A STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

By

XOLISILE P. NDABA

(B.Ed. Hons.)

Dissertation submitted in fulfilment of the requirements for the degree

Master of Education

in the

FACULTY OF EDUCATION

SCHOOL OF EDUCATION STUDIES

(CURRICULUM STUDIES)

at the

UNIVERSITY OF THE FREE STATE

QWAQWA

SOUTH AFRICA

Supervisor: Dr B. DUBE

NOVEMBER 2020

Declaration

Student No.: 2009174075

I, XOLISILE PERSERVIARANCE NDABA declare that the dissertation, *A strategy to enhance the academic performance of Grade 12 progressed learners in life sciences*, submitted by me for the Master's degree at the University of the Free State, is my own, independent work and has not previously been submitted for any qualification at another higher education institution. I also declare that no work of other scholars has been used without proper citation, and that all the sources used or quoted have been indicated and acknowledged by means of complete references.

I, furthermore, cede copyright of the dissertation in favour of the University of the Free State.

XOLISILE PERSEVIARANCE NDABA

Signed: _____ Date: _____

ACKNOWLEGEMENTS

I would like to express my deepest gratitude to God Almighty for guiding, strengthening, protecting and for being there for me throughout my research journey.

I am so immensely grateful to my supervisor, Dr Bekithemba Dube, for his patience, support, motivation and guidance throughout my journey. It was not easy, but he was my strength when my life was falling apart and my studies seemed so complicated to complete. Thank you so much, Dr Dube, for believing in me and simplifying my research journey, both academically and financially. Be blessed abundantly.

I wish to thank the supervisory team of SuLE/SuRLEC for a great experience of growth during the research journey. I would also like to thank Mrs Hettie Human for language editing and proofreading this dissertation, and Dr C.T. Tsotetsi, for believing in me.

Truly, my deepest gratitude and appreciation goes to the following institutions: the KwaZulu-Natal Head of Department of Education, Dr Sishi, for granting me permission to conduct this study at Uthukela District schools, and the University of the Free State for funding my studies.

I am also grateful to my pillar of strength, my mother, Thokozile Victoria Ndaba, for her unconditional love, support and prayers, I am what I am today through you, Mom. You did not expect me to do anything at home, but instead, to focus on my studies. Thank you so much, MaDlamini, for giving me this opportunity. My siblings, Zamandaba, Sibusisiwe and Khethokuhle, thank you guys for your support.

Special thanks also goes to Pastor Njabulo Basi, for always including me in his prayers.

My appreciation goes to Grade 12 life sciences teachers and learners: Thank you so for your participation and support, which helped to make this dissertation a success.

I also appreciate my principal, P.S. Dlamini, and my HOD, B.E. Mazibuko, for their endless support during the toughest period of my research journey.

Lastly, I would like to thank my friends and colleagues for their encouragement and support: Khulekani Mlaba, Phindile Mthembu, Palesa Miya, Sizakele Mabaso, Andile Mabaso, Duma S.M, Mpumelelo Mazibuko and Ntuthuko Mchunu.

DEDICATION

I dedicate this study to my late father, Sabelo Christian Ndaba, and my late sister, Hlengiwe Christina Ndaba. I know that, where you are, you are very proud of and happy with my success. I so wish you were here, and I will never forget your love and support.

This work is also dedicated to my children, Rethabile, Siphokazi, Zekhethelo, Melokuhle, Siphokuhle and, my pillar, Bhekabantu Makhoba. Ngiyabonga Joko, Sebengwayo nako Mthiyane, for your unconditional love and support.

To the God of impossibilities, who provided me with strength, wisdom and perseverance.

To God be all the glory.

ABSTRACT

The aim of the study was to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. The strategy emerged from the large number of Grade 12 progressed learners who perform poorly in life sciences. The theoretical framework that underpinned the study is critical emancipatory research (CER), as developed by the Frankfurt School of 1923. Four principles were applied: active communication, transformation, emancipation and social justice. These principles supported the study by facilitating emancipation of teachers and Grade 12 progressed learners in life sciences.

Participatory action research (PAR) was applied in this study as an approach to generate data and find a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, and to complement CER by supporting disadvantaged learners at schools, and build a better future for them. Homologous purposeful sampling was used as a method of sampling. Teachers, including a subject advisor, and Grade 12 progressed learners participated in data generation through WhatsApp focus group discussions. This method was used as a part of a qualitative research study, to collect data according to the principles of PAR, and within the limitations imposed by Covid-19 pandemic restrictions and regulations. Data that was collected from the participants through WhatsApp group discussions was analysed with the thematic model suggested by Laws, Harper and Marcus, which involves seven steps. The findings of this study identify the factors that contribute to poor academic performance of progressed learners, and suggest ways to improve the academic performance of Grade 12 progressed learners.

KEYWORDS: Academic performance, learner progression, learner promotion, life sciences and rural schools

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

CAPS	Curriculum and Assessment Policy Statement
CER	Critical emancipatory research
DBE	Department of Basic Education
FET	Further education and training
ICT	Information and communications technologies
LTSM	Learner-Teacher-Support Materials
NGO	Non-governmental organisation
PAR	Participatory action research
SAARMSTE	Southern African Association dedicated to the advancement of Research in Mathematics, Science and Technology Education

CHAPTER 1: SYNOPSIS OF STUDY

1.1. INTRODUCTION TO AND RATIONALE OF THE STUDY

This study aimed to design a strategy to enhance the academic performance of progressed Grade 12 learners in life sciences. Learner academic performance is the core business of the Department of Basic Education (DBE) and schools in South Africa, and success is measured by examination results (Chisholm and Wildeman, 2013:89). Chamorro-Premuzic and Furnham (2003) define academic performance in terms of examination performance. The quality of South Africa's Grade 12 examination performance results has declined, not only in life sciences, but in other subjects too (DBE, 2012). One of the main reasons for the decline in the quality of results in most subjects is the progression policy, which states that a learner can fail only once in the further education and training (FET) band, and thereafter has to proceed to the next grade, to avoid learners spending more than four years in a phase, as prescribed by the policy, and to keep learners with their age cohorts (Leepo, 2015:60).

The progression policy means that the challenges that an underperforming learner experienced in the grade that the learner failed to pass, will have to be addressed in the next grade – the grade to which the learner has been promoted. The policy was introduced in 2012 and implemented in schools for Grades R to 12 in 2013 by the DBE (2013a). According to the DBE (2012a), and reiterated by the minister of Basic Education, Angie Motshekga, in 2018, the primary purpose of the National Senior Certificate examination is to provide learners with a national exit-level qualification, gained through an inclusive, equitable, efficient process that is of good quality (Motshekga, 2018). However, few progressed learners perform well, as indicated by the 2018 Grade 12 results (DBE, 2018), despite the resources dedicated to supporting them. For instance, in 2018, there were 128 634 registered progressed learners nationally. Of these, only 33 412 were ready to write the requisite seven subjects, while 95 222 modularised. Of the total of 33 412, only 20 122 managed to pass with 30% average, and 13 290 failed. The minister explained that progressed learners also contribute to the poor quantity of results; she pointed out that "we need to strengthen our support programme for progressed learners" (Motshekga, 2018:5).

Leepo (2015:64) explains that the progression policy truly affects the academic performance of learners, because “the poor foundation laid in lower grades affects the learners when they reach higher grades especially in Grade 12”. Kika and Kotze (2019:23) aver that, in the lower grades, grade retention is seen as “a mechanism to ensure that learners master the basic skills required in higher grades”. I agree with Leepo (2015:64) and Kika and Kotze (2019:23), because the educational value of progressing learners to higher grades before they have mastered content at lower grades is not clear, and leaves a lot of questions unanswered. Among the questions are, if a learner struggles at a lower grade, how will he or she cope and succeed at a higher grade, and how will the content gap be filled?

In attempt to respond to these questions, researchers have studied progressed learners. Stott, Dreyer and Venter (2015) argue that the progression law encourages learners to be ill-disciplined and unmotivated to work hard to improve their academic performance, because they know they will be automatically progressed to the next grade – the value of threats of grade repetition has been lost. Stott et al. (2015:90) and Picklo and Christenson (2005:258) claim that Grade retention develops the child’s ability to perform better and reduces pressure on the learner. In the South African context, progression is considered to be a synonym of learner dropout, which is likely to occur later, unless the necessary support structures are applied properly (Branson, Hofmeyr and Lam, 2014:106). In contrast, Hartley (2015:413) argues that a progression policy is a good systemic indicator of quality education. Munje and Maarman (2016) agree with Hartley (2015:413), and state that a school progression policy is a key that is employed to give learners the support that is required and necessary for them to achieve access, equity and equality. However, progression could result in a learner performing worse than before if he/she does not receive the necessary support through proper processes and structures (Alexander, Entwistle and Dauber, 2003).

While other studies have attempted to address challenges faced by progressed learners, I found a gap in this work, because none of these studies focused on the performance of Grade 12 life sciences learners in Uthukela District, which, naturally, has a unique nature and challenges, which I will discuss below. This study will not focus on the challenges with the intention of raising alarms for the DBE. Instead, it will

take pragmatic steps to suggest a solution that can contribute to mitigating the challenges faced by progressed learners in life sciences. Learners deserve to be progressed to the next grade regardless of poor performance.

Uthukela District faces many challenges related to progressed learners in life sciences. One of the challenges is these learners' poor performance. The picture painted by the results announced by Minister Motshekga was that, in 2018, there were 151 secondary schools in Uthukela District, of which 135 offered life sciences. In these 135 secondary schools, 5 087 learners wrote life sciences, and 3 750 managed to pass with a minimum pass rate of 30%; while 1 337 learners failed, of whom most were progressed learners. Minister Motshekga emphasised that these were good results, since most learners had obtained 30%, which is at Level 2. The minister also admitted that the education system in South Africa lacks remediation, which is required for social promotion, when she stated in her speech, "we need to strengthen our support programme for [progressed] learners" (Motshekga, 2018:23).

Im, Hughes, Kwok, Puckett and Cerda (2013:350) and Goos (2013) argue that Grade retention does not offer any advantages to learners – it only hinders them unnecessarily. I disagree with Im et al. (2013:350) and Goos (2013), because, in my opinion, retention is used as an intervention to help learners who are struggling academically to close the content gap and master the curriculum properly, thereby improving current and future performance and making success possible.

What is missing from the research of Im et al. (2013:350) and Goos (2013) is acknowledgement that learners who are progressed to the next grade, instead of being retained, lack the basic skills they were supposed to have gained in the lower grade, and will have to apply in higher grades; they might even lack the requisite skills to become productive members of the community. I am of the view that South Africa's 2013 Progression Policy suggests that learners who lack the skills to be productive in society, should be forced to exit the education system. It must be clarified that the policy, in relation to the provision of additional support to progressed learners, is well-intentioned. However, the Grade 12 results of 2017 and 2018 seem to suggest that this additional support is not having the desired effect, as most of these learners fail academically at the end of Grade 12.

In life sciences, few progressed learners make it through to the tertiary education level, due to the poor quality of their results (Stott et al., 2015:90). By the time these learners reach Grade 12, they are confused and have low self-esteem, because they were expected by their educators to work at least twice as hard as and much faster than their age cohort. Progressed learners are not receiving effective support, and they have to deal with an academic gap, which is left unfilled while they are in the system. Modulation-registered learners report to centres to write the subjects in which they performed poorly, but they are not always successful, despite the strategies that have been implemented by Uthukela District to help them to improve their results. The strategies that have been implemented by the district in an attempt to intervene and improve the academic performance of progressed learners, include establishing learning centres, presenting extra teaching sessions by teachers, and school holiday camps (Leepo, 2015). These enhancement strategies are aimed at covering the content that learners find challenging and struggle with, and creating time to revise the work by means of previous question papers. In this study, I will propose a strategy to enhance the academic performance of progressed learners in life sciences.

Progressed learners find some topics of life sciences difficult, among which genetics (genetics terms and genetic crosses), meiosis, and evolution theories (Fauzi and Mitalistiani, 2018:73-84). This finding is supported by Ross, Taylor, Hughes, Kofod, Whitaker, Lutze-Mann and Tzioumis (2010), who state that most learners fail to master genetics terminology, and find it difficult, since these terms have similar stems but synonymous, for example, homologous and homozygous. In genetics, learners have to draw genetics diagrams and predict possible outcomes. Most learners find it challenging to solve problems, especially when the problems are given in words (sentences), instead of diagrams. Learners also struggle to calculate percentages, especially when figures are involved (Haambokoma, 2007:1-9).

Meiosis is one of the difficult concepts in life sciences to master, especially when learners have insufficient background knowledge of mitosis, which they studied in Grade 10. Learners fail to distinguish meiosis from mitosis, for example, meiosis (sex cells) and mitosis (somatic cells). Regarding evolution theories, most learners expect to be required to state the difference between Lamarck and Darwin’s theories in the examinations, while they are actually required to master and to interpret both theories

at the same time in relation to the development of the modern species (Ratcliff, Raney, Westreich and Cotner, 2014:81-87).

Most schools in Uthukela District lack adequate learning resources for life sciences, such as textbooks, study guides and laboratories, which would enable all learners to improve their academic performance. Most of the learners share textbooks in pairs, and they are unable to work, revise and practise at home. The lack of crucial resources, such as textbooks, have a negative effect on the learning outcomes of life sciences and on the performance of progressed learners.

One of the threats to the success of this study was a lack of communication and limited involvement by parents in their children's academic life. Leepo (2015) states that parental involvement is more meaningful when parents are given an opportunity to be involved in various activities at the school. Centres, extra lessons and camps can compromise the success of teaching and learning, since many learners from different schools attend a single centre, and are taught by different educators using different approaches. These strategies might undermine the effectiveness of teaching and learning at schools, and cause teachers to become dependent on external support to cover challenging topics (Eilam, 2013:55).

It is hoped that the study will help to improve the performance of progressed learners in life sciences, and create positive interest in and attitudes towards the subject. The study also intended to encourage progressed learners to put more effort into learning and succeeding in their studies. This study will arm teachers with various tools to assist learners, especially progressed learners, so that they can demonstrate a better understanding of challenging topics, with the ultimate goal of improving learners' performance. Section 1.2 will state the research problem of this study.

1.2. RESEARCH PROBLEM

The number of Grade 12 progressed learners in life sciences who perform poorly has increased drastically in Uthukela District, therefore, the study aimed to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

1.3. RESEARCH QUESTION

The research question of this study is as follows:

> How can the academic performance of progressed learners in life sciences be enhanced?

The questions that follow emerged from the above research question as **secondary questions**:

- What are the challenges faced by progressed learners in their academic performance in Grade 12 life sciences?
- What are the current solutions implemented by the Department of Education to improve the academic performance of progressed learners in life sciences?
- What are the conditions that can enhance the academic performance of Grade 12 progressed learners?
- What threats can hinder the academic performance of progressed learners?
- What are the anticipated successes of implementing of a strategy to enhance performance of Grade 12 progressed learners?

1.4. AIM AND OBJECTIVES OF THE STUDY

1.4.1 Aim

The study aimed to design a strategy to enhance academic performance of Grade 12 progressed learners in life sciences.

1.4.2 Objectives

This study is foregrounded in the following objectives:

- To explore the challenges experienced by progressed learners in life sciences;
- To investigate solutions to improve the performance of Grade 12 progressed learners in life sciences;
- To identify conditions for the successful implementation of a strategy to enhance the performance of Grade 12 progressed learners;

- To identify threats that can hinder the success of the strategy to enhance the performance of progressed learners in Grade 12 life sciences; and
- To discuss the anticipated successes of the strategy to enhance the performance of progressed learners in life sciences.

1.5. THEORETICAL FRAMEWORK: CRITICAL EMANCIPATORY RESEARCH

This study used critical emancipatory research (CER) to investigate how the academic performance of progressed learners in life sciences can be enhanced. CER is a theory that encourages a closeness between the researched and the researcher, and CER has a practical purpose in society (Cohen, Manion and Morrison, 2011). Jurgen Habermas is viewed as the father of CER, and he argues that power relations in society have an influence on how things are understood (Field, 2018). Those in power take decisions that influence the entire society. Therefore, Habermas developed CER to enhance the participation of other sectors of society, who would otherwise not participate in decision-making, especially where educational issues are concerned (Wang, 2018). CER promotes equality and equity in all its forms, advocates for social justice, freedom, peace and team spirit, and changes people's hearts and minds (Foulger, 2010:135). Mahlomaholo (2009:224–237) states that CER allows the researcher to interpret other people's interpretations and make sense of and work towards fulfilling people through a democratic process, such as collective engagement.

CER is relevant to this study, because the rights of schools' stakeholders, such as principals, educators, learners and parents, were violated by their exclusion from the design of the progression policy. Nevertheless, it is assumed by the Department of Education that principals, teachers and parents would implement the policy effectively, in order to support progressed learners at school level. Lorini (2018) argues that CER promotes the collective engagement of all stakeholders, and promotes reaching consensus to retain underperforming learners, in order to create more time for them to master the concepts they had failed to master. To this end, I have chosen to frame my study in this theory, since it calls for dialogue and for people to work together to achieve one common aim, which is success for progressed learners.

CER was adopted for this study because it brings hope, justice and equality to progressed learners. Learners would be engaged in life sciences activities, and would build interdependent relationships with the teachers, which would strengthen their capacity to learn, and give them hope to succeed. Learners who are performing well would be encouraged to empower and work in collaboration with peers who are not performing well, to help them understand life sciences content better. All learners would receive equal treatment and opportunities (Buckmaster, 2019). CER would emancipate learners to participate in decision-making in their education, and would enable them to meet the needs of a real-life situations (Kincheloe and McLaren, 2011), with the aim of improving their academic performance in life sciences. In Section 1.6, I will discuss the research design and research methodology.

1.6. RESEARCH DESIGN AND RESEARCH METHODOLOGY

Durdella (2017) defined research design as “a plan to answer the research question and research method as a strategy used to implement that plan”. Abutabenjeh and Jaradat (2018:237) aver that research design and methodology are different, but closely related, because “they facilitate the smooth flow of various research processes” Flick (2018:32). For this study, the actual research problems were outlined and the process for solving it mentioned. The following sections will describe the techniques that were used to generate data, the data analysis, population and sampling.

1.6.1 Generating data: Participatory action research

In generating data for this study, I used the participatory action research (PAR) method, because PAR is complementary to the paradigms of CER; PAR has an overt set of social values, including democracy, improvement and social transformation. According to Filmalter (2017:31), “the strength of PAR lies in the fact that it embraces the concerns experienced by co-researchers by getting them engage in the study”. Savin-Baden and Major (2013) add that PAR is a problem-solving method, as it leads to solutions for the improvement of practice. In this study, PAR was also adopted because it would promote collaboration and inter-relationships between the researcher and co-researchers, and improve and change the lives of Grade 12

progressed learners in life sciences. To generate data through PAR, Grade 12 progressed learners, teachers and I participated equally and collaboratively in formulating a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

1.6.2 Data analysis: model suggested by Laws, Harper and Marcus

In this study, the thematic model suggested by Laws, Harper and Marcus (2003) was used to analyse the data that was generated. Thematic model was chosen for this study because data was collected through social media using WhatsApp group discussions. The thematic model is “a type of qualitative analysis that is used to analyse, make classifications and present themes that relate to the data” (Lowe, Norris, Farris and Babbage, 2018:192). In this study, themes were used to categorise subheadings according to their relevance to the research questions. Moreover, the thematic model was chosen for this study because, according to Castleberry and Nolen (2018:807), it is

> *Categorised as one of the contemporary approaches in the field of qualitative research, as it shares some of commonalities in their analytical approaches such as coding, sorting of categories, identifying themes, and relationships and drawing conclusions to answer the research questions.*

In this regard, this benefit of the thematic model helped the researcher to understand the significance of each research topic through the extensive discussion it required. Data that was collected was analysed according to the model suggested by Laws et al. (2003), and which involves seven steps:

Step 1: Reading and rereading all the collected data: The researcher read all the data collected from the WhatsApp focus group discussions. Brief notes were recorded of relevant information.

Step 2: Drawing up a preliminary list of themes arising from the data: A list was made of different types of information that had been noted, and data was categorised into themes and subthemes and arranged according to the research question of the study.

Step 3: Rereading the data: Themes that were identified from the transcript were checked and the researcher considered if they corresponded with the participants' responses to the research questions.

Step 4: Linking the themes to quotations and notes: The themes that evolved from the data that had been collected were linked to various scholarly views.

Step 5: Perusing the categories of themes to interpret them: The categories of themes were compared and interpreted based on the research question.

Step 6: Designing a tool to help to discern patterns in the data: Patterns were determined during data analysis.

Step 7: Interpreting the data and deriving meaning: The themes were clearly sorted under subheadings according to their relevance to the research questions.

1.6.3 Population and sampling

A major part of the qualitative research process involves determining and choosing an appropriate population (sample) for the study, so that data can then be collected from that population (Creswell and Plano Clark, 2011). The purposive sampling method was used in this study, because it requires a limited number of participants, which helps to reduce variation, and simplifies analysis (Palinkas, Aarons, Horwitz, Chamberlain, Hurlburt and Landsverk, 2011:44). Life sciences teachers and life sciences progressed learners were recruited according to their status and experiences, as they possess deeper knowledge about teaching and learning of life sciences. Creswell and Plano Clark (2011:12) define purposive sampling as a type of non-probability sampling that "involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest". Bloom and Michalopoulos (2013:179) explain that purposive sampling is "designed to provide information-rich cases for in-depth study". In this regard, using purposive sampling advantaged the study, as I could select progressed learners from the population of Grade 12 life sciences learners, as they would provide the particular information and knowledge the study required. The next section will discuss the value of the study.

1.7. THE VALUE OF THE STUDY

The envisaged value of the study lies in the strategy that would be designed to enhance the academic performance of progressed learners, so that they could perform better in life sciences. It was anticipated that the study would provide insight into the causes of poor academic performance of progressed learners in Grade 12. The study hoped to navigate and create an environment for both teachers and learners that would be conducive to producing quality results – life sciences should be a subject that learners can excel in (Bojuwoye, Moletsane, Stofile, Molla and Sylvester, 2014). The study strategy would also raise awareness at the DBE regarding the challenges faced by progressed learners, with the aim of addressing these challenges of progressed learners in life sciences in Uthukela District collaboratively. In the next section, I will discuss ethical considerations that were applied as a form of protection for the participants.

1.8. ETHICAL CONSIDERATIONS

The consideration of ethics is vital throughout all stages of research. Clark-Kazak (2017:12) and Brennen (2017:24) aver that, in a qualitative study, “the balance between the potential risks of research and the likely benefits of the research must be kept”. Arifin (2018:30) adds that, “in a qualitative study, ethical considerations have a particular resonance due to the in-depth nature of the study process”. The following sections will explain the ways in which the rights, anonymity and confidentiality of the participants were preserved during data collection, analysis and reporting of the study findings.

1.8.1 Permission to collect data

The study was located in the social sciences, therefore, Grade 12 progressed learners, teachers and parents were involved as co-researchers (Coleman, 2018). An ethical clearance certificate with reference number UFS-HSD2019/1522 was obtained from the University of the Free State. Permission to conduct research at schools and to administer the research was obtained from the head of the DBE at Uthukela District.

1.8.2 Informed consent

Prior to data being collected from the participants, the researcher explained the purpose and the process of the study to participants (King, Horrocks and Brooks, 2018). Consent forms were issued to the participants to sign. The ultimate goal of the informed consent procedure was explained as “to provide sufficient information so that all participants can make an informed decision about whether to or not to participate in the study” (Shahnazarian, Hagemann, Aburto and Rose, 2013:13). Voluntary participation was explained (Bok, 2017:147). Participants were also informed that, if they were uncomfortable about the study, they had the right to withdraw from participating in the study.

1.8.3 Confidentiality and anonymity

Participants were assured that data would be treated confidentially. Participants’ names and that of their schools will not be divulged to anyone. Forms that explained confidentiality were given to participants, which included reference to the principle of trust. The data was analysed and interpreted without the report mentioning the names of the participants (Gibson, Benson and Brand, 2013:18). Participants were aware that their anonymous data may be used for other purposes once confidentiality had been ensured, such as research report, journal articles and conference presentations. Privacy will be protected in any publication of the information by the use of code numbers and pseudonyms.

Data from the WhatsApp focus group discussion were transcribed and coded and categorised into various themes. During the WhatsApp focus group discussion, participants were aware that it was impossible to keep confidentiality and anonymity, though they were advised to hide or change their WhatsApp profile pictures to protect their privacy, as the discussions involved six life science teachers and five Grade 12 progressed learners in life sciences. The researcher assured the participants that they would not be connected to the information that they shared during the focus group discussion.

1.9. LAYOUT OF CHAPTERS

Chapter 1: This chapter provided an introduction to the study, and provided the rationale for the study, the research aim and objectives, and an overview of the theoretical framework, research design and methodology, and outlined the value of the study and ethical considerations that were applied.

Chapter 2: CER, its origins and development from critical theory to critical emancipatory research, and the principles of CER will be explained. The transformative paradigm, including its ontology, axiology, epistemology and methodology, will be set out, as will a reflection on CER and definitions of operational terms.

Chapter 3: Research design and methodology will be the topic of this chapter. PAR will be outlined, including its definition, origins, principles, operationalisation, strengths and weaknesses. The transformative paradigm, data analysis and ethical considerations will be explained.

Chapter 4: This chapter will involve data presentation, analysis and interpretation of results.

Chapter 5: The findings, limitations, conclusion of chapters and recommendations will receive attention.

