
Social justice and transformation	Ensuring that the educational imbalances of the past are reviewed and that equivalent opportunities are provided for the entire the population. Social transformation; establish a society based on democratic values, social justice and fundamental human rights.	3
Knowledge and skills	The National Curriculum Statement Grade R–12 offers articulation to the knowledge, skills and values worth learning in South African schools. Securing knowledge and skills in ways that are important in their own lives. Apply knowledge and skills. The curriculum promotes knowledge in local contexts. In-depth knowledge and good skills.	5
Role of IKS	Valuing IKS: recognises the rich history and legacy of this nation as significant contributors of sustaining the qualities as set out in the constitution. Valuing indigenous knowledge systems: acknowledging the rich history and heritage of this country.	2
Environment (ESD)	Develop in the learner: competence and confidence and create environmental awareness in learners. Showing responsibility towards the environment. Environmental justice.	3
Pedagogical content knowledge	The curriculum aims to ensure that “children acquire and apply knowledge and skills in a way that are meaningful to their own lives”. Clear specification of what to be taught. Content of each grade to show progression from simple to complex.	3

## APPENDIX R: DOCUMENT ANALYSIS SCHEDULE

Dispositional category (Grade 12)		Examples of statement related to the category			Frequency of statement
Role of IKS		Valuing IKS: recognises the rich history and legacy of this nation as significant contributors to sustaining the qualities set out in the constitution.			6
Social transformation and social justice		Correcting the educational imbalances and guarantee that equal educational opportunities are provided for all. Understand contribution of science to social justice and societal development.			1
Knowledge and skills		The National Curriculum Statement Grade R–12 gives expression to the knowledge, skills and values worth learning in South African schools. Acquiring knowledge and skills in ways that are meaningful to their own lives.			23
Awareness, confidence, citizenship		Develop in the learner: competence and confidence and create awareness in learners (p7 & 8).			2
Connection to learners world		The curriculum aims to ensure that “children acquire and apply knowledge and skills in a way that is meaningful to their own lives”. Interconnectedness of life (p8, 10, 11, 16).			5
Dispositional category	Strand	Topic	Content	Investigation	Representation
Role of IKS and sensitivity towards social awareness	Gr 12 Strand 1	Mitosis	Cancer	Research and brief discussion on beliefs and attitudes	Completely
	Gr.12 Strand 4	Human evolution	Alternative to evolution, different cultural and religious explanations	Research and discussion	Completely
Social transformation and social justice					Completely
Knowledge on diversity	Gr. 12 Strand 1	Meiosis Evolution	Consequences of abnormal meiosis, Down syndrome and Alzheimer's	None	Completely
Knowledge and skills	Grade 12 Strand 1	Deoxyribonucleic acid	DNA	Case study; extract DNA	Completely
Education for sustainable development	Grade 12	Human impact on the environment			Completely
Connection to the learner's world	Grade 12 Strand 1	Human reproduction	Structure of male and female reproductive systems	Prepare slides of ovary and testes	Completely

## APPENDIX S: EDITOR'S LETTER

# LINGUAFIX

EDITING AND TRANSLATION/REDIGERING EN VERTALING

☎ 082 681 6232 / [vnhelene@gmail.com](mailto:vnhelene@gmail.com)

[www.linguafix.net](http://www.linguafix.net)

To whom it may concern

### Confirmation of language editing

This letter is to record that I have completed a language edit of *Examining teachers' experiences of implementing the Grade 12 life sciences curriculum*.

The edit that I carried out **included** the following:

- Correct grammar, punctuation, spelling and usage
- Attend to the consistency of style, tone and voice
- Point out confusing sentence structures, wrong word choices and ambiguous passages
- Point out incomplete sentences or phrases
- Query or eliminate redundancies and verbosity
- Identify any problems in matters of substance or structure

I did **not**:

- Add, remove or reorder content
- Check bibliographical information for accuracy
- Rearrange sentences, paragraphs or sections to ensure that the argument is logically constructed
- Verify the accuracy of citations
- Verify the accuracy of mathematical or statistical calculations, or specific formulae or symbols, or illustrations
- Verify the correctness or truth of information (unless obvious)

**Helena Johanna van Niekerk W.W**



M.Diac. (University of South Africa); Postgraduate Diploma in Editing and Translation  
(Stellenbosch University)