CHAPTER 2: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1. INTRODUCTION

The framework that was used to develop a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, was CER. Therefore, this chapter will explain the theoretical framework of CER, as part of the research process that addressed the research problem.

CER is one of the frameworks that rose from critical theory, and which provides a broad lens through which progressed learners' knowledge can be enhanced and developed. This chapter will investigate the origin of the CER, by tracing it from critical theory as developed by the Frankfurt School of Social Sciences, then pursue the principles associated with CER, its epistemology, axiology, ontology and methodological perspectives, to thereby address the academic performance of Grade 12 progressed learners in life sciences.

This chapter will also review the literature on the challenges facing Grade 12 progressed learners in life sciences. The solutions that have been suggested in other countries to address the poor academic performance of progressed learners will be discussed. The success anticipated as a result of implementing a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, will also be discussed.

The chapter responds to the objectives of the study, which are the following:

- To explore the challenges experienced by progressed learners in life sciences;
- To investigate solutions to improve the performance of Grade 12 progressed learners in life sciences;
- To identify conditions for the successful implementation of a strategy to enhance the performance of Grade 12 progressed learners;
- To identify threats that can hinder the success of the strategy to enhance the performance of progressed learners in Grade 12 life sciences; and
- To discuss the anticipated successes of the strategy to enhance the performance of progressed learners in life sciences.

2.2. THE ORIGINS OF CRITICAL EMANCIPATORY RESEARCH

CER is a framework that developed from critical theory. Critical theory has a narrow and a broad meaning in the history of social sciences and in philosophy. Nkoane (2013:393) states that critical theory has its "philosophical roots in several traditions such as Marx's analysis of socio-economic conditions and class structure, Haberman's notion of emancipatory knowledge and Freire's transformative and emancipatory pedagogy". Various theorists have different views on critical theory. Held (1980) defines critical theory as an approach that focuses on a democratic and dialectical way of evaluating domination, ideologies, exploitation and the political economy. According to McKernan (2013:417-433), critical theory relates to the social analysis tradition.

Critical theory is also known as critical social science, which originated from the Frankfurt School in Germany in the late 1920s (Carrette and Keller, 1999:21–43). The Frankfurt School was an institute for social research, where a group of scholars with similar theories focused on studying the same topic. The institution was established by Felix Weil's father, Herman, in 1923, with the aim of developing the Marxist tradition (McLaughlin, 1999:109–139). "The idea of critical theory is traced from Kant or Weil, it is acknowledged that the school was largely influenced by Marxist perspective on economic and social questions" (Schmidt, 2007:76). Curpus (2013) and McKernan (2013:417–433) also believe that critical theory was first presented by Emmanuel Kant, a German philosopher, in 1871. In research focused on authoritarian and dominance relationships, critical theorists found explanations for social phenomena to be inadequate, even though Marx's influences were considered to be considerable (Alvesson and Deetz, 2006:255–283; Kincheloe, McLaren and Steinberg, 2011:285–326). To expand on the origins of critical theory, Section 2.2.1 will analyse the first stage of critical theory, which is called the Grünberg era.

2.2.1 The Grünberg era, as the first variant of critical theory

The first variant of critical theory, or first generation of critical theorists – Carl Grünberg, Max Horkheimer, Herbert Marcuse and Theodor W. Adorno – were influenced by World War I, during which Germany was characterised by unemployment and inflation (McLaughlin, 1999:109–139). These scientists are considered as the principal proponents of critical theory. Carl Grünberg had been appointed as the first director of

the Frankfurt's Institute for Social Research in 1923, and he was succeeded by Max Horkheimer as director in 1930, Herbert Marcuse in 1934, and Theodor W. Adorno, as one of the institute's directors, in the 1950s (McKernan, 2013:417–433). These theorists focused on studying the knowledge derived from disciplines such as economics, sociology, psychoanalysis and philosophy. Grünberg, Horkheimer, Marcuse and Adorno collaborated with the German tradition of philosophical and social thought, represented by Marx, Kant, Hegel, and Weber (Held, 1980; Wagoner, 2012); these theorists motivated the original team, which intended to transform the social world, not only to interpret it (Roderick,1986).

In the 1930s when Hitler rose to power, the Nazi party forced the institute to shut down, because "the school proved hostile to the structures and ideology of the state", (Mertens, 2010a:469) and it relocated to the United States (New York) in 1933. Another reason for its relocation was antagonism against the Jewish ethnic group, since all the theorists' ethnic background was Jewish, and the institute had been established by a Jew, Felix Weil (Parkinson, 2014:43–59). The first generation of the Frankfurt School was more focused on a revolution in politics, than on the turbulent political factionalism and reactionary politics (Held, 1980). According to Dube (2016:15), the Jewish philosophers aligned themselves with left-wing political ideology, which attracted Nazi sympathisers to the School, and that led to its persecution and the domination of Jewish members of the School.

When the theorists arrived in the United States, their radical stance against the Weimar Republic caused them to not return to their home country, and they considered themselves as exiled (Wheatland, 2009). Horkheimer, Adorno and Marcuse believed that it was necessary to comment further and shape the ideas of critical theory by using empirical research to study human behaviour – a method that had been abandoned after the first decade of their work (Alvesson and Deetz, 2006:255–283). The ideas expressed in *Dialectic of Enlightenment* (Horkheimer, 1972) and *One Dimensional Man* (Marcuse, 1964), criticised Americans' standardised wishes, desires and needs and being as one-sided rationality, which would open them up to vulnerability, control and manipulation (Kemmis, 2001:1-30)."It would turn the individual into an uncritical, passive object, well adapted to the logic of mass

production and mass consumption which pervades all areas of society from the aesthetic to the political" (Alvesson and Deetz, 2006: 255).

The first generation of theorists of the Frankfurt School associated themselves with a marginalised group, which served as their left wing. The ideas of this left wing contributed to this study, because it realised the importance of the enlightenment ideals of justice, democracy and freedom. Critical theory as proposed by the Grünberg era is important to the study, because it creates a space for progressed learners following the life sciences curriculum to challenge inequalities – Grade 12 progressed learners require more attention during the delivery of the life sciences curriculum, if their academic performance is to improve.

Section 2.2.2 will discuss the second stage of the Frankfurt School, which was led by Max Horkheimer.

2.2.2 The second variant of critical theory in the Max Horkheimer era

In the 1950s, the scholars of the Frankfurt School realised that they were no longer influential in the United States (Parkinson, 2014:43–59). They decided to return to their birthplace, Germany, since the circumstances were much better after the defeat of Nazism. In 1953, Horkheimer, Adorno and Marcuse returned to Germany to re-establish the institute (Kincheloe et al., 2011:163–177). Max Horkheimer continued as the director of the institute, as he had been before their exile (McKernan, 2013:417–433). Horkheimer focused on sustaining, reinstituting and conceiving what is known as the Frankfurt School's critical theory, which engages with change in society and a philosophical tradition that is beyond the limitations of Marxism. The philosophical traditions are based on a combination of social critique and philosophy (Somekh and Zeichner, 2009:5–21). Under Horkheimer's watch, the theoretical focus of the institute for social research shifted from the somewhat scientific or empirical Marxism of Carl Grünberg, the first director of the Institute, to a more interdisciplinary program that incorporated the methods of history, psychology, economics and philosophy (Apel, 1990; Turago, 2010).

These philosophers had benefited from being in exile, since the environment in the United States was conducive to providing experiences, and stimulating them to

explore, to collaborate and communicate with other scholars, which had been impossible before their exile.

Horkheimer (1993:79–88) states that the scholars contributed in three main ways to the struggle for emancipation: practical, explanatory and normative. These approaches to change can lead to the change that is needed to find a strategy that will enhance the academic performance of Grade 12 progressed learners in life sciences. Firstly, there must be practical changes that resolve the inequalities that still exist in schools. Secondly, for the inequality and oppression to be addressed, issues must be explained and understood. Lastly, there must be normative work, whereby individuals are encouraged to achieve self-actualisation, and they endeavour to create a freer and more open society (Turago, 2010).

I am of the view that Horkheimer's focus was not only based on the development of the Frankfurt School, but also on the countless components of interdisciplinary critical theories that arose after World War II, inspired by integrating social criticism and philosophy (Adorno, Albert, Dahrendorf, Habermas, Pilot, and Popper, 1976). Many theorists supported Horkheimer's ideas, including Adorno, Marcuse, Pollock and Neumann; they did not reject Marxism's ideas but, rather, reformulated them. This meant that Marx would be joined by a diverse range of intellectuals, which included Hegel, Kant, Weber, Freud and Nietzsche (Held, 1980; Prakash, 1992:8).

One of the theorists, Hegel, came up with the idea of dialectical relationships, which culminates in the "Absolute Idea". His aspiration was for conditions in society to change for the better. Marx opposed and was intolerant of the status quo and wanted a complete transformation (Held, 1980). Marx was concerned about political and social situations in which the political state, religion, economy and tradition were heavily tilted to benefit the upper class. Most of the theorists of the Frankfurt School agreed with Marx's ideology, and they believed that society had to be transformed urgently, though "they were not happy about Marx's scientific technical rationality which had to be used in the production assuming instrumental character increasingly" (Wigston, 2007:32). Horkheimer's thoughts were permeated by the Marxist principle "that philosophical, religious and sociological ideas could be understood only in relation to the interests of the different social groups so that theory was a function of social life" (Horkheimer and Adorno, 1972:7).

Critical theory, as proposed by Horkheimer, is relevant to this study, because it aims to expose the non-rational factors that pose risks to human rationality and "transform all the circumstances that enslave human beings" (Horkheimer 1972:246). Horkheimer and Adorno focused on traditional theory and its classification of countless phenomena, which were classified in relevant categories (Horkheimer, 1993:79–88). Horkheimer's idea was to reinstitute society through critical theory that engages people with change, and the philosophical tradition based on the natural and social sciences – beyond the limits of scientific Marxist ideology of philosophy and social critique (Nkoane, 2013:393–400). Section 2.2.3 will discuss the transition from critical theory to emancipatory research.

2.2.3 The era of Jürgen Habermas: From critical theory to critical emancipatory research

The third variant of critical theory was led by Jürgen Habermas in the 1950s, after the reconstitution of the Frankfurt School through the second variant, led by Horkheimer and Adorno (Corradetti, 2012; Hanks, 2015:92). Jürgen Habermas was an assistant of Adorno and was considered to be a contemporary embodiment of critical theory at the Frankfurt Institute for Social Research (Kellner, 1993:43–60). Habermas' academic context was the radical tradition of Adorno, Horkheimer and Marcuse, and on recovering enlightenment and the progressive traditions of Kant (Gordon, 2013:173–202). Habermas also focused on Marxist ideology, by reconstructing it for a modern age, and promoting a democratic society (McLaughlin, 1993:599). Habermas was an intellectual scholar, and his main concerns were knowledge, human interests, self-consciousness, social action, and the problems related to the nature of communication (Hardt, 1993:49–69).

In the early 1970s, when the members of the Frankfurt School were no longer productive in relation to justifying and conveying new ideas on critical theory, Habermas developed the ambitious idea of advancing critical theory, into CER. Habermas' contribution to critical theory was crucial, and he is considered to be an important scholar in the development of critical theory, and for his ideas about the production of knowledge, epistemology, freedom and human emancipation (Held, 1993:49–69). He admired the idea of the dialectic of enlightenment that had been formulated by Horkheimer and Adorno, and he was concerned about Marxist theory

principles that “sought a transformation of society away from the domination of elitist classes over the labour force” (Elicondo, Alberto, Olga, Olivia, Sauzo and Verónica, 2013:422–433). Habermas, as a believer of the enlightenment, developed the idea of CER in order to promote emancipation of all human beings and to overcome the weaknesses of the theorists of the second variant. In this sense, Habermas wanted to highlight that we, as human beings, need to communicate with each other in order to find a consensus solution, or to reach an understanding. This type of communication should be based on rational argument (Ngwenyama, 1991:267–280). Doing so will lead to emancipation, which will empower people to rise above disingenuous communication events.

Habermas linked emancipation to the notion of eliminating domination, political imagery, oppression, and cultural and social systems that promote inequality (Johnson, 2006). He conceived knowledge as emancipatory, through which critical theory itself strives to articulate emancipation, control and power. According to Habermas, CER takes over the “task of responding to historical and social conditions of crisis and the transformation of the existing social structures and replacing them with emancipatory ones” (Sinnerbrink, 2012:28).

The following quote, “The privileged group will be those who win by the way the curriculum is developed and the losers will be those who are prevented from taking important decisions that affect their lives” (Balibar, 2007:18), is very important to this study. In developing the progression policy, the Department of Education officials decided, on their own, to develop the policy, without involving other school stakeholders, such as principals, educators, learners and school governing bodies. As I sought to find a strategy that could enhance the academic performance of Grade 12 progressed learners in life sciences, I was persuaded that CER could emancipate learners who are affected by the progression policy, and others who are struggling with life sciences content.

CER is a theory that pursues social transformation, consciousness and emancipation. CER pursues transformation in order to change social conditions and to free human beings from suppression, marginalisation and domination (Sinnerbrink, 2012). CER is viewed as an umbrella term that covers several research streams, such as critical theory, participatory, transformation, race-specific, and feminist research (Günther,

1993:143–156). CER is also described as a process of constructing knowledge that can be used to empower marginalised people or society. Mertens (2015:75–85) explains that CER is referred to as transformation research, as it was formed under the motto, *nothing about us, without us*. This explanation is seconded by Dube (2016), who states that “any transformation that does not emancipate people is irrelevant”.

CER raises human consciousness beyond the walls of inequality, and emancipates people by advocating for equality, peace, social justice and hope for facing real-life situations (Brittain, 2012:204-212). Therefore, I used this theory to inform this study, so that it could emancipate and transform the lives of Grade 12 progressed learners in life sciences, by enhancing their academic performance. Through the transformative paradigm, the lives and performance of learners who struggle with life sciences will be transformed for the better (Guba and Lincoln, 2005).

Habermas classified human knowledge as objective, subjective and intersubjective (Murphy and Fleming, 2010). Gordon explains that “human beings put forward the validity claims regarding the truth of the statements about the objective world, the truthfulness of the subjective world and the correctness or rightness of the intersubjective world” (2013:202); Habermas followed Karl-Otto Apel in making these classifications. Karl-Otto Apel mentions that humans exist simultaneously in three world theories. Firstly, the external world, which includes affairs and objects; secondly, the internal world, which includes ideas, thoughts and emotions, and lastly, the normative world, which includes intersubjectivities that determine norms and values (Wang, 2013). Postone, Moishe, Galambos and Sewell (1995:173) note that “Habermas tries to provide the basis for the theoretical change to a paradigm of intersubjectivities by developing the concepts of communicative reason, and action”.

In strengthening knowledge, communication is significant for achieving rationally motivated consensus. Scholars, like Roderick (1986:142), agree about the idea that “communicative action is associated internally to the reason in which the speech is reconstructed by universal pragmatics, in order to reach an agreement based on intersubjectivity that includes sincerity, truth, comprehensibility and rightness”. In relation to this notion, I am of the view that communicative action is led by universal pragmatics.

Habermas gave critical theory a new turn with his CER paradigm “that is free from the subjective bias of the consciousness” (Habermas, 1987). Humans are no longer viewed as objects, instead, their lives are now taken into consideration and their conditions are prioritised (Frankfurt, 1987:21). CER is also interested in enhancing human freedom, and in the formation of social justice norms (Habermas, 1984:229–249).

Communicative action that forms part of CER is important to this study, because it brings all the important stakeholders that govern schools together, to contribute to finding a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, with the purpose of emancipating and improving the lives of progressed learners, teachers and parents. Therefore, CER emancipates learners to participate in decision-making that affects their education, and will enable them to meet the needs of real-life situations (Kincheloe et al., 2011:163–177), with aim of improving learners’ academic performance. Section 2.3 will address the principles of CER that correspond with the aim of this research study.

2.3. PRINCIPLES OF CRITICAL EMANCIPATORY RESEARCH

In this section, the core principles that underpin the framework of this study, namely, CER, will be discussed. The core principles are active communication, transformation, emancipation and social justice. These principles express how CER is related to the aim of this study.

2.3.1 Critical emancipatory research and the principle of active communication

CER aims to improve active communication amongst the members of a community, because “[c]ommunication is a fundamental element of human interaction’’ (Habermas, 1979:70). The main aim of active communication is to reach consensus and an understanding between two or more people through linguistic communication. With this principle, Habermas (1979:70) argues that CER not only seeks to ease inequalities in society and to eliminate social class struggles, but also “to investigate how human beings make use of language to create orderly in societies and how humans interact rationally to achieve consensus”. I agree with the view of Habermas

(1979:70) that communication is fundamental to finding a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, and for progression policymaking, since valuable stakeholders were not consulted and involved when the progression policy was developed. When people enter into dialogue, there is potential for “expressing power and implying socially firm restrictions for the understanding of the social world’’ Alvesson (1992:185). I agree with Alvesson (1992:185) that communication should focus on the rationality of an argument, so that closure can be achieved on the argument of whose idea, viewpoint or opinion holds the greatest validity. Porter (2002:53-72) notes that, of “social rules, institutions, assertions and actions, social rules can be considered according to their truth, comprehensibility and legitimacy by way of discourse”.

Habermas (1979:71) also argues that “the consensus based on realistic communication would allow the individual to suggest and question by means of critical inquiry, the suggestions and assumptions they hold in common”. When communication and consensus is achieved fairly, it will allow people to rise above inequalities and disingenuous speeches. Section 2.3.2 will discuss another principle, transformation.

2.3.2 Critical emancipatory research and the principle of transformation

Another principle of CER is that it advocates for transformation. This principle centres the experiences of individuals or a group of people from a marginalised community, to explore and understand the reasons for the marginalisation, in order to transform and empower the lives of people (Chilisa, 2011). Knowledge is constructed from different views raised by different people from marginalised communities, who want to bring their voices into the world of change (Mertens, 2010a:469-474). The fundamental purpose of the transformation paradigm is to emancipate, and involves community members in decision-making, design and implementation. I concur with Chilisa (2011) and Mertens (2010a:469-474), because the relevant stakeholders were not involved in the design of the progression policy, though they are expected to implement it in their schools.

CER and its transformation principle pursues the integration and transformation of the lives of marginalised people (Wang, 2013). Mertens (2010a:469) explains that “the

transformation principle emerged in response to individuals who have been pushed to the societal margins throughout history and who are finding a means to bring their voices into the world of research". The transformation principle aims to mitigate inequalities, ensure social justice, enforce human rights, and analyse positions of power, by working inclusively with communities. CER, in its turn, has the agenda to transform the lives of poor peoples, to emancipate them and promote justice, hope, collaboration and equality (Silverman and Torode, 2011).

The transformation principle is in line with this study, because the lives of progressed learners are being transformed for the better by teaching and learning programmes that are being introduced in schools in the Uthukela District, such as winter and spring holiday camps, extra classes and e-learning programmes that assist and address the diverse needs of progressed learners in life sciences. In Section 2.3.3, I will discuss emancipation, as the third principle of CER.

2.3.3 Critical emancipatory research and the principle of emancipation

In addition to transformation, CER advocates for emancipation. Emancipation, as a principle of CER, aims to solve problems related to domination, and to liberate everyone from oppression. Emancipation, in this study, is related to the inequality of distribution of and access to teaching and learning resources in disadvantaged schools. Therefore, emancipation gives progressed learners an equal opportunity to access resources that will help to enhance their academic performance in life sciences, and prevent them being side-lined and discriminated against. According to the emancipation principle, progressed learners should be free of being judged as 'slow learners'; the emancipation principle pursues bringing about the desired empowerment for progressed learners in life sciences.

Through emancipation, teachers and learners work together "to find each other through a set of difficulties produced not only by curriculum or school organisation but also by basic senses of what it is to be, to learn and to know" (Steinberg and Kincheloe, 2010:141). Emancipation, as a principle of CER, teaches teachers to be more attentive to learners' wellbeing and to "provide learning opportunities for all, irrespective of learners' diversity" (Devereaux, 2013: 1). Woodford (2018) adds that it is the teachers' role to bring learners to a proper understanding of and to instil skills such as critical thinking, problem-solving, communication, and collaboration skills. With this notion,

emancipation empowers learners, teachers and parents to express themselves equally about the academic performance of progressed learners in life sciences, since their voices were not recognised or heard before. Habermas (1990) notes that, in order to achieve emancipation, the paradigm of communication must be engaged, therefore, Habermas encourages all human beings in society to participate in decision-making that may affect their lives.

2.3.4 Critical emancipatory theory and the principle of social justice

One of the interests of CER is to abolish social injustice. Social justice is an indispensable and necessary principle, which focuses on the release and freedom of society (Nkoane, 2012:98–104). Social justice encourages communities to challenge the status quo, inequalities and false knowledge that depresses their freedom – elimination in order to transform their lives (Peters, 2005:35–38; Traitler, 2015:83–90). (Alvesson and Deetz, 2006:283) define social justice as an "extra-juridical concept of fairness that is based on exposing and ending injustices and inequalities".

Social justice "concerns equality in the distribution of power in an equal situation, and it also concerns the nature of the service itself and the consequences for society through time" (Connell, 2012:4). CER for social justice gives priority to the influence and relevance of power. Social justice addresses and bounds political power relations in societies. Connell (2012:18) argues that, "persons should not primarily be recipients of justice, rather, they should be agents of justice, that is, autonomous agents who co-determine the structures of production and distribution that determine their lives."

Consequently, I am of the view that CER and social justice should be emancipatory and transformative. Moreover, social relations and domination must be transformed into justifiable relations (Alvesson and Deetz, 2006:283; Kincheloe et al., 2011:163–177).Through CER, all learners receive equal opportunities, their voices are recognised and, thus, "no one group receives a particular advantaged education over the other" (DBE, 2012a:10). Hlalele (2012:111) adds that "social justice supports a process built on respect, care, recognition and empathy". In Section 2.4, I will discuss the strengths of CER.

2.4. STRENGTHS OF CRITICAL EMANCIPATORY RESEARCH

One of the powerful strengths of CER is its reflection on “taken-for-granted” societies and “structures of socio-economic” classes. Steinberg and Kincheloe (2010: 140–151) argue that “CER empowers human beings to rise above the constraints placed on them by socio-economic class and its related ideologies that exercise control over people”. CER helps teachers and progressed learners to come to an awareness of what is fair to them, what must be done to them, and the nature of their emancipation from the DBE. “CER acknowledges that there are real objects out there in the world” (Horkheimer and Adorno, 2002:112). Nkoane (2012:98) argues that CER is significant because it “provides a much needed paradigmatic change in the world of unjust society”. In addition, through CER, progressed learners achieve more, as it empowers them, irrespective of their ethnic background, level of intelligence or socio economic status, to rise above their limitations.

Linklater (2005:141) argues that “emancipation opens ways to civilisation and building better communities in developing social arrangements in which members of the societies can satisfy their needs without harm or violence”. In this sense, emancipation embraces the power of civilisation, and unites all learners regardless of their diversity. Horkheimer and Adorno (2002:112) argue that CER is an “important element that has to create the environment that satisfies the needs and values of men and also emancipate a man from slavery in the whole historical effort”. I am of the view that CER is a framework that can free progressed learners from being looked down on and taken for granted by other learners because of their academic performance in life sciences. Marx noted two types of domination: class and alienation domination (Manias and Street, 2000:50–60).

As an extrinsic technique, CER is important to learners who study life sciences, as it equips them with diverse skills that enable them to contribute to and participate in the sustainable development of society. CER empowers learners to behave as responsible citizens and enhances their interest in society (Roderick, 1986). In this study, a powerful strength of CER is recognising and creating awareness of political, economic and social contradictions, and to perform actions that work against inequalities, oppression and injustices faced by progressed learners. Section 2.5 will discuss the limitations of engaging with CER.

2.5. LIMITATIONS OF ENGAGING CRITICAL EMANCIPATORY RESEARCH IN RESEARCH

A number of critical issues and weaknesses have been raised against CER from different viewpoints, which diminishes the power of CER to transform education. CER poses a threat to its opponents, as it transforms the lives of marginalised people, and eliminates inequalities, oppression and domination. The major challenge of using CER in research "is that it fails to provide rational standards by which it can justify itself, by which it can show itself to be 'better' than other theories of knowledge" (Fenwick, 2012:141). Furthermore, it is claimed that CER suffers from conformity, immodesty, anti-individualism and naivety (Gibson, 1986).

For this research, the challenge of using CER was that it promises and says much about how progressed learners deserve better and that inequality and oppression should be eliminated, but it does not explain how this is to be achieved (action) in relation to equality, emancipation and democracy. The weakness of CER is that it focuses more on progressed learners who are not performing well in life sciences, than on learners who are performing well in life sciences. Scotland (2012:14) notes that CER "does not recognize the different contributors that enter research with fluctuating levels of conscientization". This made me realise that CER also discriminates, as it does not treat all learners equally, and this means there is no space for the advantaged (promoted learners) in the CER framework. In this light, it is hard to see how the CER theory supports promoted learners, as they are considered to be advantaged learners. CER creates a 'dependency syndrome' in progressed learners, as they are aware of their rights and the special support that they should receive from teachers and parents. CER calls for emancipation, which may be impossible given the (un)availability of resources that can emancipate learners and teachers for effective teaching and learning of life sciences.

Despite criticism of CER, I believe it is still the best and most relevant framework for this study, in which I developed a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

2.6. DEFINITION OF OPERATIONAL TERMS

In this section, the operational terms used in this study will be defined using explanations provided by dictionaries, encyclopaedias and literature of other scholars, and my own definitions. These terms are academic performance, learner progression, learner promotion, life sciences and rural schools, and they were influential in informing this study.

2.6.1 Academic performance

According to the Cambridge University Report represented by Mann (2003:5), academic performance can be defined “in terms of examination performance”. Academic achievement is defined “as what the learner has learned or what skills the learner has acquired and is usually measured through assessments like standardized exams and informal assessments” (Santrock, 2006:20). Adeyemi (2010:83–91) defines academic performance as a “scholastic standing of a learner at a given moment”.

In the context of teaching and learning, academic performance is measured during teaching through the “teacher’s ability to teach consistently with honesty, regularity and diligence”. In learning, academic performance refers to “excelling consistently in examinations, both formal and informal assessment” (Ogunmade, 2005:23). Akiri and Ugborugbo (2009:107) agree with Ogunmade (2005:23) and argue that academic performance is a “measure of outputs and that the main outputs in education are expressed in terms of learning”. This simply means that, when learners are taught very well, there is a possibility that the performance will be exceptional. Mega, Ronconi and De Beni (2014:121) found that “academic performance indicates to which extent a learner has achieved aims and goals of a certain subject or project”. Akinfe, Olofinniyi and Fashiku (2012:114) argue that academic performance is a construct of various domains in learning, which are measured and evaluated.

In this study, academic performance refers to examination results a learner attained in life sciences and, thus, indicates the abilities, skills and knowledge of a learner.

2.6.2 Learner progression

According to the DBE (2012b), learner progression is defined as “the advancement of a learner from one grade to the next, excluding Grade R, in spite of the learner not having complied with all the promotion requirements”.

> *Progression can be used to prevent a learner from being retained in a phase for a period exceeding four years as stipulated in the Admission policy for ordinary public schools as published as Government Notice 2432, Government Gazette, Vol. 400, No. 19377 of 19 October 1998, provided that the underperformance of the learner in the previous Grade is addressed in the Grade to which the learner has been promoted” (DBE, 2012b).*

Munje and Maarman (2016:13) define learner progression as an “automatic promotion”. Jimerson and Renshaw (2012:16) argue that “neither retention nor automatic promotion have the potential to fully assist learners at risk nor provide satisfactory answers to learner challenges and underperformance because both approaches harbour a host of disadvantages to the learners”. Isingoma (2013) avers that, in Uganda, progression is called to automatic promotion and allows a learner to progress to the next grade irrespective of their academic performance.

In this study, learner progression refers to a policy that was introduced by the DBE (2012a) and that allows learners who fail for the second time in a single phase to be progressed to the next grade – these learners may not be retained in the grade that they have failed.

2.6.3 Learner promotion

Learner promotion is

> *the movement of a learner from one grade to the next when that learner meets the minimum required level of achievement per subject in a particular grade, as well as complying with the promotion requirements of that grade as contemplated in the policy document; National policy pertaining to the programme and promotion requirements of the NCS Grades R-12” (DBE, 2012b).*

In this research study, learner promotion is the opposite of learner progression, as it refers to the original pass of a learner, whereby a learner manages to meet the level of expected performance in a particular grade.

2.6.4 Life sciences

Life sciences is the “systematic study of life in the changing natural and human-made environment. This systematic study involves critical inquiry, reflection, and the understanding of concepts and processes and their application in society” (Müller, 2014:26). Clarke and Fujimura (2014:36) define life sciences “as the natural science that studies life and living organisms, including their physical structure, chemical processes, molecular interactions, physiological mechanisms, taxonomy, development and evolution”.

Life sciences, in this study, refers to a subject that contains various topics that interlink with most of science subjects and is, thus, related to life matters involving the living and non-living interacting with one another. Reece and Butler (2017:24) explain that “[v]arious knowledge learned from life sciences is progressively applied to solve numerous human problem such as both human and animal health, livestock, agriculture and other vital area that concerns life”.

2.6.5 Rural schools

Myende (2015:31) explains that it “difficult to define ‘rurality’ as it means different things to different people”. The DBE (2012a) defines rural as an area that consists of tribal lands ruled by traditional leaders, where agriculture is a major economic activity. Hlalele (2012:111) defines rural schools as rural education. Farms and traditional schools are characterised by geographical isolation, low population densities, low levels of household income and low levels of infrastructure (Ebersohn and Ferreira, 2012:30–42).

According to Hlalele (2012:111), “rural education in South Africa is historically linked to the legacy of apartheid and segregated education system”. Various studies have found that, over the years, there has been no change in rural schools’ poor performance, because they still face problems related to inadequate buildings, few teaching and learning resources, and a lack of running water, toilets and electricity

(Hlalele, 2014:462). In this study, a rural school a small school that is situated in a rural area, with few learners and few teachers with the competency and motivation to teach, because of the shortage of teaching and learning resources and facilities.

2.7. LITERATURE REVIEW

This section will review the literature on the challenges that face Grade 12 progressed learners in life sciences, and will respond to the objectives of this research study. The literature review investigated the challenges, current solutions, conditions, threats and anticipated successes related to the anticipated success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

2.7.1 Challenges facing progressed learners in life sciences

Regarding this objective, I will focus on the various challenges identified by the literature, which have caused Grade 12 progressed learners to perform poorly in life sciences.

2.7.1.1 *Poor performance in life sciences*

One of the biggest challenges facing Grade 12 progressed learners in the Uthukela District is their poor performance in life sciences. The minister of Basic Education in South Africa, Angie Motshekga, announced that “the primary purpose of the National Senior Certificate examination is to provide learners with a national exit-level qualification through an inclusive, equitable, quality and efficient process” (Motshekga, 2018). However, few progressed learners perform well, as indicated by the 2018 Grade 12 results (DBE, 2018), despite the resources dedicated to supporting them. For instance, in 2018, there were 128 634 registered progressed learners nationally. Out of these, only 33 412 were ready to write the requisite seven subjects and 95 222 modularised. Of the total of 33 412, only 20 122 managed to pass with 30% average, while 13 290 failed. All in all, there are 108 512 learners who failed to achieve a National Senior Certificate in 2018 (DBE, 2018). The minister explained that progressed learners contribute to the quantity of results, and pointed out that “we need to strengthen our support programme for progressed learners” (Motshekga, 2018:10).

It is not only in South Africa that progressed learners are not performing well – it is also the case in Tanzania, where there has been a trend of massive failure in life sciences. There, the life sciences pass rate has been 41 percent for the past five years (Steele, Hamilton and Stecher, 2010).

Several studies have been conducted on the issue of poor performance in life sciences. Dhurumraj (2013) and Komba, Hizza and Jonathan (2013) state that the contributory factors to poor performance in life sciences include the language of teaching and learning, an unconducive teaching and learning environment and the curriculum itself. Osman, Ogolla, Owino and Yungungu (2015) indicate that, in Kenya, (life sciences) results have not been good, since, "in the year 2004 only 12.03% attained the high quality Grades B+ to A. This declined to 7.7% in 2005, 6.13% in 2006, 8.79% in 2007, 5.08% in 2008, 4.39% in 2009, and 5.88% in 2010". These are the results of all learners, including the progressed learners, and, thus, shows that the teaching and learning of life sciences in Kenya was unsatisfactory.

In short, progressed learners in life sciences perform poorly, in general. Various studies have indicated that "teachers who are incapable to use a correct method, approach and positive attitude while teaching influence the academic performance of learners and enhance the negative attitude towards life sciences" (Abudu and Gbadamosi, 2014:35). Another challenge facing progressed learners is a lack of trained teachers in life sciences.

2.7.1.2 *Lack of trained teachers in life sciences*

Teachers play a significant role in the performance of learners. They are the facilitators who facilitate what is expected to be learnt by learners (Milner, Templin and Czerniak, 2011:151–170). However, Woodin, Carter and Fletcher (2010:71–73) are of the view that teachers are the major manpower that impacts the performance of the learners in life sciences. Coetzee and Bray (2010:1) support the view of Woodin et al. (2010:71–73), whose findings are that the performance of learners depends on the quality of the teacher, and that incompetent teachers are unable to adequately and properly instil the relevant skills that are required in life sciences. Life sciences, as one of the crucial subjects in most schools, requires to be taught with effective seriousness (Holman, 2011). In this regard, I am of the view that the life sciences teacher needs to be

effectively and sufficiently grounded in the conceptual knowledge and understanding of life sciences and must be able to apply the best methods to accommodate diverse learners in the classroom.

Various studies have been conducted on the lack of training of teachers of life sciences and the necessity of qualified teachers for effective teaching and learning. Ngema (2016:35) argues that “the failure or success of any educational programme relies on the adequate availability of qualified, dedicated and competent teachers”. This view is also expressed by Milner et al. (2011:170), who report that “the teacher’s quality and ability to teach does not only rely on the academic background but is mostly focused on understanding pedagogical skills acquired”. Mizell (2010) notes that the poor performance of learners is influenced by an incompetent teacher’s weaknesses, which could include lack of professionalism, inadequate exposure to teaching practice, shallow subject matter knowledge and poor classroom management.

In this regard, I am of the view that the main suppressor of confidence of incompetent teachers is their lack of knowledge of technical techniques relating to accommodating and teaching progressed learners in life sciences, since teachers were never trained to do inclusive teaching. The South African Council for Educators (SACE, 2010) reports that the lack of opportunities for teacher career advancement has caused many science teachers to exit the DBE, and this has affected progressed learners, who lose competent teachers. Hughes (2012: 255) agrees with the statement of SACE (2010) that many experienced science teachers are retiring and leaving a gap, which must be filled by teachers who are still in training.

Poor performance connected to a lack of qualified teachers could be attributed to the observation by Brownell and Tanner (2012:346) that “teaching career is seen as a dumping site for any unemployed university leavers, irrespective of their area of specialisation due to the shortage of competent teachers in schools”. Taking this phenomenon into consideration, incompetent teachers could display negative attitudes towards learners, since teachers lack innovative pedagogical skills to instruct, and strategies to monitor learners’ performance, especially that of progressed learners in life sciences. Majamana (2018) and Rissanen (2018:137) report that life sciences is one of the subjects that is crucial for developing scientifically literate citizens and improving economic productivity for sustainable development.

Life sciences is a subject that cannot be allocated to any teacher, because teaching it requires adequate knowledge, a deep understanding of and a background in the subject matter – though this applies to other subjects too. A competent life sciences teacher is able to assist learners to attain a deeper conceptual understanding, can encourage hands-on inquiry into learning, and is able to determine learners' strengths and weaknesses. "Competent teachers are knowledgeable about life sciences, they create an environment in which students are regarded and treated as active learners" (Rissanen, 2018:137). Pedagogical skills and the style of delivering the content to learners is significant, as teachers have a great deal of influence on the subsequent academic achievement of learners in life sciences. Dhurumraj (2013:56) emphasises that "it is not experience nor knowledge alone that guarantee good performance but also the aptitude of a teacher to capture the attention of the young minds". The next challenge facing progressed learners is difficult concepts in life sciences.

2.7.1.3 *Difficult concepts in life sciences*

Various scholars have studied the difficulties learners face in learning concepts in life sciences. Onur, Sahin and Tekkaya (2012:271–297) found the concepts that were considered difficult in Grade 12 life sciences were "protein synthesis, hormonal regulation, genetic engineering, chromosomes, meiosis, central nervous system and evolution". Research by Muspikawijaya, Iswari, and Marianti (2017:252–263), in Indonesia, reveals that high school learners in Luwu Timur District had difficulties understanding life sciences concepts, especially Mendelian genetics and cell metabolism. Ozcan (2003:35) states that "experiencing difficulties in various topics in life sciences affects learners' motivation and achievement".

In this study, most of the progressed learners in Uthukela District struggled to memorise genetics and inheritance concepts, especially Mendelian genetics, though some enjoy the topic, as it requires problem-solving. Scholars report several reasons why learners experience difficulties learning biological concepts (Tibell and Rundgren, 2010: 25–33). Aminu and Abdurrahman (2019:92) report that the most important reason why learners fail to grasp the concepts quickly, and found them difficult to learn, is that there are a lot of foreign words written in Latin and there are various biological events that cannot be seen by naked eye. Zeidan (2010:783–800) indicates that some concepts in life sciences are too abstract and require memorisation, which makes it

hard for learners to learn them. The requirement to memorise facts affects learners, because they learn the facts only, and fail to understand and relate the concepts to their real-life situations, which inhibits meaningful learning of life sciences. In Turkey, the learning of life sciences is based on memorisation only. Furthermore, the weakening of the learners' interest in life sciences is attributed to the curriculum being overloaded Mart (2013:438). Aminu and Abdurrahman (2019:92) support Mart's (2013:438) argument, by noting that overloaded life sciences curricula and a lack of discussion of the content topics of interest by teachers and learners in life sciences can affect the learning of life sciences, so that it becomes ineffective. In this regard, I am of the view that focusing on creating a positive environment for progressed learners, while ignoring their views and interests, can affect their learning interests and performance in life sciences.

2.7.1.4 *Negative attitudes of teachers and learners towards life sciences*

Another challenge noted in literature is the negative attitudes of teachers and learners towards life sciences. Kabunga, Habiba and Mnjokava (2018:20) state that "positive attitude contributes to positive results". Najafi, Ebrahimitabass, Dehghani and Rezaei (2012:134) state that "attitude towards science affects course and career choices of learners". Al Mamun, Rahman, Rahman and Hossaim (2012:209) argue that "emotional attitude can have profound effect on our learning efficiency".

Various studies found that the attitudes of learners towards life sciences are negative, in general. According to Kabunga et al. (2018), findings have shown that most girls have a positive attitude to and perform better in life sciences than boys, while Archer, DeWitt, Osborne, Dillon, Willis and Wong (2013:171–194) and Kaahwa (2012) disagree: their findings were boys have a more positive attitude and perform better than girls.

So far, in my experience as a life sciences teacher, I have noticed that there are many stereotypical attitudes about girls in most societies, and that boys are expected to perform better at school than girls when it comes to life sciences. According to Papanastasiou and Zembylas (2002:469), "positive attitudes affect the learners' science achievement, while the learners' achievement also has an effect on their science attitudes". Reed (2014:22) supports Papanastasiou and Zembylas

(2002:469), by stating that positive nor negative attitudes influence performance. A positive attitude stimulates ambition, feelings, thinking and morale, while a negative attitude destroys learners' intrinsic motivation and confidence (Soltani, 2011:100–104). This means that, whatever attitude the learner possesses, becomes a reality. If a learner displays a positive attitude, performance is likely to be better, and if a learner displays a negative attitude, performance will be poor.

Abudu and Gbadamosi (2014:35–43) explain that there are other various factors cause poor performance of learners in life sciences, in addition to their negative attitudes. Some of the factors that influence learners' performance are associated with family background, classroom environment, and insufficient prior knowledge of life sciences. According to Wabuke, Barmao and Jepkorir (2013:79), a learner's positive attitude and having an interest in learning life sciences influence performance as it provides a motto and drives learners' attitude to participate in learning effectively. In this regard, I am of the view that learners' positivity and motivation can influence learners to perform well in life sciences.

Farooq, Chaundhry and Berhanu (2011) report that teachers' attitudes also contribute to learners' academic performance. Lebata (2014:23) supports Farooq et al. (2011) by averring that, in "schools in Lesotho, the poor academic performance of learners is mostly caused by the poor attendance of teachers in classrooms, they even miss their lesson periods while present at school".

2.7.1.5 *Lack of adequate resources and facilities for life sciences*

Resources and facilities play a significant role in teaching and learning of life sciences. "A rich life sciences lesson requires integration of resources for proper understanding of sciences concepts" (Labov, Reid and Yamamoto, 2010:10). Brown, Callahan, Harder, Orlich and Trevisan (2009) established that "learners' learn better where instructional activities are sequenced, visualised and carefully presented from simple to complex and abstract". Karsai and Kampis (2010:632-638) agree with Brown et al. (2009) and suggest two methods of teaching, inductive and deductive, to help learners achieve learning objectives, by learning procedures from the known to the unknown. "Inductive method focuses on the reasoning progressing from specific to general to constitute effective learning while deductive method focuses on the lecture methods

where learning proceeds from general to specific with little or no resources required for effective learning" (Roseman, Stern and Koppal, 2010:40). To use these two methods, life sciences requires sufficient resources and is learnt better when more practical work is used to teach learners, starting from what they know and progressing to what they do not know.

Scholars, such as Buah and Akuffo (2017:28), believe that, "in today's modern era, science subjects have been positioned as the backbone of a country's progress in various aspects of life". Saunders (2015:60) argues that

> *80 percent of effective learning takes place when a teacher engages learners' sense of sight, feeling and hearing while delivering the content and learners retain 50 percent of what they are taught while seeing, feeling and hearing as opposed to 20 percent retention of what they are taught through hearing alone.*

The absence of adequate resources for teaching and learning life sciences disadvantages learners to learn and perform better (Dhurumraj, 2013). Using resources plays a significant role in shaping learners' minds and helping them to receive new knowledge, especially when they are engaged in practical work, as it enhances problem-solving ability, helps them to discover hidden facts, come up with new principles and link it to what they see, feel and hear and write down. Altunoglu, Atav and Sönmez (2010:34) argue that using laboratories in life sciences lesson delivery promotes "hands-on activities which support the development of practical skills and understanding of scientific concepts and phenomena". The proper use of teaching and learning aids enhances the successful delivery of lessons in life sciences (Dhurumraj, 2013). In this regard, using resources in teaching and learning helps learners to gain clarity of ideas through observations and description of various objects in life sciences.

Vebrianto, Rery and Osman (2016:67) aver that "the world today is rapidly changing". Technological changes and new socio-economic demands make teaching and learning more challenging than it was in the past (Tondeur, Pareja Roblin, Van Braak, Voogt and Prestridge, 2017:157-177). Vebrianto et al. (2016:55-67) agree with Hill, Blazar and Lynch (2015:23), by stating that "the 21st century has brought innovative teaching skills in life sciences teaching and learning, new goals are being set and new

teaching techniques are being devised in order to meet new challenges and demands of the modern era". Ebersohn and Ferreira (2012:30) argue that rural schools are being left behind, because "most of the 21st century resources are being initiated in urban schools where the required resources and support for information and communications technologies (ICT) are already available and in place". In this regard, I am of the view that, in this modern era, life sciences demands that learners are hands-on in practical work, as doing so will familiarise them with the way modern devices, equipment, instruments and techniques are used in the laboratory. Furthermore, Grade 12 progressed learners need computer-assisted learning programs that give them the opportunity to view and save videos related to the topics they encounter that they find difficult. Teachers should use scaffolding when teaching progressed learners, as it makes it easier for learners to understand the topic, and applies all eight multiple intelligences proposed by Gardner (2012).

In order to utilise the scaffolding method, the teacher must be effective and efficient in delivering the content in order for the method to be adopted by learners in the classroom. Hill et al. (2015:1–23) relate laboratory work to practical work, whereby learners engage in experiments and various activities take place, such as observations, teacher demonstrations, simulations, discussions and exercises. In this study, using various resources and facilities in life sciences can enhance the academic performance of progressed learners in Grade 12 and promote a mostly learner-centred approach. The next section will consider suggestions for improving learners' performance in life sciences.

2.8. SUGGESTIONS FOR IMPROVING PERFORMANCE IN LIFE SCIENCES

Various solutions have been proposed and discussed by various researchers from different countries to overcome the challenges that were highlighted in Section 2.7.

The minister of the DBE, Angie Motshekga, announced that the DBE is "prioritising interventions and policies that target an improved fundamental quality of teaching and learning and implementing accountability systems to ensure that quality outcomes are achieved" (Motshekga, 2011:10). The DBE partnered with UNICEF, Association for the Development in Africa (ADEA) and the LEGO Foundation to support and respond to the demand for 21st century skills for progressed learners, in order to improve their

academic performance. These organisations plan to implement Learning Tool for a Powerful Future Programme (LTPFG) to enhance teaching and learning by using fourth industrial revolution materials to assist progressed learners to survive in a changing world (Moloi, 2019).

The minister also reported that,

> *The 2019 learner support programmes, encompassed a broad collection of educational strategies, including supplementary materials, vacation classes (during autumn, winter and spring vacations), after-school classes, teacher content, pedagogical and assessment support, mobilising volunteer tutors, as well as alternative and differentiated ways of grouping and teaching learners (Motshekga, 2018).*

Schools, NGOs, institutions of higher learning and community groups also provide learner support programmes to address specific challenges that hinder performance of progressed learners (DBE, 2016). Countries in Europe and China also use UNICEF to support their Grade 12 learners' programmes, as a last push to improve their academic performance (DBE, 2012a). The discussion in the next sections will propose a variety of solutions to address the problem of the poor performance of progressed learners in life sciences.

2.8.1 Providing sufficient trained teachers for life sciences

As the first solution for the challenges facing progressed learners in life sciences, I will discuss the availability of trained teachers for life sciences. The DBE has failed to ensure that schools are provided with well qualified and good quality teachers to teach progressed learners. Statistics from the DBE indicate that "the supply of newly qualified teachers has almost tripled over the five years to 2016, growing from 8 000 in 2012 to 23 800 of qualified teachers in 2016" (DBE, 2016:4). The Funza Lushaka Bursary Scheme is a successful initiative scheme of the DBE to ensure that there is an adequate supply of newly trained teachers, especially in scarce skills subjects. Newly trained and retained teachers are competent to address the issues pertaining to the progressed learners in life sciences.

To close the content gap created by curriculum changes over the years, workshops on life sciences content take place at the start of each year. The DBE ensures that subject advisors arrange workshop sessions to address all the challenging concepts and topics collaboratively (DBE, 2011a). These workshops train teachers to pay attention to progressed learners and to set quality papers, and teach teachers about the importance of assessment in teaching and learning.

In this regard, I am of the view that the increase in the number of newly trained teachers in life sciences could assist progressed learners, as these teachers have been exposed to 21st century skills and knowledge, such as ICT, and are able to explain complex content to progressed learners to enhance their comprehension and, thus, make success in life sciences more achievable.

2.8.2 Improving the curriculum for life sciences

In 1953, the South African curriculum was guided by the Bantu Education Act, which oppressed black children during the apartheid era. In 1998, Curriculum 2005 was implemented as a master curriculum to eradicate the inequalities caused by the apartheid education system. In the late 1990s, outcomes-based education was introduced to supplement Curriculum 2005 (Bantwini and King-McKenzie, 2011:1).The implementation of outcomes-based education was accompanied by various challenges, which prompted a review in 2000. This approach had been criticised in the countries where it had been introduced, for instance, in Australia and the United States of America (Tshiredo, 2013). Consequently, the Revised National Curriculum Statement was introduced. When the minister of Basic Education, Angie Motshekga, took over in 2009, she instructed her committee to work on revising the Revised National Curriculum Statement (DBE, 2012a). In 2012, the minister introduced a new curriculum, called Curriculum and Assessment Policy Statement (CAPS), which is still in use in South African schools (DBE, 2012c).

Curricula are often changed, and new curricula are developed, in South Africa and in other countries around the world. A curriculum “is a plan of action that aimed at achieving desired goals and objectives” (Stotsky, 2012:10). According to the DBE (2011a:9), curriculum can be defined as a “vision of what learning and teaching might be, what is to be learned, assessments assigned, required knowledge and skills”.

CAPS is the current curriculum, which aims to accommodate and meet the needs of all learners, “irrespective of their socio-economic background, race, gender, physical ability or intellectual ability, with the knowledge, skills and values necessary for self-fulfilment and meaningful participation in society as citizens of a free country” (DBE, 2011a:10). The life sciences curriculum under CAPS was designed to equip all learners, including progressed learners, so that they are prepared for a changing world and “the demands of the 21st century where progressed learners need to be exposed to different levels of skills and knowledge” (DBE, 2011b:16). The life sciences curriculum nurtures scientific knowledge and skills, which should be in line with changing world that is becoming more science-oriented. According to DBE (2011c), the life sciences curriculum objectives should be executed to enhance the academic performance of progressed learners, so that they develop,

- Their knowledge of key biological concepts, processes, systems and theories;
- An ability to critically evaluate and debate scientific issues and processes;
- Greater awareness of the ways in which biotechnology and knowledge of life sciences have benefited humankind;
- An understanding of the ways in which humans have impacted negatively on the environment and organisms living in it;
- A deep appreciation of the unique diversity of past and present biomes in southern Africa and the importance of conservation;
- An awareness of what it means to be a responsible citizen in terms of the environment and life-style choices that they make;
- An awareness of South African scientists’ contributions;
- Scientific skills and ways of thinking scientifically that enable them to see the flaws in pseudo-science in popular media; and
- A level of academic and scientific literacy that enables them to read, talk about, write and think about biological processes, concepts and investigations.

Dhurumraj (2013:36) avers that,

> *by including indigenous knowledge in the life science curriculum, the particular social identity of the learner is acknowledged in the science programme in which can turn learning into a more positive experience for learners who are resistant to learning the Westernized science curriculum.*

An improved life sciences curriculum that includes indigenous knowledge would be suitable for progressed learners, as it will be grounded on experienced reality, and will use a vocabulary that is more accessible to learners. Another solution that is proposed, is instilling a positive attitude in teachers and learners towards life sciences.

2.8.3 Improving the attitudes of teachers and learners towards life sciences

The DBE organises science conferences and workshops, where teachers and learners are encouraged to improve their attitudes towards life sciences. The Southern African Association dedicated to the advancement of Research in Mathematics, Science and Technology Education (SAARMSTE) is an education project that was established by the DBE and science councils with the aim of encouraging excellence and instilling positive attitudes towards science. The SAARMSTE project has given Grade 12 progressed learners opportunities to participate, to enhance their skills and knowledge of life sciences and improve their attitudes towards the subject. Participating progressed learners have the opportunity to compete with learners from other countries, such as Zimbabwe, Lesotho and Namibia (DBE, 2011b), “learners from different categories who demonstrated exceptional performance are selected to attend either the London International Youth Science Forum or the Australian National Youth Science Forum” (Dhurumraj, 2019:85). The DBE also present science Olympiad workshops and competitions, where teachers and learners participate in a Science Focus Week, “consisting of stimulating lectures, excursions, industry visits and other science fun events” (DBE, 2012b:15). In this regard, I am of the view that the negative attitudes of progressed learners towards life sciences can be changed to an optimistic attitude through SAARMSTE and Science Focus Week projects.

In the United States, the department of education has a programme called Iowa Chautauqua programme, which is supported by the National Science Foundation. The Iowa Chautauqua programme aims “to counter the typical and continuous decline in positive attitudes toward science related to teachers and learners” (Thurmond, Goodman, Strelets, Attrill, Gramates, Marygold, Matthews, Millburn, Antonazzo, Trovisco and Kaufman, 2018: D759). This programme focuses mostly on (progressed) learners by enhancing a learner-centred environment, to improve their attitudes

towards life sciences, and share their ideas and experiences with their peers (Thurmond et al., 2018).

2.8.4 Providing sufficient resources and facilities for life sciences

The DBE is in the process of addressing challenges concerning the shortage of resources and facilities at schools. The DBE is working under the policy of Learner-Teacher-Support Materials (LTSM) to track schools with resource shortages. LTSM is defined as any facility, tool or resource that can be used to enhance teaching and learning and understanding of the subject content (DBE, 2011a). The minister of the DBE, Angie Motshekga, announced in her departmental budget speech, that their main aim and priority are to supply all disadvantaged learners, especially in rural schools, with resources by the end of 2030, and that resources will be allocated in relation to the actual education needs of learners. The LTSM policy was introduced in 2011 and implemented in 2013 to accelerate the supply of resources and facilities to disadvantaged schools to enhance the academic performance of Grade 12 progressed learners to perform better in sciences subjects, especially in life sciences (Motshekga, 2018:10).

In Kenya, the Department of Education has a policy called Teaching and Learning Resources, which supports disadvantaged schools to enhance effective teaching and learning (Dawo, 2015). The Teaching and Learning Resources policy refers to “satisfactory and acceptable quality and quantities of material resources, human resources and physical facilities” (DBE, 2015:10). Adequate teaching and learning resources are necessary to improve access to educational standards and outcomes and to bring good academic performance to (progressed) learners (DBE, 2011b), as they “are less likely to be absent from life sciences lessons and the adequate resources provide meaningful, interesting and relevant knowledge, skills and experiences to both teachers and learners” (DBE, 2011c:14).

In most rural schools in the Uthukela District, the DBE has ensured adequate availability of resources, such as textbooks, laboratories, classrooms and furniture; and other facilities, like toilets and sanitation, to enhance the culture of teaching and learning and to assist progressed learners to perform better academically. The DBE has supplied most secondary and high schools with laboratory equipment, library

books and one tablet per child Progressed learners are now able to save videos, listen to audio and write notes on tablets.

2.9. CONDITIONS CONDUCIVE TO THE SUCCESSFUL IMPLEMENTATION OF A STRATEGY TO ENHANCE THE PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS

This section will address the conditions needed for the successful implementation of a strategy to enhance the performance of Grade 12 progressed learners in life sciences.

2.9.1 English proficiency as a medium of instruction in life sciences

The learning of another language, in addition to a learner's mother tongue, that could be useful and beneficial, is called acquisition of second language learning (Mafora, 2013). Dearden (2014:23) defines using English as a medium of instruction as "a model of education in which some curriculum content is taught in English to learners who speak other languages in their homes and communities". English as a medium of instruction enables learners to understand life sciences concepts better, and enables them to analyse scientific information and express their ideas and opinions during teaching and learning, because, if they are to perform successfully, there is no other way to teach and learn life sciences than to express it in English (Dearden, 2014). Baloyi (2011:42) adds that "learners in the life science classroom not only learn the subject matter but they also learn to cope with the language comprehension too." I concur with Baloyi (2011:42), that paying attention to English proficiency is very important for improving the quality of learning in life sciences, especially for Grade 12 progressed learners.

In rural schools, most learners are only exposed to English at school, in the formal context, though teachers try their best "to extend learners' knowledge of concepts beyond basic vocabulary, to be able to engage in, understand and manipulate the appropriate discourse" (Baloyi, 2011:42) of the language of instruction, since that language is not used in learners' immediate environment. Proficiency in English leads to good academic performance, as learners are able to understand life sciences content and interpretation. Pretorius (2010:117–140) suggests a solution to help

progressed learners to pass life sciences in Grade 12. They can be helped to understand English by engaging them in reading and writing through numerous activities, such as magazines, quizzes and revision of previous question papers. In addition, English proficiency prepares Grade 12 learners to enrol at universities with diverse learners who value English as a language of science, technology, business, the economy and communication, in general, and who have the ability to speak, read and write in more than one language.

2.9.2 Parental involvement

Another condition for the success of progressed learners is parental involvement. Parents are considered to be the first teachers to train their children to adapt, socialise, behave and be productive in society (Kgosidialwa, 2010). Various research studies have found that parental involvement plays a significant role in learners' academic performance (Diamond, 2015). Learners who get attention from their parents tend to be more successful in their studies than those who do not get attention from their parents. Leepo (2015) notes that parental involvement solves numerous education problems concerning their children. Leepo (2015) agree with Topor, Keane, Shelton and Calkins (2010:183) by noting that learners cannot achieve their academic performance by only being provided with expensive school and good learning environment until their parents play a positive role towards them.

In addition, parental involvement has a strong and positive effect on Grade 12 progressed learners' well-being and academic performance; it not only enhances learners' attitudes, morale and academic performance in life sciences, but also promotes good behaviour and cultivates in them the desire to be responsible and productive in their communities.

Recent studies show that parental involvement in their children's education changes the negative attitudes of their children's towards life sciences (Ross, 2016). If progressed learners parents remain in close contact with the teacher, their children benefit, because doing so enhances children's learning; parents also become involved in school activities (Sanchez, Montesinos and Rodriguez, 2013:169–187). Parents who are involved in school-based activities become active in school programmes, frequently check their children's progress, ensure school attendance and try to provide

their children with a stationery (Modisaotsile, 2012:7). Galindo and Sheldon (2012:90) argue that “a close relationship between parents and teachers plays a significant role in learners’ success because it can result in higher levels of school attendance and lower levels of behaviour problems”, and provides a supportive network that promotes learners’ success. In addition, parental involvement creates a strong bond between a child and a parent, and makes it easier for children to communicate and get assistance from parents when they encounter problems that hinder their academic success.

2.9.3 Camps and extra lessons

Camps and holiday and extra classes are preferred intervention strategies in Uthukela District to help Grade 12 progressed learners. These interventions play a significant role, as progressed learners are taught by different teachers with various teaching approaches and strategies, and “are taken through the previous years’ question papers and any other relevant revision work that would help to prepare them for the examinations” (Leepo, 2015:145). Oghuvbu (2010:21–25) reports that, during camps and extra classes, schools are introduced to “twinning”, which refers to availing teaching and learning resources to under-resourced schools.

If Grade 12 progressed learners attend such interventions, it helps them to interact with other learners who perform better in life sciences; they share vital information and transfer skills, new ideas and techniques that help them to grasp the difficult concepts of life sciences (Morris and Perry, 2017:1–24). Cheruvalath (2017:143–155) agrees, and states that such strategies do not help only learners, but also teachers, as it enables them to network with other teachers from well performing schools, to share the best methods of and approaches to teaching Grade 12 progressed learners life sciences. In addition, camps and extra classes mean progressed learners do not struggle alone, but work smarter in groups with other learners, and share knowledge and experiences to find solutions to common problems. The following section will discuss threats that might hinder the success of this study.

2.10 THREATS TO THE SUCCESS OF A STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF PROGRESSED LEARNERS IN GRADE 12 LIFE SCIENCES

In this section, I will outline the various threats that I anticipated in the implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

2.10.1 Lack of English proficiency as a medium of instruction in life sciences

Hlabane (2016) defines life sciences as a subject that requires a learner to grasp, recall, read, write, analyse, interpret and communicate. English as a medium of instruction may cause problems for Grade 12 progressed learners in life sciences, and is a factor that influences the academic success of these learners. Murray and Hicks (2016:187) note that “there is a thin line between language proficiency and academic success”. Even in Australia, the language proficiency of learners has become a serious problem, since English is the second language of many learners (Murray and Hicks, 2016:170–187). In the Uthukela District, most schools consider English as the first additional language, which causes challenges for progressed learners, as they are not proficient in English.

Lack of proficiency in English affects life sciences progressed learners, as they fail to communicate their ideas in writing (Perez and Alieto, 2018:132–150), are unable to interpret and analyse data from diagrams or read and respond to extracts with understanding (Reynoso, 2019). In this regard, I realise that a lack of proficiency in English has led to poor performance of progressed learners, and it is imperative that they can read English in order to understand difficult concepts and reach conclusions, to solve problems related to those concepts. Lebata and Mudau (2014:271) aver that, “in Lesotho most learners fail to obtain their life sciences certificates because they fail to meet English requirement as it is a prerequisite to obtain the certificate”. This report shows that English proficiency plays an important role in the learning and understanding of life sciences. Various studies have found that progressed learners encounter enormous problems in studying life sciences, since they are tested and examined in English (Ravi, 2011:3–33). Progressed learners fail to understand the questions and struggle to give the correct answers.

Researchers, such as Ravi (2011:3–33) and Lebata and Mudau (2014:271), have reported the negative impact of using English as a medium of instruction; it causes negative attitudes and anxiety in progressed learners, which, inevitably, impacts their academic achievement. Hlabane (2016:78) argues that “the use of other official languages in teaching and learning life sciences cannot be considered a solution to the difficulties that weak learners come across with learning and understanding scientific concepts”. Cekiso, Tshotsho and Masha (2015:325–333) also report that using other languages may lead to misinterpretation of life sciences concepts, as some of these concepts cannot be expressed in all languages – some terms do not appear in ordinary dictionaries. Alenezi (2010:7) disagrees, by stating that “life sciences concepts must be taught, learnt and understood scientifically because at times an English word had a different meaning in life sciences”. Ngema (2016) reports that even code switching during teaching is not the solution to help progressed learners to pass life sciences if they lack English proficiency, because they face difficulties understanding and answering the questions during the tests and exams.

This problem is not peculiar to South Africa. However, studies in countries such as Botswana (Clegg and Simpson, 2016:359–374) and Tanzania (Mkonongwa and Komba, 2018:1–14), and have found that learners who are taught life sciences using code switching perform significantly better than those who are taught in English as medium of instruction.

2.10.2 Lack of parental involvement

Parental involvement has been viewed as a key factor for enhancing their children’s academic performance, confidence, self-esteem, behaviour and school attendance (Garbacz, Herman, Thompson and Reinke, 2017). Mbatha (2018) defines parental involvement as an influential source of success, whereby parents are fully supportive, not only in assisting with homework, but also encouraging their children to participate in extramural activities and guiding them in respect of social interactions around people. A lack of parental involvement affects learners negatively, especially progressed learners, as it causes them to lose hope, motivation, self-esteem and confidence in themselves.

Various studies have shown that a lack of parental involvement is caused by factors such as low income in the family and a single parent having to work for extra hours in order to provide for the family, and therefore lacking the time to help the child with schoolwork (Garbacz et al., 2017). Dhurumraj (2013:38) adds that “in rural areas, most learners are in the care of their grandparents who are old, illiterate and cannot actively participate in the school programmes”.

I agree with Dhurumraj (2013:38), because, in the Uthukela District, most school are situated in rural areas, therefore, the learners originate from poor rural areas, where most of their family members are illiterate, and unable to assist them with life sciences homework, investigations and research. The adults in the community who are educated do not necessarily have the interpretation skills needed by life sciences, they may be challenged by the language of instruction, and they are not aware of how the new curriculum works.

Siddiqui (2011) argues that the lack of parental involvement may not be caused only by socio-economic factors, but that schools play the biggest role, by not involving parents in programmes related to the teaching, learning and academic success of their children and failing to communicate what is expected of parents to ensure they become fully effective in supporting their children’s learning.

2.10.3 Poor attendance by progressed learners of camps and extra lessons

“The camps and extra classes are now used as a substitute for the actual teaching and learning time” (Leepo: 2015:145). Findings by Samuel and Dudu (2017) reveal that few Grade 12 life sciences progressed learners are fully engaged in early camps and extra classes, because they are aware that such programmes would be also available to them later in the year. “The lack of maximum participation of progressed learners in these interventions disadvantages them in not networking with diverse learners from different schools” (Astor, Jacobson, Wrabel, Benbenishty and Pineda, 2017:32).

In the United States, Nolan (2018) found that few progressed learners attended camps and extra classes due to overcrowding of learning centres, which meant they failed to gain teachers’ attention when they need help – after lesson delivery they were left on their own. Research studies support the findings of Leepo (2015:67), namely that

progressed learners face many problems at camps and extra classes, because “Some teachers who teach them are not as competent as they could be, discipline problems represented by learners from other schools and the lack of security at night”.

Chowa, Masa and Tucker (2013) argue that it is the duty of parents to volunteer to assist with camps and extra classes for their children by engaging in various activities, such as cooking and monitoring safety and security at the learning centres. Some scholars express different views about camps and extra classes for progressed learners. Taylor (2019: 321) argues against camps and extra classes, by noting that

> *Progressed learners are considered as slow learners and the fact that they had to attend school throughout the weekdays, weekends and holidays is really exhausting for them and thus left them with no time to study on their own, do some self-evaluation, determine how much work they grasped and identify areas that need attention.*

Yikici, Altinay, Altinay and Dagli (2016) agree, by stating that collaboration by schools to present camps and extra classes compromise the success of Grade 12 progressed learners; instead of improving their achievement, it confuses them and the best way to help them is for every school to present its own camps and extra classes, so that they can concentrate on the challenges experienced by progressed learners during these intervention strategies. Yikici et al. (2016:25) add that “such interventions might undermine the effectiveness of teaching and learning since both teachers and learners depend on external support in covering the challenging concepts in life sciences”. In addition, camps and extra lessons need to be monitored, because it may affect the performance of progressed learners’ negatively. Section 2.11 will focus on the anticipated successes of the strategy to enhance the academic performance of progressed learners in life sciences.

2.11 ANTICIPATED SUCCESSES OF THE STRATEGY TO ENHANCE THE PERFORMANCE OF PROGRESSED LEARNERS IN LIFE SCIENCES.

This section will discuss anticipated successes in the implementation of a strategy to enhance the performance of progressed learners in life sciences.

2.11.1 Create positive attitudes towards life sciences

It is hoped that the study will help to improve the academic performance of progressed learners in life sciences by creating positive attitudes towards and interest in the subject. It is anticipated that progressed learners will be able to adopt a 'scientific attitude' and develop an interest in life sciences-related activities and learning experiences. Through this study, teachers will be able to create a conducive environment to support progressed learners in life sciences.

2.11.2 Enhance parental involvement

This study supports parental involvement as a way to help Grade 12 progressed learners in life sciences, as I believe that the parent-teacher relationship has a beneficial impact on learners' education. This study encourages progressed learners' parents to fully commit to their children's education, as it helps learners to achieve better exam scores, complete their homework consistently, and develop high self-esteem, discipline and motivation in relation to life sciences. Morin, Eisenbraun, Key, Sanschagrin, Timony, Ottaviano and Sliz (2013:1456) state that "the best IT tip for progressed learners to perform better is to make sure that parents and teachers are working together as allies". Parents are encouraged to set realistic expectations for their children's behaviour and academic performance in life sciences.

2.11.3 Make use of available resources

The study encourages progressed learners to put more effort into learning and succeeding in their studies. They should use different resources that could help them to grasp difficult concepts in life sciences. Through this study, teachers will be armed with various tools to assist learners, especially progressed learners, so that teachers can demonstrate better understanding of challenging topics, with the ultimate goal of improving learners' performance.

2.11.4 Enhance attendance of camps and extra lessons by progressed learners

Through this study it is anticipated that Grade 12 progressed learners will see the need to attend extra classes and camps, as it would give them opportunities for revision and

to understand the concepts from other teachers' perspectives. This study will enhance collaboration by teachers and learners. Grade 12 progressed learners can make use of camps and extra classes as a substitute for normal teaching and learning time, to deal with challenging topics and concepts and to improve their academic performance in life sciences.

2.11.5 Collaboration in life sciences curriculum development

It is hoped that the DBE's policymakers, district managers, and subject advisors will note, through this study, the impact curriculum change has on teachers' competency, and will consider developing strategies, monitoring and evaluation that teachers could apply for curriculum implementation in schools. Teachers, learners and parents will be encouraged by this study, because their views were taken into consideration – as they are the people who feel and understand the challenges they face in relation to the new curriculum.

Teachers and learners are encouraged to work collaboratively to enhance effective teaching and learning. The relationship between the teacher and parents is also important for enhancing the academic performance of progressed learners in life sciences.

2.12 CONCLUSION

In this chapter, I focused on the theoretical framework, CER, which was used to address the research problem. CER rose from critical theory of the Frankfurt School in 1923. The CER framework provides a broad lens through which progressed learners' knowledge can be enhanced and developed. Furthermore, principles associated with CER, its epistemology, axiology, ontology and methodological perspectives were investigated, to address the academic performance of Grade 12 progressed learners in life sciences. Operational terms that underpin this study were stated. Lastly, the literature review discussed challenges, solutions, conditions and threats related to the framework that this study will propose, and the anticipated successes of the framework.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

PAR is the approach that I found suitable for generating data and developing a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. In this study, PAR was used as an approach to data generation. In this chapter, the aim and objectives will be restated, in order to explore the effectiveness of methodological approach of this study. The relationship between the transformative paradigm and PAR will be discussed. The origins of PAR, its definition, principles, strengths, weaknesses and methods of data collection will be explicated. To fully conceptualise this study, PAR will be operationalised, and data analysis, the selection of participants and ethical considerations will be elucidated. In Section 3.2, I will present the aim and objectives of this study.

3.2 AIM AND OBJECTIVES

3.2.1 Research aim

The aim of the study will be to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

3.2.2 Research objectives

The research objectives will be,

- To explore the challenges experienced by progressed learners in life sciences;
- To investigate solutions to improve the performance of Grade 12 progressed learners in life sciences;
- To identify conditions for the successful implementation of a strategy to enhance the performance of Grade 12 progressed learners;
- To identify threats that can hinder the success of the strategy to enhance the performance of progressed learners in Grade 12 life sciences; and
- To discuss the anticipated successes of the strategy to enhance the performance of progressed learners in life sciences.

3.3 TRANSFORMATIVE PARADIGM AND PARTICIPATORY ACTION RESEARCH

The ultimate aim of PAR is to transform the lives of marginalised people in societies. Mertens (2012a:802) delineates the transformative paradigm "as an umbrella term that comprehends paradigmatic perspectives that are meant to be emancipatory, inclusive and participatory". Zuber-Skerritt (2018:513) explains that the transformative paradigm is a "research framework that centers the importance of lives and experiences of poor and marginalised groups". The transformative paradigm empowers the powerless, so that they have a voice in the world of research and can mitigate disparities. Chilisa, Major and Khudu-Petersen (2017:326) and Cram and Phillips (2012:36–49) argue that the transformative paradigm "emerge[s] to the manifestation of dissatisfaction as a way to legitimate inclusion of diverse voices and to establish a home for exploration of methodologies that have an explicit goal of furthering human rights and social justice".

The transformative paradigm has much in common with PAR, as they are both inspired by strong social justice that is focused on the philosophy that addresses the issues power, culture, oppression, ethnic minorities and inequalities (Mertens, 2017:18–24; Jönsson, 2010:393). PAR is a blanket term that recognises the power of knowledge and working together towards a shared goal (Glassman, Erdem and Bartholomew, 2013:272). The ultimate goal of the transformative paradigm and PAR is to transform the lives of marginalised communities through collaboration. Mertens (2017:24) argues that the transformative paradigm and PAR "collect and analyse data for the aim of taking action and making change". They are both democratic, equitable and empowering (McDonald, Kidney and Patka, 2013) and put "social enquiry into action" (Glassman et al., 2013:272).

The four transformative paradigm qualities will be discussed below are ontology, axiology, epistemology and methodology.

3.3.1 Ontology in the transformative paradigm

Ontology deals with the nature and form of reality and what can be acknowledged about it (Killam, 2013). Ontology in the transformative paradigm holds that "our world is multifaceted with different opinions about what is real and arising from different

societies" (Mertens, Bledsoe, Sullivan and Wilson, 2010:193). According to Mertens (2017:18), the

> *Ontological assumption of the transformative paradigm embraces that reality is socially constructed with conscious awareness that certain individuals occupy positions of greater power and some are experiencing exclusion from decision taking, research focus and into all aspect of the inquiry.*

Barnes (2019) agrees with Mertens (2017:18–24), and argues that the ontological assumptions associated with the transformative paradigm "leads to considerations of power that influence who will be more or less likely to be included in decision making about the accepted definition of what is real".

I am of the view that the ontological assumptions of the transformative paradigm emphasise what truly exists – this includes the decisions that are made by the DBE about the lives and futures of Grade 12 progressed learners. It is a reality that learners, teachers and parents had no say on progression policy and in the life sciences curriculum – those in power were the ones who made decisions concerning the education of progressed learners. The next key of transformative paradigm is axiology.

3.3.2 Axiology in the transformative paradigm

Axiology deals with the nature of what is "intrinsically worthwhile" (Bleijenbergh, Van Arensbergen and Lansu, 2018). In this context, axiology in the transformative paradigm is considered as "a branch of philosophy that seeks the nature of ethical-moral behaviour" (Mertens, 2010b:9–18). Romm (2015:411) indicates that the transformative axiology assumption embraces the need for ethical research, as it promotes social justice and cultural respect, reduces inequalities and promotes human rights. Mertens, Holmes and Harris (2009:85) express the same idea as Romm (2015:411), by arguing that the axiology assumption transforms the lives of marginalised communities by deliberately addressing the social issues facing the community members. Dube (2016:67) adds that the "transformative paradigm is concerned with ethical issues which should be considered when challenging the status quo". Mertens (2010a:469) explains that axiology provides "transparency and reciprocity" that enables members of a community to be resilient.

In addition, Mertens et al. (2009:101) explain that axiology in a transformative paradigm has three main ethical principles: “respect, beneficence and justice”. In research, respect is considered as the principle of treating all participants from various backgrounds with equal respect and courtesy; beneficence embraces participants’ well-being by maximising the chances of all benefiting from the research, and not being harmed; and justice strives to provide all participants with “procedures that are fairly administered and thoughtfully thoroughly prepared” (Mertens, 2013:27) and improve social justice (Mertens, 2012b). In addition, it is the ethical responsibility of the researcher to address and assess the best ways to accommodate all the participants equally and fairly.

In this study, axiology in the transformative paradigm pursued the development of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. However, as researcher and a life sciences teacher, I benefited a great deal from the study, it was important for me that learners, teachers and other members of the community also benefited from the strategy to enhance the academic performance of progressed learners in various subjects. The following section will focus on the third key of transformative paradigm, which is epistemology.

3.3.3 Epistemology in the transformative paradigm

Epistemology deals with the nature of knowledge and justification of that knowledge (Pali, 2019:7). Mertens (2012a:35) avers that the epistemology assumption in the transformative paradigm emphasises that knowledge is “socially constructed within a context of power and privilege with consequences attached to which version of knowledge is given privilege”. Lake and Wendland (2018:11) agree with Mertens (2012: 802) that the epistemological assumption refers “to the nature of knowledge and the type of relationship between the researcher and participants”. Mertens (2017:24) notes that epistemology in the transformative paradigm “leads to a cyclical model of research in partnership of the researcher and community member”. Epistemology ensures that all participants achieve accurate knowledge. Nelson and Evans (2014:158) note that the epistemological assumption encourages unity and collaboration between the researcher and participants.

I, consequently, understand that collaboration enhances the sharing of knowledge between the researcher and participants. In this form, knowledge is socially constructed. Grade 12 progressed learners and teachers shared their knowledge and experiences in life sciences with the researcher through consensus. The fourth key of the transformative paradigm is methodology.

3.3.4 Methodology in the transformative paradigm

Methodology is an extensive term that refers to “research design, methods, approaches and procedures in a well-planned research” (Mertens, 2017:24). Biddle and Schafft (2015:320) note that methodological assumptions refer to “the appropriate method of systemic inquiry”. Methodology includes the gathering of data, selecting instruments to use, selecting participants and analysing data. Mertens (2012a:813) argues that “methodological assumptions emphasise that there are no single methodology is privileged, rather methodological decisions are tied to social-justice aspirations and identify the forces that support the status quo”. There is no specific methodology associated with the transformative paradigm (Romm, 2015:427); “it is characterised by the use of multiple approaches, theories and method techniques” (Mertens et al., 2009:101). Mertens et al. (2010:193) argue that the method used in the transformative paradigm must empower marginalised people, must be democratic and must provide social justice.

In this research, collaboration by the researcher and participants was significant for addressing the methodological questions, design and approaches concerning the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

3.4 ORIGINS OF PARTICIPATORY ACTION RESEARCH

Various studies have explained that the origins of PAR cannot be traced easily, because of its “broad range that blends various research approaches such as participatory research, action research and popular education initiatives” (Bergold and Thomas, 2012:191). Khan and Chovanec (2010) and Glassman and Erdem (2014:206–221) argue that the origins of PAR can be traced back to the work of the psychologist Kurt Lewin in the 1940s. Chevalier and Buckles (2019) claim that Kurt

Lewin was a Jew from Nazi Germany who worked in the United States of America and in the United Kingdom as a psychologist. In his work, he argued that “peace and democracy should be the core concepts for social existence” (Lewin, 1992:15). I support Lewin’s idea, because Grade 12 progressed learners should be involved in decision-making.

Regardless of uncertainties about the origins of PAR, Lewin claims that PAR originated in “both social action research and emancipatory philosophy” (Morales, 2016:156), which address various problems of discrimination, segregation and assimilation (Wynne-Jones, North and Routledge, 2015:218–221). Langdon and Larweh (2015:281) claim that PAR “emerged from movements such as social sciences, adult education and international development that shared a vision of society free from domination”.

The origins of PAR can also be traced to Paulo Freire, in the 1970s, who was a philosopher and a Brazilian educator who pioneered critical pedagogy. “Paulo Freire’s ideas, life, and work served to ameliorate the living conditions of oppressed people” (MacDonald, 2012:68). Bergold and Thomas (2012) report that Freire’s pedagogy was based on empowering the disadvantaged and marginalised people of society, to address issues such as dominance, power, economic contradictions, oppression and injustice. “The significance of critical consciousness to social change was highly emphasised” (Freire, 1970:205). Both researchers – Kurt Lewin and Paulo Freire – share the same vision of PAR, as it freeing societies of domination, and they encouraged consensus amongst members of society (Baum, 2016). In light of the discussion on the origins of PAR, I relate the origin of PAR to CER as proposed by the Frankfurt scholars, as they shared a common vision of transforming the lives of marginalised and disadvantaged people and enhancing emancipation. In Section 3.5, I will provide definitions of PAR by various scholars.

3.5 DEFINITIONS OF PARTICIPATORY ACTION RESEARCH

Various researchers define PAR in various ways, because they represent disparate fields and disciplines (Sandwick, Fine, Greene, Stoudt, Torre and Patel, 2018:473). PAR is defined as “participatory, action and democratic processes concerned with knowledge in the pursuit of worthwhile human purposes” by Speziale, Streubert and

Carpenter (2011:31). According to Gillis and Jackson (2002:15), PAR is “a systemic approach that considers collection and analysis of data for the purpose of taking action and making democratic change”. Rowell and Hong (2017:63) argue that PAR “is not only research that is followed by action but it is the action that is researched, changed and researched within the research process”. Similarly, Borg, Karlsson, Kim and McCormack (2012:33) define PAR as an “approach that enhances equitable, democratic and life-enhancing qualitative inquiry for further understanding and consideration”. Chabot, Shoveller, Spencer and Johnson (2012:20-33) and Yates and Leggett (2016:225) agree with Borg et al. (2012) and Martí (2016:169), by stating that PAR works well in qualitative research as an approach to data generation, as it considers individual feelings, allows participants to be active in democratic consensus, and frees them from manipulation.

Fletcher and Marchildon (2014:6) explain that PAR is “a philosophical approach that recognises the need to collaborate and generate new knowledge to address the current issues in education, embrace progress, emancipation and transformation of children’s lives to improve their social situations”. Baldwin, Cave and Lodge (2012) argue that PAR “is transformative rather than simply informative”. Chabot, Shoveller, Spencer and Johnson (2012: 22) define PAR in simple terms, which it “is to learn by doing”. In this regard, I find that the definitions of PAR by Fletcher and Marchildon (2014:6) and Chabot, Shoveller, Spencer and Johnson (2012:22) suitable for this research, as I believe they are applicable to the education sector and can enhance collaboration, fairness and democratic decision-making, interactions and emancipation. In light of these definitions of PAR, I believe developing a new definition of PAR, through synthesis of the definitions given above, could provide an umbrella definition that could include a variety of action research approaches. I define PAR as a collaborative research approach that transforms lives.

3.6 PRINCIPLES OF PARTICIPATORY ACTION RESEARCH

In this section, five principles of PAR will be discussed and unpacked; these principles guided the researcher in generating qualitative data in collaboration with core researchers.

3.6.1 Participatory action research's pursuit of democracy and social change

PAR aims to pursue democracy and social change in communities. PAR is considered democratic, by enhancing participation of all people and empowering individuals' worth by providing freedom from oppression (Speziale et al., 2011:34). MacDonald (2012:35) notes that, through PAR, "the participant is active in making informed decisions throughout all aspects of the research process for the primary purpose of imparting social change; a specific action (or actions) is the ultimate goal plays a significant role". The democratic features of PAR ensure that all participants are considered as a co-researchers (Yanar, Fazli, Rahman and Farthing, 2016:122; Feldman and Rowell, 2019). Kralik, Koch, Price and Howard (2004:259–267) argue that democracy is the process that creates and enhances new knowledge. Democracy, through PAR, addresses traditional hierarchies between researchers and co-researchers by encouraging them to be full collaborators in the research process and to emphasise democratic engagement (Bannon, Bardzell and Bødker, 2018:26–32). Feldman and Bradley (2019:91) and Rowell and Hong (2017:63-83) aver that democratic collaboration enhances co-generation of knowledge between the researcher and co-researchers to address various problems in the community. The core aim of PAR is enlightenment and "empowerment of oppressed individuals to partner in social change" (Kral, 2018:148).

"PAR enlightens people to investigate meaningful social topics and encourages them to participate in research in order to understand the root causes of problems that directly impact them and take action in finding a democratic solution" (Kim, 2016:96). Hoang (2017:23) has the same idea as Kim (2016:96), and states that PAR promotes involvement of community members, so that they can be enthusiastic about "social change and development of leadership skills". Freire (1970) emphasises that "social realities have been constructed and created by peoples' knowledge and are therefore changeable." PAR seeks to enhance social change strategies, by moving beyond new knowledge and promoting critical consciousness (Percy-Smith, 2018:159).

Furthermore, social change through PAR emphasises the development of knowledge, skills and abilities in progressed learners, so that they can become experts on issues that influence their lives and "create new knowledge about existing social conditions"

(Powers and Allaman, 2012:10). In Section 3.6.2, I will discuss the role of PAR in the acquisition of knowledge.

3.6.2 Participatory action research as acquisition of knowledge

Another principle of PAR is the acquisition of knowledge. Battiste (2007:111) and Kemmis, McTaggart and Nixon (2013:63) explain knowledge as the collective knowledge of traditions developed over the years through the experiences of community members. PAR empowers members of the community "to value and strengthen their capacity to produce knowledge that is useful to the researcher and other members of the community" (Madsen and O'Mullan, 2018:26). Thomas, Stornaiuolo and Campano (2018:97) argue that PAR "seeks to maximise the use of local and traditional important knowledge to address issues and policies that affect them". Knowledge gained through PAR identifies the numerous forms of knowledge that members of a society could use to generate strong research to fight against various limitations and biases (Whitehead, Delong and Huxtable, 2017). Cordeiro and Soares (2018:153) aver that "PAR seeks to improve and advance the validity of traditional knowledge and challenges and addresses the belief that modern scientific knowledge is useful for dealing with the issues that affect communities". With traditional knowledge, issues of power, injustice and inequality are ironed out and dealt with, because PAR sustains the voices of poor, oppressed and marginalised people (Thomas Stornaiuolo and Campano, 2018:101). Section 3.6.3 will explain the third principle of PAR, reflective critique.

3.6.3 Participatory action research as reflective critique

Reflective critique, another of the principles of PAR, "allows individuals to reflect on the processes and issues by making clear interpretations and agreements upon which judgements are made" (Née-Blackwell, Lowton, Robert, Grudzen and Grocott, 2017:83). Ortiz Aragón and Glenzer (2017:3) note that "reflection is tied to participation and action". Née-Blackwell et al. (2017:83) add that it is the duty of the researcher to reflect "before, during and after" action research; "co-researchers are encouraged to reflect on "what they believe, how they understand about the problem and how they view other people's opinions and views" (Coghlan, 2019:39). For this research, Grade

12 progressed learners in life sciences were encouraged to reflect on the problems they faced in learning life sciences, in order to improve their academic performance. PAR gave them a chance to reflect on how they felt about being progressed learners. Various studies have highlighted that “power inequalities which exist between teachers and learners are reflected in everyday life for learners” (Wabule, 2019:16). Therefore, it is important for the researcher to encourage in-depth reflection by all the participants. “PAR emphasizes collective inquiry and experimentation grounded in experience and social history as it is easy for people to reflect on them, as PAR prioritises skills and expertise at the disposal of the disadvantaged and marginalised communities” (Morales, 2016:156). The next principle of PAR is emancipation.

3.6.4 Participatory action research as emancipation

Gredig and Marsh (2010) define PAR as emancipatory research. Emancipation aims to reduce any form of inequality and oppression in societies (Stewart and Lucio, 2017:533). Habermas (1984:229) defines emancipation as “a process that is achieved through consensus, communicative competence, mutual understanding and critical reflection”. The mutual relationship between the researcher and co-researchers is crucial for the success of PAR “as an emancipation activity” (Goede and Taylor, 2019:36). Various studies found that emancipation aims to raise consciousness and understanding of main barriers, and awareness of new possibilities (Bogues, 2012:29).

Woodford (2018:36) avers that “emancipation evolved from critical theorists in the Frankfurt School as a central principle of social sciences and feminism as a result of the acknowledgement of oppression and the desire to engage in participation action to create change”. Walther (2016) adds that emancipation gives a voice and empowers the oppressed. Teachers involved in PAR are encouraged to empower and listen to the voices of Grade 12 progressed learners in life sciences. From this perspective, PAR pursues practical solutions to help Grade 12 progressed learners. Elicondo et al. (2013:425) note that the central concern of emancipation “is to identify all the social structures that impact the lives of community members and finding an emancipated solution to improve their lives”. I found emancipation, as a principle of PAR, suitable for informing this study, as I desired the study to transform the lives of

Grade 12 progressed learners in life sciences, and bring about freedom. Section 3.6.5 will discuss the last principle of PAR, which is collaborative and transformative theory.

3.6.5 Participatory action research as collaborative and transformative theory

PAR is known as a collaborative process of research, action, participation and education (Lykes, 2017) and a "philosophy of interaction" (Wasserman, 2018:247). Collaboration in PAR encourages an "individual with diverse knowledge, skills, expertise and experience to nurture the sharing of knowledge with other members of the society" (Stuart, 2014:33). In research, participants have equal rights and can all make contributions (Janes, 2016:72) – their ideas, opinions and reflections are listened to and respected (Cram and Mertens, 2015). According to Israel, Schulz, Coombe, Parker, Reyes, Rowe and Lichtenstein (2019:272), collaboration in PAR is not a compromise, but a process of giving, taking and sharing. Ozer (2017:173) and Goodyear-Smith (2017:268) state that collaboration through PAR teaches individuals to be responsible for their actions and to maintain respect for others. Collaboration "suggests a way of living and dealing with people" (Bertrand, 2016:15). Hebert-Beirne, Felner, Kennelly, Eldeirawi, Mayer, Alexander, Castañeda, Castañeda, Persky, Chávez, and Birman (2018:415) aver that "collaboration ties into social movement, encouraging members of the society to use knowledge and sharing of authority upon consensus building through cooperation". Consensus aligns disparate views amongst members.

Wasserman (2018:247) refers to PAR as problem-solving approach that links with the work of Habermas through critical theory and emancipation. In this study, collaboration as a principle of PAR played a significant role, as it encouraged the idea that learners also have a right to collaborate in decision-making that concerns their lives and futures. Collaboration inspires social transformation, as it aims to transform the lives of disadvantaged and marginalised communities.

The main aim of PAR is radical transformation and improving the lives of people in communities (Guy, 2018). Transformation, as a PAR principle, seeks to change individuals' status quo and address social issues that members of a community are facing (Hebert-Beirne et al., 2018:436). Bergold et al. (2012:222) believe that knowledge is rooted in the experiences of individuals and more knowledge is created

through collaboration and the exchange of ideas. The transformative principle intertwines with reflection and action, research and practice (Lykes, 2017). Section 3.7 will, therefore, discuss the strengths of PAR.

3.7 STRENGTHS OF PARTICIPATORY ACTION RESEARCH

PAR is an approach that empowers, raises consciousness and liberates individuals (Kral and Kidd, 2018:285); it values people as social beings and those who participate in research are recognised as active co-researchers, not as subjects of research (Hayhurst, Giles and Radforth, 2015:952). PAR "is powerfully oriented to pursue and address issues of imbalances and oppression of the poor and marginalised communities" (Ripamonti, Galippo, Gorli, Scaratti and Cunliffe, 2016:68). The process of PAR, ultimately, aims to restructure individuals' capacity, and collaborate with other members of the community in order to share diverse skills, knowledge, and expertise (Hayhurst et al., 2015:952), and participate in meaningful decision-making (Sherab, 2013:164). Members of the community develop trust in one another.

McNiff and Whitehead (2011:35) note that, through PAR, individuals participate and learn by doing that "which strengthen[s] their abilities and develop[s] skills in collecting, analysing and utilising information". A crucial strength of PAR is to create workable, democratic solutions for immediate problems that face societies (Dahlgren, 2013) and to empower people to "reflect on social realities and experiences" (Walker, 2018:53). I chose PAR as an approach to generate data for this study because it accommodates and empowers Grade 12 progressed learners who are struggling academically, and who are disadvantaged by the life sciences curriculum and progression policy. Section 3.8 will investigate the weaknesses of using PAR.

3.8 WEAKNESSES OF PARTICIPATORY ACTION RESEARCH

Although PAR has numerous strengths, it also has specific weaknesses. Chouinard (2013:237) reports that the biggest challenge facing PAR is "the diversity of definitions of PAR has and interchangeable use of terms as 'PAR', 'action research' and 'participatory research'". Stoudt, Fox and Fine (2012:178) add that PAR can be confusing, especially when researchers learn about this approach for the first time. Soranzo, Nosella and Filippini (2017:1100) explain that the origins of PAR are also

confusing, since it concerns various disciplines, such as education and health, and political and economic sciences.

Gibbs, Cartney, Wilkinson, Parkinson, Cunningham, James-Reynolds, Zoubir, Brown, Barter, Summer and McDonald (2017:3) aver that using PAR can be challenging, as it requires knowledge and time from community members and "some may struggle to maintain their commitment to the rest of the research due some sensitivities" (Young and Sternoa, 2011:9). In this regard, I am of the view that participants must be informed that PAR consumes time and requires their full commitment and participation. In addition, some misunderstanding of participants' perceptions may occur (Gibbs et al., 2017:22). Dube (2016:112) notes that "the participation of the researcher in the research procedure can lead to bias, which will lead to a lack of coherence between the theory and the implementation of PAR".

A weakness of PAR pointed by Chouinard (2013:238) is that issues of power imbalances and the establishment of democracy must be addressed prior to implementing the PAR approach. I agree with an idea of Chouinard (2013:253) that social issues must be cleared up first, before participants are involved in action research, because these issues might cause the research to be misinterpreted.

Dube (2016) argues that PAR is selective, by focusing only on poor, oppressed and marginalised people. Supporting this notion, McNiff and Whitehead (2011:45) add that PAR is a "soft research method that focuses on the voices and experiences of individuals not on a hard data". In spite of the challenges faced by PAR, I still believe that the lives of Grade 12 progressed learners in life sciences can be improved. Section 3.9 will discuss the way data was collected using PAR.

3.9 COLLECTING DATA USING PARTICIPATORY ACTION RESEARCH

Various methods can be employed for data collection using PAR. Researchers and co-researchers are encouraged to collaborate in determining appropriate methods of data collection in each specific situation (Stringer, 2013; Nicolaide and Dzubinski, 2016:120). During the collection of data using PAR, the researcher ensures that all participants are consulted and informed about the research procedures prior to commencing the research (Groundwater-Smith, Dockett and Bottrell, 2014). To

generate data using PAR, I used focus group discussions and semi-structured interviews. Section 3.9.1 will explain how the qualitative method is related to PAR.

3.9.1 Qualitative data and participatory action research

PAR is one of the preferred options for qualitative research "that should be considered and understood" (Borg et al., 2012:68). Cibangu (2012:95) argues that the ultimate goal of the qualitative method "is to describe and understand rather than to predict and control". Similar to PAR, the qualitative method focuses on the whole of individuals' knowledge and experiences. "PAR is considered democratic, equitable, liberating, and life-enhancing qualitative inquiry that remains distinct from other qualitative methodologies" (MacDonald, 2012:34). Creswell and Poth (2016:54) add that the qualitative method "aims to get a better understanding through first-hand experience, truthful reporting, and quotations of actual conversations." Ajagbe, Sholanke, Isiavwe and Oke (2015) define qualitative research as an approach that "describe[s] and interpret[s] issues systematically from participants' point of view as it consider[s] individuals' life experience, knowledge, views and feelings". Qualitative research, through PAR, seeks to explore the richness inherent in individuals in depth (Groundwater-Smith et al., 2014). Maxwell, Abrams, Zungu and Mosavel (2016:95–110) explain that qualitative research, through PAR, plays a significant role, especially in the education discipline, as it used in real situations, since the ultimate aim of qualitative research "is solving real life problems" (Morse, 2015:1212). In this study, qualitative research and PAR enabled Grade 12 progressed learners and teachers to speak up about their experiences and the issues that affect their academic performance in life sciences.

Qualitative research, as a form of PAR, considers focus group discussions and semi-structured interviews to be effective methods for data generation, as they are "open-minded and nuanced" (Goonewardene and Persad, 2018:101).

3.9.1.1 Focus group discussion

According to Carey and Asbury (2016:121), "focus group discussion is frequently used as a qualitative approach to gain clear and in-depth understanding of social issues". Cox and Van Gorp (2018:69) define focus group discussion as a "strategy which

involves an intensive discussion within a small group of people on a given focus". Focus group discussion is considered to be a group method that involves seven to ten individuals "that share a certain characteristic relevant to the main focus of the study" (Wirtz, Cooney, Chaudhry and Reisner, 2019:87). Fitzsimmons (2017:2454) adds that a focus group is a method that selects a group of participants purposively "rather than [them being] selected statistically" (Rudiana, Sabandar and Subali, 2018:116). Memar, Krisna, McMeekin and Tan (2018) note that, during a focus group discussion, it is the duty of the researcher to create a conducive environment for participation by all the participants in the group; they all must have equal rights and an opportunity to communicate and raise their viewpoints and opinions (Mishra, 2016:1–5). Qualitative research plays a significant role during focus group discussions, "as it helps the researcher to access the thoughts, feelings, knowledge, skills and experiences of participants in generating data" (Lewis, 2015:475).

Carey and Ashbury (2016) argue that the small number of people in a focus group enhance the environment, so that data generation is more effective and easier. When using PAR during a focus group discussion, all the participants remain active throughout the entire research (Kuckartz and Rädiker, 2019:201; Wirtz et al., 2019). Participants are given an opportunity to collaborate in research by "checking tentative conclusions and possible changes to be implemented" (Mishra, 2016:1–5). During focus group discussions for this study, teachers and learners were allowed to raise their opinions on a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

3.9.1.2 Semi-structured interview

Semi-structured interviews are considered to be a method that provides a "clear set of instructions to the participants" (Pathak and Intratat, 2016:10) and provide "reliable and comparable qualitative data" (Cohen and Crabtree, 2006:101). It is the most common setup for data collection used in qualitative research and PAR, as it provides freedom for the participants to describe their situations (Irvine, Drew and Sainsbury, 2013:87) and to express their ideas and opinions in their own terms (Kallio, Pietilä, Johnson and Kangasniemi, 2019:2954). Horton, Macve and Stuyven (2004) and Stuckey (2013:56-59) define semi-structured interviews as a formal and structured interview that asks open-ended questions, which allows a researcher and participants

to discuss the topic in detail and in private. Rabionet (2011:566) argues that a semi-structured interview is defined as a “conversation with a purpose”. Semi-structured interviews offer “face-to-face verbal interaction and elicit information through direct questioning” (Pathak et al., 2016:10); it has a set of guideline questions that act as a powerful technique in PAR to gain participants’ personal views, ideas, knowledge and experiences (Mishra, 2016:1–5). Stuckey (2013:56) avers that “new questions may rise during each semi-structured interview contact”.

Semi-structured interviews, according to Walker, Neoh, Gilkes and Rayment (2018:1428), are conducted fairly conversationally, with one participant at a time, to maintain confidentiality. Cohen and Crabtree (2006) add that the researcher and the participant learn and share knowledge in a reciprocal manner. In this way, it allows the co-researchers to become active participants by being able to describe “their events, phenomena and observations in their own terms” (Rabionet, 2011:566). Irvine et al. (2013:87) highlight that recording the interview is highly recommended, rather than taking notes by hand, as “it make[s] it easier for the researcher to focus on the interview content”. In addition, the participant should agree to the recording being made.

I conclude that focus group discussions and semi-structured interviews were perfect for generating data for this study, as these techniques enabled me to pursue a comprehensive inquiry on what causes Grade 12 progressed learners to struggle with their academic performance in life sciences. In Section 3.10, I will discuss the transformative paradigm and PAR.

3.10 OPERATIONALISATION OF PARTICIPATORY ACTION RESEARCH

Due to the Covid-19 pandemic, schools were mandated to close and data was collected through WhatsApp focus group discussions, in which 11 participants participated to discuss the research questions for over five days; participants reflected on each question for three hours a day. The study participants were five Grade 12 progressed learners aged between 17 and 19, and six life sciences teachers from Uthukela District. The data that was collected was divided into themes and sorted under subheadings according to their relevance to the research question. All participants concurred on the ground rules of the group, in order to achieve its purpose.

Participants were advised to hide or change their WhatsApp profile pictures to protect their privacy (Moore, McKee and McLoughlin, 2015), and to use pseudonyms.

The collected data was analysed using the thematic model suggested by Laws, Harper and Marcus (2003), which comprises seven steps (see Sections 1.6.2 and 3.11). The thematic model was chosen for this study, because data was collected through social media using WhatsApp group discussions. The thematic model is “a type of qualitative analysis that is used to analyse classifications and present themes that relate to the data” (Castleberry and Nolen, 2018:807). In this study, themes were used to categorise subheadings according to their relevance to the research questions.

The world today wants us to embrace the fourth industrial revolution. As PAR incorporates social transformation and collaboration (Brydon-Miller, Kral, Maguire, Noffke and Sabhlok, 2011:387), WhatsApp focus group discussions empowered participants, so that they were fully engaged in finding a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, by expressing their views freely and collaboratively.

PAR also encourages research to be conducted “with participants rather than on participants” (Herr and Anderson, 2015). In the WhatsApp focus group discussions, the research was conducted *with* teachers and learners, not *on* them.

In creating a WhatsApp focus group chat, the following steps were followed:

Step 1: Seek consent from the participants to formulate a WhatsApp focus group.

Step 2: Set the ground rules jointly.

Step 3: Explain the research aim and objectives.

Step 4: Discuss each objective, one at a time.

3.11 DATA ANALYSIS: LAWS, HARPER AND MARCUS MODEL

Data that was collected through WhatsApp group discussions between participants and was analysed with the model suggested by Laws et al. (2003), which comprises seven steps:

Step 1: Reading and rereading all the collected data: The researcher read all the data collected from the WhatsApp focus group discussions. Brief notes were recorded of relevant information.

Step 2: Drawing up a preliminary list of themes arising from the data: A list was made of different types of information that had been noted, and data was categorised into themes and subthemes and arranged according to the research question of the study.

Step 3: Rereading the data: Themes that were identified from the transcript were checked and the researcher considered if they corresponded with the participants' responses to the research questions.

Step 4: Linking the themes to quotations and notes: The themes that evolved from the data that was collected were linked to various scholarly views.

Step 5: Perusing the categories of themes to interpret them: The categories of themes were compared and interpreted based on the research question.

Step 6: Designing a tool to help to discern patterns in the data: Patterns were determined during data analysis.

Step 7: Interpreting the data and deriving meaning: The themes were clearly sorted under subheadings according to their relevance to the research questions.

Data was collected and in-depth member checking was done to establish the validity of the findings. Data that had been categorised in themes and analysed was presented to participants so that they could affirm that the data reflected their lived experiences of poor performance, which affects both teachers and learners (Woodyatt, Finneran and Stephenson, 2016:741). Doing so enabled the researcher and the participants to analyse the data that had been collected concurrently, to check their contributions on the topic of the research. In Section 3.12, I will discuss the ethical considerations that were considered during WhatsApp focus group discussions.

3.12 ETHICAL CONSIDERATIONS

The following section will identify the ethical considerations that were applied, as it is significant for any study to safeguard the well-being of the participants during data collection.

3.12.1 Permission to collect data

The study was in the social sciences, therefore, Grade 12 progressed learners, teachers and parents were involved as co-researchers (Coleman, 2018). An ethical clearance certificate with reference number UFS-HSD2019/1522 (see Appendix A) was obtained from the University of the Free State. Permission to conduct research at schools was obtained from the head of the Department of Basic Education at Uthukela District.

3.12.2 Informed consent

Prior to data being collected from the participants, the researcher explained the purpose and the process of the study to them (King et al., 2018). Consent forms were issued to the participants to sign. The ultimate goal of the informed consent procedure was explained, as “to provide sufficient information so that all participants can make an informed decision about whether to or not to participate in the study” (Shahnazarian et al., 2013:13). Voluntary participation was explained (Bok, 1995:15). Participants were also informed that, if they were uncomfortable about participating in the study, they had the right to withdraw from participating, or could contact the relevant people.

3.12.3 Confidentiality and anonymity

Confidentiality was assured. Participants’ names and their schools will be not divulged to anyone, and all data will be treated with great confidentiality. Forms to assure confidentiality were given to participants; and included reference to the principle of trust. The data was analysed and interpreted without the report mentioning the names of the participants (Gibson et al., 2013:18). Participants were aware that, after ensuring the confidentiality of the data collected, their anonymous data could be used for other purposes, such as a research report, journal articles and conference presentations. Participants’ privacy will be protected in any publication of the information by the use of code numbers and pseudonyms.

Data from the WhatsApp focus group discussion was transcribed and coded and categorised into various themes. During WhatsApp focus group discussions participants were aware that it was impossible to keep confidentiality and anonymity,

and they were advised to hide or change their WhatsApp profile pictures to protect their privacy. The researcher assured them that they would not be connected to the information that they shared during the focus group discussion.

3.13 CONCLUSION

Chapter 3 focused on research design and methodology. PAR was used as an approach to generate data to find a strategy to enhance academic performance of Grade 12 progressed learners in life sciences. The aim and objectives were identified. The relationship between the transformative paradigm and PAR was also discussed. Ontology, axiology, epistemology and methodology in the transformative paradigm were explained. The origin, definition, principles, strengths and weaknesses of PAR were outlined. The chapter dealt with the collection of data using PAR and the operationalisation of PAR. Data analysis was also discussed. The chapter clarified ethical considerations that were adhered to during data collection. The next chapter will provide the presentation and analysis of the results.

CHAPTER 4: PRESENTATION AND ANALYSIS OF THE RESULTS

4.1 INTRODUCTION

This chapter will cover the presentation, analysis and interpretation of data. The data collected and presented in this chapter responds to the aim and objectives of the study. Homogenous purposeful sampling was used for this study, and Grade 12 progressed learners in life sciences, and teachers who taught life sciences were selected to participate. Snowball sampling was used to allow participants to assist in identifying other participants possessing similar traits to participate in the study. A WhatsApp group was created to collect data from the participants, in order to comply with Covid-19 regulations for social distancing. In Section 4.2, I will restate the aim and objectives of this study.

4.2 AIM AND OBJECTIVES RESTATED

4.2.1 Research aim

The aim of the study was to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.2.2 Research objectives

This study is foregrounded in the following objectives:

- To explore the challenges experienced by progressed learners in life sciences;
- To investigate solutions to improve the performance of Grade 12 progressed learners in life sciences;
- To identify conditions for the successful implementation of a strategy to enhance the performance of Grade 12 progressed learners;
- To identify threats that can hinder the success of the strategy to enhance the performance of progressed learners in Grade 12 life sciences; and
- To discuss the anticipated successes of the strategy to enhance the performance of progressed learners in life sciences.

Section 4.3 will explain the challenges that Grade 12 progressed learners encounter with in learning life sciences, which affect their academic performance. The data was generated by Grade 12 progressed learners and life sciences teachers.

4.3 CHALLENGES EXPERIENCED BY PROGRESSED LEARNERS IN LIFE SCIENCES

During the WhatsApp focus group discussion, various issues were raised by participants; these issues relate to the challenges faced by Grade 12 progressed learners in life sciences. Responses by the participants were collected separately and categorised together to form a main theme. In Section 4.3.1, I will discuss the first challenge, which is the lack of qualified teachers for life sciences.

4.3.1 Lack of trained teachers in life sciences

The responses by the participants indicate that most life sciences teachers lack training on the content knowledge of life sciences. According to SACE (2010), the lack of opportunities for teacher career advancement has caused many science teachers to leave their employment at the DBE. The findings also indicate that most life sciences teachers are older in age, and some are not up to date on what the new curriculum requires. This claim was supported by Nokwanda, a learner, when she reported that, "*they prefer to be taught by newly qualified teachers because it seems that the old teachers do not understand what the new curriculum really want them to do*". Mabaso, a teacher, said,

> *To add on that one. The teacher who is not well trained for life sciences could display a negative attitude towards the subject and that might affect the learners' attitude towards the subject especially the progressed learners.*

The above findings indicate that some teachers who teach life sciences have deviated from their subject specialisation and, therefore, possess limited knowledge on delivering the life sciences content; they fail to strengthen content clarification to learners, especially progressed learners who require more examples, attention and clarification if they are to understand the content better. Even though the findings indicate that some of the life sciences teachers are professionally qualified to teach life sciences, and others are qualified life sciences teachers, the training they received

does not resonate with the new curriculum, hence, they find it difficult to teach the new curriculum.

The fact that some of the teachers were not qualified to teach life sciences contradicts the observation by Mwenda, Gitaari, Nyaga, Muthaa and Reche (2013:95) that "the central role of a teacher is to disperse the curriculum effectively". Qhawe, a teacher, commented on the lack of qualified teachers in life sciences:

> *I think the lack of trained educators in Life Sciences is a very big challenge for progressed learners. Teachers play a significant role in the performance of learners meaning they should be passionate about teaching Life Sciences, understand the terms as they are and that it is not an easy subject but needs to be practised daily in order to enjoy it. That will also help learners to fall in love with the subjects of their educator knows his or her story.*

Recent studies found that a lack of specialised teachers in the subject contributes to a higher failure rate in life sciences (Brownelland Tanner, 2012:339; Kiadese, 2011). With the lens of CER, I realise there is need to emancipate teachers and to train them to use different pedagogical styles to enhance the academic performance of progressed learners in life sciences (see Section 2.7.1.2). The lack of trained life sciences teachers is referenced by scholars such as Keller, Neumann and Fischer (2017:586) and Kleickmann, Richter, Kunter, Elsner, Besser, Krauss and Baumert, 2013:90), who indicate that incompetent life sciences teachers lack pedagogical content knowledge, which "they should use to create a positive environment, anticipate learners' difficulties and respond very quickly in making the subject matter accessible to learners that encounter problems in life sciences" (Caldwell, 2007:9). Tsanwani, Harding, Engelbrecht and Maree (2014:41) indicate that,

> *Teachers who are specialists in life science, understand science beyond the curriculum, and teach science in a variety of ways raise enthusiastic and confident learners about science, and spend time beyond their duty to ensure that the learners understand the concepts of science.*

From the above findings, it is clear that competent life sciences teachers plays a significant role in understanding the current curriculum and the delivery of the subject content to enhance the academic performance of the progressed learners by using

the relevant pedagogical approaches in teaching life sciences. Considering the shortage of trained teachers for life sciences, I argue that the DBE should prioritise the training of life sciences teachers. My suggestion is supported by Lebata (2014), who proposes that teachers should receive in-service training organised by DBE subject advisors, with the ultimate aim of improving the academic performance of progressed learners in life sciences. Section 4.3.2 will discuss the second challenge experienced by progressed learners, which is complicated life sciences terminology.

4.3.2 Complicated life sciences terminology

Another challenge raised by the participants is the difficulty of life sciences concepts. They indicated that most of the progressed learners struggle to understand the language used in life sciences, especially its terminology. During the discussion, Mhlengih, a learner, said that "*protein synthesis is the main problem for me, I'm struggling to differentiate the steps of DNA transcription and DNA replication*". Qhawe, a teacher, added *"life sciences concepts or terminologies is the main problem especially for progressed learners. They mostly lack understanding of them and sometimes reading their text books and slides can make them think they know the terms very well".*

The findings make it clear that life sciences terminology is one of the main causes of poor performance, and progressed learners perceive some content in life sciences as being challenging to learn. This challenge was also identified by literature (see Section 2.2.1), and supported by the examination diagnostic report for the National Senior Certificate, which states that,

> *Poor performance is still being recorded in questions based on the process of protein synthesis, which include DNA transcription and DNA replication. Most of the progressed learners struggle in misconception of these terms: DNA transcription and DNA replication and apply wrong steps in a correct process (DBE, 2018).*

Dhurumraj states that, "[l]ife sciences concepts are too abstract and most are foreign terms" (2013:37). In a discussion, Qhawe, a teacher, indicated that,

Life sciences requires application. Especially in genetics. It requires learners to recall the rules and theories of which they are more similar but applied differently. So if the teacher's pace will be faster. Learners will find it difficult to see the differences and similarities between genetics theories.

The issue of difficult terminology in life sciences was also referred to by researchers in Turkey, who argue that the nature of life sciences itself requires memorisation, and that the level of abstract concepts, topics and events is challenging for Grade 12 progressed learners (Zeidan, 2010; Cimer, 2011; Reinaldo, 2014). Findings by Ogunkola and Ravi (2011:17) reveal that "learners are experiencing difficulties in various topics in life sciences and therefore it affects their motivation and performance negatively". In support of the foregoing, Deshmukh (2013) notes that overloaded curricula and the interdisciplinary and challenging concepts of life sciences contribute to poor performance of learners in life sciences.

In addition to the difficult terminology in life sciences, the subject contains challenging terms that require learners to understand them and recall them, in order to understand the whole topic they are studying. Therefore, most Grade 12 progressed learners perform poorly in life sciences, due to their low levels of application and knowledge construction. In this regard, I am of the view that there is a need for learners to be assisted to understand and remember difficult concepts, since CER advocates for empowerment of the disadvantaged. Section 4.3.3 will discuss the third challenge that Grade 12 progressed learners' encounter, which is a lack of motivation and a negative attitude to learning life sciences.

4.3.3 Lack of motivation and negative attitude to learning life sciences

During the WhatsApp discussion, it emerged that attitude and motivation play significant roles in learners' performance. Participants reported that most progressed learners lack motivation, and they have a negative attitude towards life sciences. Olwethu, a learner, said that,

We have a negative attitude towards life sciences because it has difficult words that are even hard to pronounce. And it demotivate us even more if the teacher is moving at a higher pace and we ended up losing interest completely.

Mabaso, a teacher added,

> *Being progressed kills self-esteem, some progressed learners they have been progressed most of their schooling that makes them feel incompetent. Teaching them life science is just too much for them and saps the negative attitude to the teacher.*

From the above points raised by participants, it is clear that the negative attitudes and lack of motivation of teachers' and learners' leads to poor academic performance of Grade 12 progressed learners in life sciences. It is argued by some scholars, such as Cimer and Cimer (2012:17), that "teachers' attitude and teaching style are one of the factors that affect learners in learning life sciences" and, therefore, "if learners are not happy with the way life sciences is being taught, they may show disinterest towards life sciences and its teaching" (Sharpe and Abrahams, 2020:85). A negative attitude towards teaching progressed learners makes it impossible to assist progressed learners; a negative attitude contradicts CER, which emphasises the need for emancipation (see Section 2.4.1). Guido (2018) reports that "creating a positive environment only for the learners, while disregarding their interest and expectations in the subject could lead to learning problems and the decrease of performance in life sciences". Rabgay (2018: 265) believes that "a teacher is a key factor in the manifestation of a positive attitude towards life sciences."

For progressed learners to succeed, there is a need for motivated teachers. This resonates with the argument by Sharpe and Abrahams (2020:85) that,

> *The duty of the teacher is to create an environment that is conducive to progressed learners to stimulate their attitude, the use of methods and approaches that will enhance their concentration and motivation in order to improve their academic performance in life sciences.*

The next challenge experienced by progressed learners in life sciences that will be discussed, is a lack of adequate resources for teaching and learning life sciences.

4.3.4 Lack of adequate resources for teaching and learning life sciences

During the discussion, the participants reported that the lack of adequate resources for teaching and learning life sciences causes poor academic performance of Grade

12 progressed learners, as it limits them from extracting knowledge from their empirical data and physical surroundings; this problem was also identified in the literature (see Section 2.5.3). The LTSM policy stipulates that "every learner must have his or her own textbook and the usage of appropriate quality material must be ensured" (DBE, 2011a), and "teachers and learners have to be provided with a wide variety of curricular resources, exposing learners to diverse ideas, experiences and opinions" (Republic of South Africa, 1996a). While it is a duty of the DBE to provide learning material, some schools still struggle to obtain sufficient resources. This was revealed by MaCingwane, who reported that

> *The lack of resources like laboratory facilities also contribute to the poor performance of progressed learners, life sciences is a practical subject and learners needs to perform practical activities. Some of the topics in life sciences need to be taught by conducting experiments in a laboratory.*

Olwethu, added that *"life sciences is an interesting subject but I'm struggling a lot to memorise some content because of the shortage of textbooks and laboratory equipment for life sciences".* The findings indicate that the absence of practical investigations in laboratories disadvantage progressed learners, as some of them learn better by being hands-on and moving around. Mhlengih reported,

> *At our school we do have a life sciences laboratory but we have never used it because of the shortage of equipment, text books and study guides are not enough for all of us. We are sharing in pairs. This make it hard for me to use the study guide and textbook because the partner that I'm sharing with always says he forgot the study guide at home.*

Various studies, such as that of Labov et al. (2010) and Dhurumraj (2013), found that inadequate resources for life sciences leads to poor performance. CER states that "it is an injustice to institute systems and structures in education that exclude some on the basis of poverty, or because they live in underprivileged communities" (Dube, 2020:103). In light of this claim, it is clear that few schools in rural areas have adequate resources, which are needed to improve their performance. The study by Cimer (2011:61) found that "the major factor that ignites learners' performance and teachers' effectiveness to teach is the availability of instructional materials such as charts,

textbooks and laboratories". Learners tend to perform poorly in life sciences if resources needed for teaching and learning are lacking. Anif, Sutama, Prayitno and Idrus (2019:23) report that "the quality of learning materials such as text books, chats, laboratories are an ingredient of education". Matimbe (2014) found that learners without textbooks and laboratories perform worse than those who have textbooks and fully equipped laboratories.

In this regard, I am of the view that there is a strong correlation between the availability of resources and performance of progressed learners in life sciences. The findings of this study correlate with the findings by Mwaba (2011) and Mwenda et al. (2013:93), that "the lack of resources such as textbooks, physical infrastructure and laboratory equipment has led to the learner's poor academic performance" (Ohia, 2018:148). Firstly, this shortcoming makes it hard for teachers to be effective and innovative, as they cannot give learners work to be done at home. Secondly, it makes it difficult for progressed learners to study and research further what was done in the classroom. Lastly, it causes learners and teachers to lose interest in life sciences. Next, I will discuss lack of parental involvement as a challenge experienced by progressed learners in life sciences.

4.3.5 Lack of parental involvement

In addition to the challenges that lead to poor performance of Grade 12 progressed learners in life sciences discussed in Sections 4.3.1 to 4.3.4, the participants identified a lack of parental involvement in their children's schoolwork as a further challenge (see Section 2.10.2). Most of the parents cannot assist their children, because some are uneducated, and others have very little knowledge of life sciences. According to the South African Schools' Act of 1996, section 23 (9), "parental involvement is a constitutional right, therefore parents should be more involved in the education of their children" (Republic of South Africa, 1996a).

Mhlengih said that, *"I think our parents need to understand that we are doing matric so, in some of the house duties we must not be involved because we need to focus on our studies*". Mbali added that, "*we need our parents to be involved in our school work so, that they can be able to help us where they can. We really need their support that's what we actually need from them as learners".* Thando, a teacher, said,

Learners who lack attention from their parents tend to be underperforming in their studies than those who get attention and support from their parents. Parental involvement solve many educational problems concerning their children.

Teachers and parents play a major role in learners' performance (Yulianti, Denessen, Droop and Veerman, 2019:3). Researchers, such as Kwatubana and Makhalemele (2015:315) and Yulianti, Denessen and Droop (2018) noted that parental involvement makes it easier for teachers to have a good relationship with parents, helps teachers to understand the background their learners come from, and shows them what extra and extended help is needed by the learner at home (Llamas and Tuazon, 2016:70). Collaboration between the learner, teachers and parents is critical for learning, and resonates with the emphasis of CER on communication, to create solid consensus between teachers and parents to help learners improve their academic performance in life sciences (see Section 2.10.2).

The findings make it clear that involving parents in their children's education is regarded as influential for teaching and learning, and for the learners' academic performance. This claim is supported by a study by Amani, Nazifi and Sorkhabi (2020:50), who argue that "the duty of a parent is to make sure that the learner is assisted in the process of learning as much as they possibly can by mentoring, encouraging, leading and inspiring". In this regard, I am of the view that parental involvement would encourage learners to be persistent in improving their academic performance in life sciences, as they would not want to disappoint their parents. Section 4.4 will provide solutions, as proposed by the participants, for solving the problems faced by Grade 12 progressed learners in life sciences.

4.4 SOLUTIONS TO IMPROVE THE PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

The WhatsApp group discussion not only highlighted problems – possible solutions were also discussed by the participants, who contributed to a strategy that would help improve the academic performance of Grade 12 progressed learners in life sciences. This section will present the solutions proposed by the participants for solving the problems that had been identified (see Section 4.2). The first solution that was

suggested by the participants is providing sufficient trained teachers, which is likely to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.4.1 Providing sufficient trained life sciences teachers

The participants suggested providing sufficient trained teachers for life sciences as one of the main solutions for enhancing the academic performance of Grade 12 progressed learners in life sciences. Teachers who specialised in life sciences have scientific knowledge and will be able to deliver the life sciences curriculum effectively. In the discussion, Qhawe indicated that,

> *We, as life sciences educators, we need to be effectively and sufficiently grounded in the scientific knowledge and understanding of life Sciences and we should be able to apply the best and relevant methods that would help us to produce good results for progressed leaners in the classroom.*

Nokwanda added,

> *We need competent teachers whose specialisation is life sciences. Therefore, it will be easier for us to understand the subject content better.*

Regarding the claim that many teachers of life sciences are incompetent, researchers such as Mupa and Chinooneka (2019:98) argue that “teachers should possess some experience in teaching life sciences in order for effective teaching and learning to occur”. Sathy and Hogan (2019:34) disagree with Mupa and Chinooneka (2019:98); Mapolisa and Tshabalala (2014:16) and Mavhunditse (2014), by stating that teachers who are newly trained may have less experiences of teaching but be more effective than teachers with longer-term experiences in teaching. In turn, Mapolisa and Tshabalala (2014:16) supports the idea of Sheperd (2013:21) and Lebata (2014), and states that newly qualified teachers sometimes find it difficult to adjust to the schooling system. That is why the senior and experienced teachers should assist the newly qualified life sciences teachers. This suggestion is supported by South African Qualifications Authority (SAQA), which states that qualified teachers “are able to identify and solve educational problems by using critical and creative thinking to arrive at a responsible decision and evaluate knowledge in their area(s) of specialisation” (DBE, 2012b:9).

Sufficient trained teachers for life sciences would be the best solution for improving the academic performance of progressed learners, as trained teachers would find it easier to identify topics on which progressed learners struggle and need more attention. This suggestion resonates with Ogbonnaya (2011:121), who argues that the "quality of education cannot exceed the quality of the teacher". Better knowledge and pedagogical life sciences skills of teachers would enhance the academic performance of Grade 12 progressed learners in life sciences. The second solution that was suggested by the participants to enhance the academic performance of Grade 12 progressed learners in life sciences is improving the curriculum for life sciences.

4.4.2 Providing various life sciences curricula

Another suggestion that the participants made as a solution to improve the academic performance of Grade 12 progressed learners in life sciences is providing various life sciences curricula. Having more than one syllabus for life sciences would meet the various needs of learners, by acknowledging variations in their potential abilities and intellectual and physical needs. In the discussion of possible solutions to alleviate the challenges experienced by Grade 12 progressed learners in life sciences, Mabaso, MaCingwane and Mazibuko elucidated that,

> *Mabaso: Learners are different, unique individuals and their level of thinking is not the same. I suggest that life sciences should have various syllabi to cater different learners. Back in the years, we used to have standard Grade and higher Grade systems in [life sciences].*
>
> *MaCingwane: I suggest that the DBE should adopt the inclusive approach that will specify the minimum requirements for each learner and acknowledges their potentials in order to receive the necessary support.*
>
> *Mazibuko: Guys, don't you think this will be a burden to us, as it going to add an extra work by catering each learner's needs and our classes are overloaded already. I see this idea as time consuming and we do not have enough time.*

The suggestions put forward by Mabaso and MaCingwane are in line with the ideas of Balakrishnan (2020:131) that "different grading syllabi in life sciences reduce the

unnecessary stress, pressure and unhealthy competition amongst the learners as they are provided with an opportunity to choose the subject grading according to their level of understanding". Sathy and Hogan (2019) add that a grading system provides teachers with the means to identify special needs, appropriate learning programmes, assessment standards and instruments that can be used to help progressed learners to obtain good marks in life sciences.

Mazibuko, on the other hand, believes that the suggestion will add to teachers' burden, as it will mean extra work, and a great deal of extra time. This contradicts the argument of Priyadarshini and Thangarajathi (2017:28) that "inclusive syllabi work when there are enough resources available for teachers to provide individualised learning processes for each learner".

I appreciate the suggestion provided by the participants to avail various life sciences syllabi to cater for inclusivity. However, in reality, inclusive syllabi require enough resources, well trained teachers and enough time to deliver the content during teaching and learning. While the suggestions are appreciated, various syllabi in life sciences will have to be a long-term plan to be implemented effectively, as it would require a considerable capital outlay. In this regard, I conclude that it is advisable to focus on strategies that involve short-term plans and have few budgetary implications. The third solution that was given by participants to enhance the academic performance of Grade 12 progressed learners in life sciences, was providing sufficient resources to teach and learn life sciences.

4.4.3 Sufficient resources for teaching and learning in life sciences

In this study, the issue was that life sciences is a demanding subject and that it is taught best through a learner-centred approach – this was mentioned by participants during the discussion. This approach works effectively when there is sufficient resources, and this was confirmed in the literature (see Section 2.8.5). The availability of adequate resources, such as sufficient text books and fully equipped laboratories, enhances teaching and learning in life sciences, and also improves academic performance of progressed learners, because these learners would remain interested and pay attention. During the discussion, Mthombeni, a teacher, said,

> *Learners learn better if they can relate to the subject hence more practicals are key to their understanding. For example: by giving them a 3Dimension model for structures makes it easy for them to recall.*

Mabaso added,

> *Our laboratories should be fully equipped with the best teaching aids and progressed learners should be given practical worksheets to help them understand.*

Studies have shown that the availability of resources for life sciences appears to be one of the solutions for improving the academic performance of progressed learners in life sciences (Belay, Khatete and Mugo, 2020; Buah and Akuffo, 2017). The availability of learning and teacher support material would enhance the effectiveness of teaching and learning life sciences, as using basic resources, such as charts, videos and projectors for teaching, can bring about good academic performance by progressed learners. Van der Berg and Hofmeyr (2018:34) assert that the sufficient and relevance of life science resources contribute to good academic performance of learners.

During the discussion, Olwethu, said, *"Watching a video on mitosis makes us understand the topic better and be able to differentiate it from meiosis"*. Lebata (2014:117) argues that sufficient learning material has a considerable effect on learners' academic performance, since it facilitates the learning of abstract concepts and ideas of encouraging rote learning. According to my experience as a teacher, I am aware that sufficient learning resources stimulate discipline and enhances the academic performance of progressed learners in life sciences. The national policy for Equitable Provision of an Enabling School Physical Teaching and Learning Environment "recognises the detrimental effects of inadequate resources on teachers and learners, especially in rural schools" (DBE, 2015). In this regard, I am of the view that the DBE should prioritise supplying sufficient resources for life sciences progressed learners, in order to improve their academic performance. The next solution offered by participants was fostering positive attitudes in teachers and learners towards life sciences.

4.4.4 Fostering positive attitudes in teachers and learners towards life sciences

As part of the solution, fostering positive attitudes in teachers and learners was suggested during the discussion. Motivation and attitude are regarded as the key factors that boost the academic performance of the Grade 12 progressed learners in life sciences (Mbajiorgu, Oguttu, Maake, Heeralal, Ngoepe, Msafu and Kaino, 2014:138). Participants reported that positive attitudes lead to interest in the subject, commitment, hard work and, in turn, the desired good academic performance. During the discussion, Qhawe, said:

> *Positive attitude contributes to positive results, attitude towards the Life Sciences affect the career choices of learners. Learners need to be motivated in order to change their negative attitude towards the subject as it will affect their performance.*

Participants emphasised that it is the duty of a life sciences teacher to display a positive attitude and commitment towards learners, in order to change their negative attitude towards the subject, in spite of the poor conditions they are learning under, and the lack of basic resources. MaCingwane, a teacher said:

> *Progressed learners especially in life sciences want a teacher who is dedicated and optimistic because even the simplest task can become long and difficult for progressed leaners to master. It is at times like this that teachers must offer hope and encouragement by celebrating any and all victories no matter how big or small the accomplishment is. This will encourage learners to participate actively and build their confidence.*

According to Tsanwani et al. (2014:42),

> *Life sciences must be taught by an enthusiastic and confident teacher that is eager to spend time beyond their duty to ensure that the progressed learners understand the challenging concepts by giving them extra practise activities and reward them whenever they show some improvement.*

Abudu and Gbadamosi (2014:35) believe that it is the duty of a learner to be disciplined, in order to perform well and to achieve good results in life sciences. Olwethu, a learner, indicated that,

> *Being disciplined as a learner changes a bad attitude. When you are disciplined you will be able to work with other learners and you will be able to listen to instructions and you won't wait for the teacher to tell you to study you will be ahead already.*

In support of the foregoing, Vassallo (2014:105) argues that,

> *life sciences is a subject that requires a lot of passion and dedication from the teachers as they should take their time in guiding learners through challenging concepts of life sciences which are seen as difficult, boring and irrelevant and they should make them interesting.*

However Abudu and Gbadamosi (2014:35), contrary to Vassallo (2014:105), says that "learners should take control of their learning and be responsible for their school work by working hard and seeking for help whenever they need it".

It seems that participants and the literature agree that it is the duty of both the teacher and the progressed learner to display positive attitudes towards life sciences, because having a negative attitude towards life sciences could lead to poor academic performance. The last solution suggested by participants relates to parental involvement, which they believed could enhance the academic performance of Grade 12 progressed learners in life sciences.

4.4.5 Parental involvement

In this study, the lack of parental involvement was identified as a challenge. Participants also referred to the importance of parental involvement in their children's education. The Education White Paper 6 (EWP6) legislation specifies and promotes "the rights and responsibilities of parents since they are a significant form of support in the education of their children" (Republic of South Africa, 1996b). During the discussion, it was mentioned that parental involvement plays a major role in restoring confidence in learners and improving the academic performance of learners, as it

reduces mischievous behaviour by learners, such as skipping classes, absenteeism and failing to do homework. Mazibuko, a teacher, said,

> *Parents can help the learner by encouraging he or she to study and also ask a learner to identify the challenges him or her experiences in the subject. If the learner identifies his or her weaknesses in Life sciences, the parent can discuss these challenges together with subject teacher to help learner.*

Mthombeni added:

> *Parental involvement plays a significant role in each and every child's life. Parents are considered to be the first teachers. Parental involvement does not contribute only on the well-being of a child but it also enhance the child's attitude towards his/her academic performance and promotes good behaviour and taking of responsibilities.*

During the discussion, it was also emphasised that parent-child and parent-teacher relationships could play an important role in performance, as it encourages a parent to enquire about the learner's performance, and also creates a healthy relationship and communication with a child by genuinely monitoring, inspiring and leading them through life's endeavours. Llamas Tuazon (2016:59) and Kwatubana et al. (2015:315) aver that involving parents in their children's education builds parents' confidence in supporting their children with schoolwork, especially homework, and creates better communication with their children's subject teachers. Ntekane (2018:58) states that "it is the duty of a parent to make sure that the learner is assisted in the process of learning". In this manner, parents become active participants in decision-making about the future of their children.

The results of this study are similar to the findings of Hornby and Lafaele (2011:37), who found that "parents should also be involved in children's sports activities, as this would improve learners' academic performance and serve as motivation". During the discussion, Nokuphiwa, a learner, stated that *"our parents need a workshop on how to treat us when we are doing Grade 12, we need time to focus. They really need to understand that"*.

Next, I will discuss the conditions needed for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.5 CONDITIONS FOR THE SUCCESSFUL IMPLEMENTATION OF A STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Section 4.5.1 will address the conditions proposed by the participants for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.5.1 Attending camps and extra lessons

One way in which the academic performance of the Grade 12 progressed learners can be enhanced is if they attend camps and extra lessons. According to the Bill of Rights, “every child has a right to learn and a learner has the responsibility to attend school punctually and regularly” (Republic of South Africa, 1996a). Literature confirms that if progressed learners in life sciences attend camps and extra lessons, it could help the teachers to finish the curriculum on time and provide time for remedial work. This benefit is supported by Spaull (2013:123), who argues that “Grade 12 intervention programmes are one of the positive factors which contribute greatly towards improving the progressed learners’ academic performance”.

In the group discussion about possible conditions for the successful implementation of a strategy to improve Grade 12 progressed learners’ academic performance in life sciences, Mazibuko, Qhawe and Mbali stated,

> *Mazibuko: I think one of the ways which may be effective to enhance the performance of Grade 12 progressed learners in life sciences is to attend camps and extra classes. As it helps them to understand the content better as they are also able to discuss the challenging topics in groups.*
>
> *Qhawe: I also think attending the school camps during holidays and extra classes are the most valuable and successful strategies in helping the*

Grade 12's especially the progressed learners as they are taught by different professional educators with lots of experience.

Mbali: Extra classes and camps works for us. Our Teacher is able to finish the curriculum on time so that we can go back and feel the gaps where we missed issues and as we need to be attended individually.

The academic performance of Grade 12 progressed learners can be improved if there is co-operation between teachers and learners. Hlabane (2016) asserts that, during extra classes and camps, learners have enough time to consult the teacher when they encounter problems, as the teachers have a minimum workload for a day. Leepo (2015) and Muzah (2011:200) add that this is when a great deal of drilling occurs, as the teacher has enough time to assign more work to learners to check how they are likely to perform in their external examination, by using previous question papers and drilling learners on "how the examination questions would likely to appear" (Morris and Perry, 2017:5). Extra classes and camps help life sciences teachers to finish the curriculum in time and provides the opportunity to set remedial work for progressed learners. Cheruvalath (2017:144) refer to remedial work as "educational interventions aimed at addressing learning needs of a targeted group of learners who are behind academically and having problems in mastering certain topics".

Mazibuko, a life sciences teacher, stated that:

Progressed learners have been encouraged to participate and co-operate with other learners during tutorial lessons in order to be free in asking questions and assistance from their peers.

He also explained that this strategy is inclusive, as all learners take control of the lesson. Qhawe, on camps and extra lessons, explained that, during the camps and extra lessons, the progressed learners have an advantage, as they are being taught by different life sciences experts, with different teaching styles and strategies. Mbali, a learner, indicated that the intervention programmes for life sciences learners benefit both teachers and learners, as the teacher is able to finish the curriculum on time, so that there is enough time for remedial and revision work, and it benefits progressed learners, who can revisit topics and close any knowledge gaps.

Given this condition for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners, I conclude that intervention programmes prepare progressed learners optimally for their final examination to enter a tertiary institution and strive to achieve positive results for their academic performance in life sciences. Next, proficiency in English, as the medium of instruction for life sciences, was proposed by participants as a second condition for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.5.2 Proficiency in English

Another condition for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences is proficiency in English, which is the medium of instruction for life sciences. English, as a language, plays a significant role in the learning and understanding of life sciences (see Section 2.9.1). Using English has many benefits, as learners are able to communicate and express their ideas logically – life sciences requires analysis and interpretation of concepts. According to Hlabane (2014:77), “life sciences is descriptive in nature, therefore it requires a learner to have sufficient English proficiency in order to understand the meaning of life sciences concepts”. Lebata (2014:119) asserts that, due to the “limited exposure to English, most learners in Lesotho fail life science which they critically need as a core subject in the science stream and for active participation in the learning of the subject”. During the discussion, Olwethu, Mthombeni and MaCingwane stated,

> *Olwethu: Being poor in English affects our performance in life science because life science is a subject that is taught in English and which has tough terminologies and if you are good in English you will understand what is being asked in a statement or question.*
>
> *Mthombeni: If a learner lacks English proficiency as a medium of instruction, it's easy for that learner to perform poorly because he/she will fail to understand and communicate his/her ideas in English since life sciences is read and taught in English. English educators should play a big role especially in the essay writing questions.*

MaCingwane: That's so true. To add on that one. If a learner lack English proficiency as a medium of instruction, it's easy for that learner to perform poorly because he/she will fail to understand and communicate his/her ideas in English. Proficiency in English lead to good academic performance as learners will be able to understand Life Sciences language interpretation very well.

Olwethu, a learner, believed that being proficient in English would make it easier to understand the questions, and to express the ideas in writing. Mthombeni and MaCingwane, both teachers, stated that proficiency in English contributes to the academic performance of progressed learners in life sciences, as performance does not only require learners to learn the subject matter, but also demands English comprehension. Being proficient in English benefits the learners, who can listen attentively, with understanding, and express their ideas appropriately in English (Mafora, 2013; Baloyi, 2011). Malekela (2010:33) states that learners would not only be benefited by being fluent in English, but they would also be able to read, write and comprehend their ideas critically. Exposure to English enhances the confidence of life sciences learners, as they understand the subject matter better and show strong knowledge and skills in their life sciences academic performance (Ngema, 2016; Hlabane, 2016).

In this regard, I am of the view that, as life sciences progressed learners are struggling to comprehend life sciences concepts in English, it is advisable to switch to mother tongue, when necessary, to help progressed learners understand life sciences terms better, and also to pay attention to the use of English during teaching and learning life sciences, to improve the quality of the subject and benefit learners, so that they can communicate, analyse and interpret their ideas in English in class tests and examinations. In Section 4.5.3, I will discuss attendance of life sciences workshops by teachers as a condition for the successful implementation of a strategy to enhance performance of Grade 12 progressed learners in life sciences.

4.5.3 Attendance of life sciences workshops by teachers

Another condition for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences is the

attendance of life sciences workshops by teachers. The Continuing Professional Teacher Development System (CPTD) encourages teachers to attend workshops and participate in subject conferences, of which the aim is “enhancing the pedagogical content knowledge and teaching skills of all teachers in recognising, identifying and addressing barriers to learning and creating inclusive environment for all learners” (SACE, 2010). During the discussion, participants indicated that it is very important for the teachers to attend relevant life sciences workshops, so that they are up to date with the current curriculum and receive adequate training on how to apply different methods during content delivery. During the discussion, Qhawe, Thando and MaCingwane remarked that,

> *Qhawe: Educators attend relevant Life Sciences workshops assigned by the Dept of Education twice in a term to check and guide them if they're following the right teaching procedures and methods as they're advised and team-teaching is mostly advised.*
>
> *Thando: Teachers who attend life sciences workshops are usually equipped with various methods of teaching which involves the progressed learners.*
>
> *MaCingwane: That's a good point. During workshops, we collaborate in life sciences teaching and curriculum delivery to modify teaching methods and styles to meet present standards.*

The DBE organises an external in-service programme for teachers, where teachers are trained and “equipped with the new discoveries” (Yusuf and Afolabi, 2010:65). Ngema (2016:38) defines in-service training of teachers “as a series of short programmes and courses designed to prepare teachers with new content, knowledge and skills”. In this manner, life sciences teachers are have the advantage of advancing their skills and knowledge on the subject matter (Muzah, 2011; Owolabi and Adedayo, 2012:75).

CER asserts the need for collaboration that involves teachers learning from each other during life sciences workshops, and teachers empowering each other in improving the academic performance of progressed learners. During workshops, collaboration among teachers is stimulated, as it allows teachers to indicate where they experience

problems in relation to ways of dealing with progressed learners and treating life sciences' challenging concepts (Rissanen, 2016; Jamil, 2014:182).

Qhawe and Thando indicated that team teaching is frequently encouraged during life sciences workshops – it involves teachers working and planning together to facilitate progressed learners and assist each other in presenting different topics. MaCingwane indicated that, during the workshops and through collaboration, teachers are able to work cooperatively to achieve a common goal, which is to improve the academic performance of Grade 12 progressed learners.

I agree with the view that, if life sciences teachers attended workshops, it could improve the academic performance of progressed learners in life sciences, as it is through these workshops where problems pertaining to the teaching and learning of life sciences by progressed learners are exposed, and these problems are solved collaboratively. In Section 4.6, I will discuss the threats identified by participants that can hinder the success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.6 THREATS THAT CAN HINDER THE SUCCESS OF A STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

This section will address the threats that can hinder the success of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.6.1 Poor attendance of learners of camps and extra lessons

One of the threats that nullifies efforts to successfully implement a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, is the poor attendance of learners of camps and extra classes. To improve the academic performance of progressed learners in life sciences, teachers and learners should work together. However, during the WhatsApp group discussion it was indicated that the progressed learners are not serious about their school work, therefore they contribute in not performing well in life sciences as they also fail to attend camps and extra lessons, as required. During the discussion of the anticipated threats facing the

successful strategy to enhance the academic performance of the Grade 12 progressed learners in life sciences, Thando, Mazibuko and Mhlengih commented as follows:

> *Thando: Progressed learners take such programmes for granted. They know that they would be available to them in every term. They mostly absent themselves.*
>
> *Mhlengih: We lack discipline, we don't have respect for our teachers during camps because of overcrowding. Some learners attend classes when they feel like.*
>
> *Mazibuko: To add on that one. For me, it is really hard to teach the progressed learners during camps. They are impulsive, some they leave while the lesson is in progress and some absent themselves.*

According to Ngema (2016), "no matter the case, it may be, absenteeism negatively affects the academic performance of learners in the life sciences." Muzah (2011:200) avers that learners who tend to be absent during extra classes "lack the knowledge of the content that was taught during their absence". Ejere (2010:115) and Leepo (2015) emphasise that the blame for absenteeism during extra classes and camps should not be on learners only, but must be on both teachers and learners, "because learning involves both a learner and a teacher, therefore, absenteeism of teachers also affects the academic performance of learners". Lebata (2014:117) adds that "consistent absenteeism of teachers affect learners motivation as they know that there will be no learning that would occur on that particular day." CER promotes mutual respect, therefore, it is the duty of teachers and learners to work collaboratively to improve the academic performance of learners in life sciences.

Thando, a teacher, claimed that progressed learners take advantage of the intervention programmes presented to them – they are aware that the focus is on them and they know they should be available in each term. Mhlengih, a learner, disclosed that, during camps and extra lessons, teachers and learners do not work in harmony as some progressed learners are rude towards the teachers. Mazibuko complained about the behaviour of progressed learners during camps and extra lessons, as they disrupt her presentation of lessons. The threats exposed by participants in this study correlate with the threats identified by Lebata (2014:118), who argues that "the

presence of large numbers in camps and extra lessons of unmotivated, ill-disciplined and ill-prepared progressed learners places an immense emotional burden and increased work-load on teachers who are working in the already difficult context“. This claim confirms that poor attendance by progressed learners in life sciences could be a threat to improving academic performance in the subject. Section 4.6.2 will address the lack of English proficiency of learners of life sciences, as the second challenge identified by participants.

4.6.2 Lack of English proficiency

Another threat that was indicated by the participants that counters efforts to successfully implement a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, is the lack of proficiency in English, which is the medium of instruction for life sciences. The study findings indicate that the majority of Grade 12 progressed learners struggle to understand and express their ideas in writing during tests and examinations. The National Education Policy Act, in Section 4, indicates that “every learner has a right to be instructed in the language of his or her choice for clarity” (DBE, 2011b:12). Keletso (2017:227) argue that learners with limited English proficiency seemed to have a weaker knowledge of life sciences and this inevitably affected their academic performances in life sciences. During the discussion, Thando, Olwethu and Nokwanda stated the following:

> *Thando: The lack of English proficiency in progressed learners arises the negative attitude and pose anxiety towards life sciences. In rural schools most learners are exposed to English when they are only at school in the formal context but teachers try their best to extend learners knowledge of concepts and add learners' basic vocabulary that could help them in answering the questions.*
>
> *Olwethu: Understanding and writing English is the main problem for us progressed learners that's why we have the difficulty in understanding the meaning of words in exams and that makes us fail.*

Nokwanda: Yes, English is very challenging when we write exams you find out that I can be able understand what the question wants but I don't have a proper way to answer the question correctly.

From the above responses, it is clear that most progressed learners struggle to perform well in life sciences because their lack of English proficiency acts as a barrier for them. They report failing to understand scientific language in English (Hlabane, 2016). Thando, a teacher, averred that English poses a great challenge to learners for whom English is a first additional language, as they are only exposed to English in the formal classroom context, and not in other settings. Learners' lack of English proficiency contributes to pressure on life sciences teachers to use English as much as possible. Commenting on this situation, Ngema (2016:34) aver that "the lack of regular practise in the usage of the English language leads to the lack of learners' confidence to read or to express themselves fluently and freely in English". Olwethu and Nokwanda indicated that they are unable to understand the content presented to them during the discourse of instruction by the teacher, and this prevents them from engaging in and expressing their ideas during the exam. Findings by Murray and Hicks (2016:171) are similar to that of this study, and they argue that shortcomings in English proficiency for science "creates the problem that the majority of learners are struggling to read, write, listen attentively and speak English and understand a comprehension text all by themselves without the teacher's assistance".

In short, I conclude that many challenges are caused by a lack of English proficiency; using English as the medium of instruction for Grade 12 progressed learners in life sciences also pose challenges for the teacher, who can fail to recognise the special needs of progressed learners. Teachers cannot always see whether a learner is struggling with language-related issues, or there is a disability involved. Section 4.6.3 will address the failure by life sciences teachers to attend workshops – the third challenge identified by participants.

4.6.3 Teachers' failure to attend life sciences workshops

The failure by teachers to attend life sciences workshops was indicated by participants to pose a major threat to the successful implementation of a strategy to enhance academic performance of Grade 12 progressed learners in life sciences. Teachers

who do not attend workshops struggle alone with the newly developed curriculum, which comes with many demands. During the discussion, MaCingwane and Mabaso commented as follows:

> *MaCingwane: "Attending workshops helped me a lot as I was able to learn new skills on how best other topics would be treated in life sciences".*
>
> *Mabaso: "Teachers need to attend relevant life sciences workshops in order to dispense the life sciences curriculum to the learners effectively".*

According to Rissanen (2018:137), "the level of education of teachers needs to be cultivated in order to meet with the specified required efficient scientific content". Both MaCingwane and Mabaso indicated that teachers need to attend workshops in order to receive adequate training, as they are not involved in curriculum development by the DBE. Muzah (2011) and Rissanen (2016) found that teachers who do not attend life sciences workshops are seldom equipped with the life sciences content and lack the numerous pedagogical skills needed to teach progressed learners life sciences. Ortiz, Conkey, Brennan, Fedynich and Green (2020:5) support Rissanen (2018:137), by stating that "teachers who do not attend organised workshops tend to have shallow knowledge and inadequate skills in teaching the progressed learners in life sciences." Owens, Trujillo, Seidel, Harrison, Farrar, Benton, Blair, Boyer, Breckler, Burrus and Byrd (2018:2) are also of opinion that teachers who attend workshops gain more confidence, learn to be strategic in treating difficult topics and create a conducive environment for all learners. Collaboration among life sciences teachers is highly appreciated by learners and parents as teachers convey suitable and sustainable social transformation (see Section 3.6.5) in developing each other's pedagogical knowledge and skills.

In essence, it is crucial for teachers to attend training workshops, as it gives them the opportunity to work together as a team, to collaborate by giving each other advice, to share material and prepare life sciences lessons together, as some teachers may excel in topics that are difficult for others. In Section 4.7, I will discuss the successes anticipated by the participants from finding a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.7 ANTICIPATED SUCCESSES OF THE STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Based on the findings of this study, this section will present empirical data in which the participants indicated the successes they anticipate as a result of implementing a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. They identified successes such as an inclusive life sciences curriculum, more positive attitudes in teachers and learners towards life sciences, parental involvement being promoted, and providing relevant scope for life sciences. Section 4.7.1 will discuss an inclusive life sciences curriculum as an anticipated success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.7.1 Inclusive life sciences curriculum

It was requested that if, and when, a new, inclusive life sciences curriculum is developed, teachers are involved throughout the process. The South African Schools Act 1996 (Act 84 of 1996) (Republic of South Africa, 1996a), is “aimed at ensuring that all learners have access to quality education without discrimination in any way”. Teachers are ought to be trained on how to deal with curriculum changes, including teaching approaches, styles and learning material to be utilised. During the discussion, Thando and Qhawe gave their opinions:

> *Thando: I hope this study will be able to help us life sciences teachers and our progressed learners and also the curriculum planners to be able to organise a curriculum that will cater all learners according to their capabilities.*

> *Qhawe: This study should help us life sciences teachers to be mostly involved in the curriculum development since we are the one who implement it and delivers the content to the learners and how these learners should be assessed.*

It is, therefore, expected that this study will encourage life sciences curriculum planners to develop a curriculum that accommodates all the learners with their

different capabilities, and will reduce the cognitive load, which will enable progressed learners to grasp concepts effectively. Moore (2015:36) defines curriculum as a "guideline to teachers on what to teach and how to teach it". "Life sciences curriculum is broad therefore it is advisable to reduce the content in order to advantage all learners with their diversity and to advance the quality of teaching and learning" (Cimer, 2011:61). Abudu and Gbadamosi (2014: 36) and Dhurumraj (2013) assert that the newly developed curriculum should include indigenous knowledge, and should specify the ways it should be taught to learners, in order to enhance the interest of progressed learners in life sciences (see Section 2.8.3). Emancipation as a principle of CER acknowledges indigenous knowledge in the life sciences curriculum, which will contribute to eliminating social injustice and will enable learners to understand academic science content better while they access the scientific language of life sciences.

Participants Qhawe and Thando stated that the study should also encourage teachers to make time for assessment, to identify the topics where knowledge is lacking, and to use diagnostic assessment to improve the academic performance of progressed learners in life sciences. Section 4.7.2 will discuss enhancing the attitudes of teachers and leaners towards life sciences as another anticipated indication of success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.7.2 A more positive attitude by teachers and leaners towards life sciences

Many factors contribute to enhancing the attitudes of teachers and learners towards life sciences. The participants indicated why they believed improving the attitudes of teachers and learners towards life sciences was a success that could be anticipated:

> *Mabaso: In this study it must be raised that life sciences teachers that are teaching during weekends and holidays should be receiving incentives as a token of appreciation and encouragement.*
>
> *Mazibuko: The Department of Basic Education should recruit life science teachers by giving them bursaries to further their studies part time as to be in line with the changing time of the fourth industrial revolution.*

Nokwanda: Another thing that will encourage us to get high marks scores is that our life sciences teachers should rewards us with anything or R10-R20 each learner that scored maybe 70% and up wards.

A negative attitude limits performance, destroys motivation, and inhibits learning, therefore, a positive attitude enhances good academic performance by encouraging positivity, stimulating motivation and enhancing good academic performance. Abudu and Gbadamosi (2014:36) aver that teachers with positive attitudes "drive learners to a positive attitude, no matter the conditions they are learning under." Connell, Donovan and Chambers (2016:3) state that positive attitudes in teachers and learners towards life sciences "leads to a yearning for good academic performance" and modifies teachers' pedagogical skills (Tsanwani et al., 2014:42; Rogayan, 2019:79).

Mabaso, a teacher, made it clear that life sciences teachers should be encouraged by being given a stipend, as they illustrate their commitment to teaching by offering up their weekends and holidays. Mazibuko added that there must be benefits to being a science teacher, and teachers should be given bursaries to continue their studies. Teachers should play a major role in encouraging the learners to improve their academic performance in life sciences; Nokwanda mentioned that learners would accept any reward from their teachers, as a token of encouragement to perform better. In this regard, I am of the view that the positive attitudes portrayed by Grade 12 progressed learners towards life sciences would fuel and improve their academic performance in life sciences. Section 4.7.3 will address improving parental involvement, as an anticipated success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

4.7.3 Improving parental involvement

Another success anticipated as a result of the study that was mentioned by participants is that it could reinforce parental involvement. Life sciences teachers should have a programme that encourages parents to be involved in their children's schoolwork by supporting and motivating them. Parents should assist in actual teaching and learning of their children (Llamas and Tuazon, 2016:70; Topping and Wolfendale, 2017:115). Life sciences teachers should be trained on how to involve the

parents of Grade 12 progressed learners academically. Nokwanda and Mbali Mchunu stated the following:

> *Nokwanda: OK, I'm hoping that this wonderful study will open our eyes and especially our parents because without their involvement we are nothing. We really need their support and they need to understand that we also have to study when we get home.*
>
> *Mbali Mchunu: I also hoping this study will encourage our parents to support us as they will motivate us not to give up easily when we feel discouraged and not to bunk classes as they will monitor our school attendance.*

This anticipated success correlates with the argument of Lau, Li and Rao (2011:97) that "parental involvement in learning acts as a gel that helps to make learning for children pleasant and encourages them to work even more as they seek to make those closest to them proud". Modisaotsile (2012) argues that involving parents in policymaking for the school encourages them to take responsibility for their children's education. Parveen, Hussain and Reba (2016:240) aver that the gap between parents and the school should be closed by "fostering an active and heathy relationship as the parents are being encouraged to strive for quality education of their children". In addition, this study is likely to encourage parents to develop a positive relationship with their children, in order to boost progressed learners to improve their academic performance in life sciences. Section 4.7.4 will address the availability of resources, as the last anticipated success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, as proposed by participants.

4.7.4 Making resources available

Another indicator of success of this study is the anticipation of enough of teaching and learning resources in life sciences. Participants noted that resources play a major role in the academic performance of Grade 12 progressed learners, as it benefits them in both theory and practical life sciences lessons. CER strives to abolish social injustice in schools: all learners have an equal right to access resources for the purpose of enhancing their academic performance (Nkoane, 2010:112). Mhlengih and MaCingwane shared the following sentiments:

Mhlengih: Can this study encourage anyone who can be able to donate textbooks to us, so that all of us can have individual textbook. And maybe with the laboratory equipment's for the practicals.

MaCingwane: I hope this study will encourage the schools to improvise for the use wall charts at least as they will assist to simulate the real life situation to improve progressed learners' performance.

Mhlengih and MaCingwane suggest that the school partners with non-government organisations (NGOs) to receive donations of charts, textbooks and life sciences laboratory equipment to enhance the academic performance of learners in life sciences. These resources will help to put theory into practice. Sufficient learning resources in life sciences enhance effective teaching and learning and intensify positive attitudes about learning life sciences (Manqele, 2017; Belay et al., 2020:4). Oluwaseun, Onovroghene and Isaac (2018:282) add that "availability of learning resources makes life sciences more relevant and promotes memorisation". During practical investigation, progressed learners acquire various skills that assist them in memorising the content. In addition, the DBE needs to invest in the use of ICT in all schools, as it may encourage progressed learners to be creative, and may develop technical skills and knowledge. The use of ICT will advantage teachers from integrating some forms of technology in the classroom and to make teaching and learning effective.

4.8 CONCLUSION

In this chapter, I focused on interpreting and analysing the findings from the empirical data. The thematic model suggested by Laws et al. (2003), which involves seven steps, was used to analyse the data. Research findings were discussed according to themes. The data presented by the participants responded to the objectives of the study, which is to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. Chapter 5 will present a summary of the chapters and make recommendations.

CHAPTER 5: FINDINGS, STRATEGY FOR INNOVATIVE COLLABORATION FOR LEARNER ATTAINMENT, SUMMARY OF CHAPTERS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter will be partitioned into three sections. In the first section, I will focus on the findings of this study. In the second section, I will discuss the formulation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences, and, in the last section of this chapter, I will present a summary of what was done in this study by providing a summary of each chapter. The limitations of the study and recommendations will be outlined in relation to the improvement of the academic performance of Grade 12 progressed learners in life sciences. First, the research aim and objectives will be reiterated.

5.1.1 Research aim

The aim of the study was to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

5.1.2 Objectives

The following were the objectives of this study:

- To explore the challenges experienced by progressed learners in life sciences;
- To investigate solutions to improve the performance of Grade 12 progressed learners in life sciences;
- To identify conditions for the successful implementation of a strategy to enhance the performance of Grade 12 progressed learners;
- To identify threats that can hinder the success of the strategy to enhance the performance of progressed learners in Grade 12 life sciences; and
- To discuss the anticipated successes of the strategy to enhance the performance of progressed learners in life sciences.

5.2 SYNTHESIS OF FINDINGS

In this section, I will present the findings from data provided by participants for a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. The data emanated from WhatsApp group discussions during data collection, as reported in Chapter 4. The findings correspond to the objectives of the study.

5.2.1 Need for competent and committed teachers in life sciences

Providing a sufficient number of trained teachers for life sciences is one of the main solutions for enhancing the academic performance of Grade 12 progressed learners in life sciences, as suggested by participants (see Section 4.3.1), as teachers who have specialised in life sciences possess scientific knowledge and are able to deliver the life sciences curriculum effectively. Mothwa (2011:35) argues that “no system of education could be better in quality than the quality of its teachers who educate the children”. Darling-Hammond, Oakes, Wojcikiewicz, Hyler, Guha, Podolsky, Kini, Cook-Harvey, Mercer and Harrell (2019:120) concur with Mothwa (2011:35), by adding that “the teacher is the mediator between the knower and the known, between the learner and the subject to be learned”. Competent and committed teachers of life sciences contribute to the performance of progressed learners, as they are able to identify areas that needs more attention, and create an effective learning environment, which is essential for progressed learners’ achievement. Samuel and Adekunle (2019:95) note that “there is a strong relationship between teacher quality and learner performances”. A competent teacher will encourage progressed learners to learn to think independently and to employ their creativity. It has been found that the “quality of education goes with quality of teachers” (Indriani, 2019), though these findings contradict those of Instefjord and Munthe (2017:38), who argue that “a committed teacher without competency can be more productive than a competent teacher by offering sufficient opportunities for learners to build on acquired knowledge and skills in creative and novel ways that help them to assimilate the content”.

To me, it is clear that, in the 21st century, life sciences teachers needs to be both competent and committed to aiding progressed learners to develop the ability to adapt

to the demands of a future society. Section 5.2.2 will focus on an inclusive curriculum for life sciences.

5.2.2 Inclusive curriculum in life sciences

I also found that one of the challenges confronting progressed learners is the absence of an inclusive curriculum for life sciences , which has caused a decline in interest in life sciences by Grade 12 progressed learners. Throughout the process of gathering empirical data, I discovered that life sciences curricula are often overloaded with challenging and unfamiliar concepts, which leaves little room for enjoyment of life sciences by Grade 12 progressed learners. I concur with Mukminin, Habibi, Prasojo, Idi and Hamidah (2019:53), who report that, “In some topics in life science learners become sponge-takers who soak up knowledge as it comes from the teacher or from the textbook without any understanding.” Furthermore, little is done by the DBE to ensure that the life sciences curriculum caters for all learners’ abilities, including progressed learners (see Section 4.6.1). This finding confirms the research done by Cimer (2011:61) and Zeidan, (2010:785), who argue that the life sciences curriculum is broad; therefore, it is advisable to reduce the content in order to advantage all learners with their diversity and to advance the quality of teaching and learning . In this regard, I suggest that, when it comes to decision-making for any newly developed curriculum, teachers must be included, and must have the opportunity to raise their concern. Section 5.2.3 will discuss providing sufficient resources for teaching and learning life sciences.

5.2.3 Sufficient of resources for life sciences

The data collected from the participants indicates that there are insufficient resources and facilities available for teaching and learning life sciences, and this contributes to the poor performance of Grade 12 progressed learners in life sciences. Most of the resources used in the 21st century classroom enhance a learner-centred approach to teaching. Onah and Eguzo (2020:75) argue that “the availability of high quality resources is one of the critical factors in the performance of learners and the successful implementation of curriculum reform”. The participants reported that using ICT in the life sciences classroom has great potential to transform teaching and

learning, and to enhance the academic performance of Grade 12 progressed learners. Pardede (2020:145) confirms that “ICT makes the learning less abstract, more relevant to their real life situations and promotes increased learner engagement.” Chinapah and Odero (2016:107) add that “ICT learning enhances collaborative learning and encourages interaction and cooperation among learners and teachers”. Syahid, Sunarya, Sudin, Sunaengsih and Karlina (2019:152) contradict these findings about the value of ICT in the classroom; they argue that “over-reliance on ICT limits learners’ critical thinking and analytical skills”. Section 5.2.4 will discuss the correlation between attitude and interest and achievement in life sciences.

5.2.4 Attitude as requirement for interest and achievement in life sciences

The research indicated that a positive attitude plays a vital role in good performance. Movahedzadeh (2011:13) argues that “the only key to a positive attitude is empowerment”. Learners must be empowered by the life sciences teacher to obtain good marks in life sciences. During data collection, the participants noted that it is the duty of a teacher to create a conducive environment that will cater for learners’ different needs. Various factors contribute to the negative attitudes of teachers and progressed learners towards life sciences; one of the most noted factors is “the lack of requisite pedagogical and content knowledge required by the subject” (Darmaji, Astalini, Kurniawan and Perdana, 2019:109). Progressed learners’ attitudes are directly and automatically influenced by the life sciences teacher’s attitude towards life sciences. According to Saputro, Irwanto, Atun and Wilujeng (2019:54), “there is a great correlation between positive attitude and achievement.” It is the duty of a teacher to display a positive attitude and commitment towards the learners, in order to improve their attitudes towards the subject, irrespective of the poor conditions they are learning under (Maluleka, 2011).

5.2.5 Parental involvement

Parental involvement plays a major role in the education of progressed learners (see Section 4.6.3). Participants noted that engaging parents, so that they play an active role in their children’s schoolwork, can provide alternative opportunities for progressed learners to succeed in life sciences. Sapungan and Sapungan (2014:23) argue that

“parents’ involvement helps learners focus and absorb information quicker and more effectively than any other technique”. Goodall and Montgomery (2014:399) add that “[p]arental involvement has always been an essential component of every teacher-learner school academic endeavour”. In this regard, I discovered that the lack of parental involvement in progressed learners academic work, not only leads mischievous behaviour by learners, but also to poor academic performance. In the following section, I will formulate and discuss the rationale of the strategy to enhance the academic performance of progressed learners in life sciences.

5.3 STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

The aim of the study was to formulate a strategy that could enhance the academic performance of Grade 12 progressed learners in life sciences. The strategy is an outcome of the best recipe for teaching and learning life sciences, as discussed in Section 3.6, as reported by the literature study, empirical research that was conducted and my personal inputs to the strategy. The strategy conforms with the principles of CER (see Section 2.3) as the findings from empirical research conducted, literature study and the recommendations drawn from conclusions helped in the formulation of the strategy that will help Grade 12 progressed learners improve their academic performances in life sciences. Innovative collaboration to promote learner attainment is envisioned, because strong collaboration by teachers, parents and the DBE could have a significant impact on progressed learners’ attainment in life sciences (see Section 4.4.3).

The utilisation of the strategy could bring about understanding for teachers, parents and the DBE that their affirmative contribution and commitment to Grade 12 progressed learners can improve these learners’ academic performance in life sciences. It could also help the progressed learners, as individuals, to improve their academic performance in life sciences. Various researchers, such as Leepo (2012) and Shangase (2013) agree that for the learners to be successful, stakeholders must embrace collaboration and teamwork. Consequently, it is expected that teachers, Grade 12 progressed learners, parents and the DBE make a deliberate effort to work together and collaborate in the planning and implementation of processes for

delivering and learning life sciences, in order to improve the academic performance of Grade 12 progressed learners in life sciences.

The findings noted from this study's empirical research may solve many of the challenges facing Grade 12 progressed learners in life sciences (see Section 2.7.1). Therefore, I propose that the challenges that were identified can be addressed by the implementation of my strategy, as it entails a holistic approach that could inspire progressed learners, teachers, parents and the DBE to work concurrently and collaboratively to improve the academic performance of Grade 12 progressed learners in life sciences. I base the arguments for the strategy on the principles of CER, which state that collaboration enhances participation, pools skills, and promotes problem-solving and teamwork. Furthermore, the strategy is sensitive of and vigilant to the issue of inequality and lack of freedom. Melis, Song, De Cristofaro and Shmatikov (2019:692) contradict this claim about collaboration, by stating that "it could reduce motivation and cause a loss of productivity if group members unequally contribute".

Section 5.3.1 will address the aims or principles of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

5.3.1 Principles of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences

The strategy presented by this study considered the following principles, which I believe can enhance the academic performances of Grade 12 progressed learners in life sciences. These principles enhance innovative collaboration between progressed learners, teachers, parents and the DBE, who should work together to promote and enhance Grade 12 progressed learner attainment in life sciences.

5.3.1.1 To enhance communication

To achieve the essence of the strategy to enhance the academic performance of Grade 12 progressed learners, communication needs to be enhanced. The strategy seeks to bridge the gap caused by the lack of communication between the teachers and parents; and teachers and the DBE. Enhancing communication addresses the challenges of lack of parental involvement (see Section 2.10.2) and the absence of an inclusive life sciences curriculum (see Section 2.8.3). To enhance communication, the

strategy suggests that teachers open the lines of communication, especially to promote parental involvement. Positive teacher-parent communication benefits both parents and teachers (Wasserman and Zwebner, 2017:12). Ozmen, Akuzum, Zincirli and Selcuk (2016:27) aver that,

> *When teachers communicate and interact with parents, strong partnership is built as parents will gain confidence in knowing about their children's education by getting ideas from the teacher on how to help and support their children, and by learning more about the school's academic program and how it works.*

The strategy elucidates that positive teacher-parent communication can free teachers from handling all the duties at once, and to focus more on the task of teaching learners (Glover, McCormack and Smith-Tamaray, 2015:363), as they are working collaboratively with parents. Scholars, such as Modisaotsile (2012:28) note that when parents and teachers work together effectively by sharing relevant information about a learner, it can significantly impact each learner's long term success. In this regard, I believe that it will also enhance parent-learner communication, as there are many advantages for learners when their parents are involved in their schooling: it can increase their self-esteem and their motivation for learning, improve behaviour, inculcate a positive attitude and lead to more regular school attendance.

The strategy also intends to enhance effective communication between life sciences teachers and the DBE. The strategy promotes communication by the DBE about a newly developed curriculum, to inform teachers and provide them with adequate training a year before the curriculum is implemented, in order to adapt and improve their opinions on the organisation and provision of the new curriculum. Participants indicated that the life sciences curriculum is long and, thus, contributes to the negative attitudes of teachers and learners towards life sciences (see Section 2.7.2.4). The findings revealed by Oghuvbu (2010:23) and Menjo (2013:433) are that, in Kenya, the life sciences curriculum is overloaded as a result of the content being too wide on some topics, and it ends up not finished on time and affects the academic performance of learners in life sciences. Tsanwani et al. (2014:42) disagree with the idea of Oghuvbu (2010:23) and Menjo (2013:433), by stating that life sciences must be taught by an enthusiastic and a confident teacher that is eager to spend time beyond that

prescribed by their duties, to ensure that progressed learners understand the challenging concepts of the subject. Lebata (2014) adds the attitude of the teacher impacts the academic performance of learners and their attitudes towards the subject.

In this regard, I am of the view that communication between the DBE and life sciences teachers is key, as teachers will be given an opportunity to identify the challenges that they have to overcome, and to suggest possible solutions, as they are the ones who deal with progressed learners in classrooms.

5.3.1.2 To improve curriculum provision for learners

The strategy seeks to enhance the academic performance of Grade 12 progressed learners in life sciences, therefore, collaboration will improve curriculum provision for learners. This principle responds to the challenge posed by the lack of trained teachers for life sciences (see Section 2.7.2.2). Regarding improving curriculum provision for learners, I propose that specialist teachers in life sciences work with incompetent teachers, collaboratively, to improve the academic performance of Grade 12 progressed learners in life sciences. In this regard, I concur with Halinen, Harmanen and Mattila (2015:66), that "improved provision through collaboration enhances learning opportunities for all learners, thereby increasing learners' engagement, sharing of learning materials and improving academic performance".

This point was also suggested by the participants, who believe that collaboration among life sciences teachers can improve curriculum provision for progressed learners, as teachers will be able to share knowledge and skills and inform effective practice and strategies to address similar challenges (see Section 4.4.6). Brennan (2018:166) notes that "this might also include joint professional development opportunities and sharing of approaches to teaching and learning". Seashore Louis, Dretzke and Wahlstrom (2010:315) add that "teacher collaboration positively impacts learners' performance and allows them to explore new territory". Through collaboration, curriculum provision not only benefits teachers, but also learners, as learners will be able to work with their peers concurrently, and develop high-level thinking skills, and boost their self-esteem and confidence. Burns and Darling-Hammond (2014:70) add that "collaboration makes learning less stressful and more satisfying".

Moreover, collaboration among life sciences teachers is one of the significant factors that that are presented as decisive for improving the academic performance of progressed learners, as they are the curriculum provisionals (Bertrand, 2016:15). In this regard, it is the desire of the strategy to encourage life sciences teachers to work collaboratively as a team in planning and provisioning the curriculum, so that it enhances the academic performance of Grade 12 progressed learners in life sciences. The following principle is to invest in shared school resources and facilities.

5.3.1.3 To invest in shared school resources and facilities

In an attempt to address the challenges of poor performance by Grade 12 progressed learners in life science, the data collected from participants and the literature agrees that there must be sharing of school resources and facilities (see Section 4.3.3). For some schools, especially in rural areas, building new infrastructure, such as life sciences laboratories, and buying textbooks, new technology gadgets and devices for the classroom are not practicable, due to the capital investment required (Malada, 2010). In this regard, participants reported that sharing school resources and facilities can address the challenge posed by a shortage of resources for life sciences (see Section 4.3.3). Spengler, Connaughton and Carroll (2011:33) argue that “effective education partnerships are mutually beneficial”. I concur with Spengler et al. (2011:33) that Grade 12 progressed learners’ performance in life sciences could be enhanced if schools collaboratively share the common goal of improving the academic performance of progressed learners, by sharing facilities that will assist learners to understand life sciences content better. Kanters, Bocarro, Filardo, Edwards, McKenzie and Floyd (2014:303) add that “shared facilities provide greater opportunities for learners to improve their learning, development and achievement”.

The strategy focuses on shared school facilities, because it benefits both teachers and learners by making it easier for the teacher to demonstrate the content that is taught practically and gives learners the opportunity to be hands-on. Through sharing school facilities, “teachers and learners are provided with a wide range of curriculum resources, exposing learners to diverse ideas, experiences and opinions” (Republic of Africa, 1996:63).

In this regard, I am of the view that the availability of shared facilities among schools benefits teaching and learning, making it more learner-centred, as learners will work collaboratively and assist each other in technology-based tasks – learners who are more technologically advanced can assist their inexperienced peers (Kanters et al., 2014:303; AbdelMohsen, Assem and Ezzeldin, 2019). I believe that sharing school facilities will promote incorporating different teaching and learning styles of Grade 12 progressed learners, which could enhance their academic performance in life sciences. Figure 5.1 presents the strategy for innovative collaboration for learner attainment.

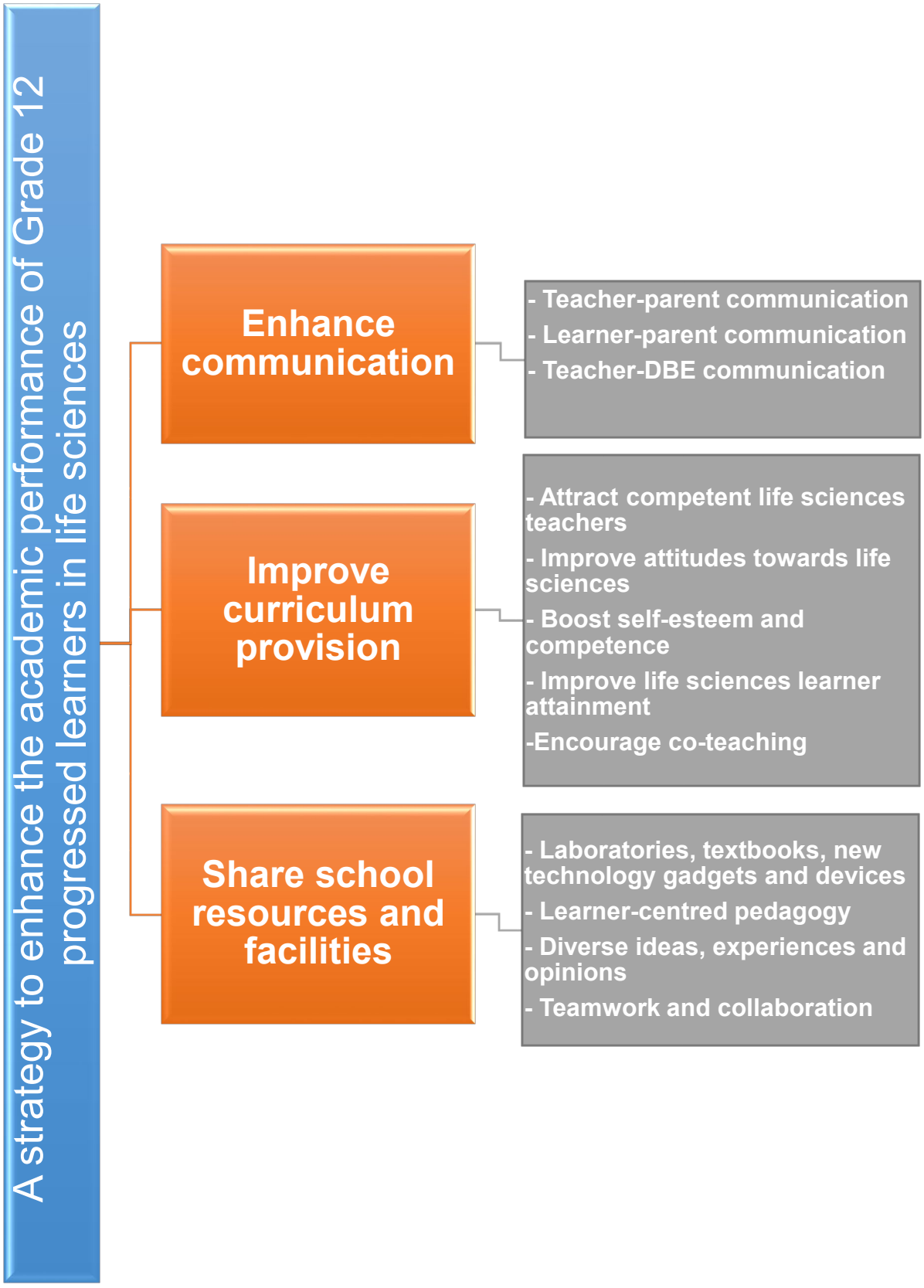

Figure 5.1: A strategy to enhance academic performance in life sciences

5.3.2 Indicators of the success of the strategy

In this section, I will focus on the indicators of success when the strategy is used to enhance the academic performance of Grade 12 progressed learners in life sciences. Once the following indicators become visible, they will serve as positive results that will indicate that the strategy has been successfully implemented to improve the poor academic performance of Grade 12 progressed learners in life sciences. In Section 5.3.2.1, I will discuss the first indicator, effective communication.

5.3.2.1 Effective communication and collaboration

Effective communication and collaboration between the Grade 12 progressed learners, parents, teachers and the DBE to improve the academic performance of Grade 12 progressed learners in life sciences will be an indicator of success of the strategy, as suggested by the participants (see Section 4.2.5). Lee and Buxton (2010: 218) state that “collaboration of various stakeholders forms a support system that enhances the academic performance of learners”. Through effective communication, teacher-parent and learner-parent relationships will be enhanced, as parents will be involved in better communication with their children’s subject teachers, will take control of their children’s education, and become active participants in decision making about the future of their children. This change will restore the confidence of learners, by preventing mischievous behaviour, such as skipping classes, absenteeism, and not doing homework, and will encourage them to achieve good academic performance in life sciences (see Section 4.2.5). The teacher will become active in communicating with parents about the progress their children are making in life sciences.

The participants also reported that effective communication and collaboration will be an indicator of success of the strategy, as the DBE will communicate with life sciences teachers, first, about the development and the implementation of new life sciences curricula, as teachers are the ones who deliver the curriculum to the learners (see Section 4.2.5). Workshops will be organised to provide teachers with adequate training on how the content should be taught to learners so as to enhance the interest of progressed learners in life sciences. I argue this is an indicator of success along the lines of Narinasamy and Mamat, (2013:19), that “the newly developed curriculum should specify the ways on how it should be provisioned to learners and specify the

type of teaching and learning materials to be utilised". Section 5.3.2.2 will discuss the improvement in life sciences performance as an indicator of the success of the strategy.

5.3.2.2 Improvement in life sciences performance

Satisfactory performance in life sciences will serve as an indicator of the success of the strategy. Collaborative learning is learner centred. The negative attitudes of progressed learners will change into positive attitudes (see Section 2.7.2.4), as "learners' goal achievements will be positively correlated" (McCaleb, 2013), as they will perceive that they can achieve learning goals only if other learners in the learning group also reach their goals (Oeste-Reiß, Bittner and Söllner, 2017). Therefore, learners will seek outcomes that will be beneficial to all those with whom they are cooperatively linked. The participants reported that collaboration is the opposite of self-centredness, because, when an individual gets 'stuck', he/she is likely to give up and develop a negative attitude; however, if that person is part of a group, group members are likely to find ways to keep going to improving their academic performance in life sciences (see Section 4.3.2). Teachers will be provided with opportunities to observe progressed learners interacting, explaining their reasoning, asking questions and discussing their ideas and opinions about concepts in a group. The teacher will be able to observe and evaluate what learners know and what they think, and also gain some understanding of each learner's learning style. Extra guidance and counselling can be provided to progressed learners, when required (Lockeman, Dow and Randell, 2020:197–200). In support of this claim, Kirschner, Paas, Kirschner and Janssen (2011:587) argue that interactions help learners to acquire self-management techniques and discipline regarding their education. Another indicator of success of the strategy is a willingness to share school resources and facilities among schools.

5.3.2.3 Willingness to share school resources and facilities

Another indicator of success of the strategy is sharing school resources and facilities among schools (see Section 4.3.3). It is impossible for the DBE to supply all the schools across the country with the teaching and learning resources and facilities they need (Yan, 2016). This claim is supported by Sedibe (2011:135), who argues that "[t]he DBE has to prioritise the availability of Learning and Teacher Support Material

(LTSM) as to enhance the effectiveness of teaching and learning life sciences". Furthermore, the DBE must partner with NGOs to build life sciences laboratories to perform practical work, and provide a sufficient supply of textbooks for each learner, in order to improve their academic performance in life sciences (Walton, 2011:240–245). The DBE should invest in the use of ICT at all schools, as it encourages progressed learners to be creative and develop technical skills and knowledge.

Sharing school resources and facilities will enhance teacher-teacher collaboration, as they will assist each other with lesson planning and with the utilisation of resources (Sedibe, 2011:135); this point was also suggested by participants (see Section 4.4.3). Nelson (2019:96) avers that, "when teachers come together to share information, resources, ideas, and expertise, learning becomes more accessible and effective for learners". Furthermore, sharing resources and facilities increases the academic effort, as teachers will have the same aim: to increase the level of academic rigor in life sciences to match the core competencies they want their learners to meet. Section 5.4 will present a summary of what was done in this study.

5.4 SUMMARY OF CHAPTERS

5.4.1 Chapter 1: Synopsis of study

In Chapter 1, the main aim of the study – to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences – was outlined. I then stated the objectives and the research questions of the study. The rationale and background of the poor academic performance of Grade 12 progressed learners in life sciences was described. The related literature was outlined. In this chapter, I also reported the decline in the academic performance of Grade 12 progressed learners in life sciences, and identified possible reasons for that decline. CER, as the theoretical framework of this study, was introduced. PAR, as the approach to generate data, was elucidated. The value of the study and ethical consideration were also outlined.

5.4.2 Chapter 2: Theoretical framework: literature review

Chapter 2 discussed the theoretical framework, CER, in order to address the research problem. CER was developed from critical theory in 1923 by the Frankfurt School. The

CER framework provided a broad lens through which progressed learners' knowledge could be enhanced and developed. Furthermore, this chapter looked at the origins of CER, and principles associated with CER, its epistemology, axiology, ontology and methodological perspective, to address the academic performance of Grade 12 progressed learners in life sciences. Operational terms that underpin this study were explained. A literature review investigated the challenges, current solutions, conditions, and threats and anticipated successes that relate to the research questions.

5.4.3 Chapter 3: Research design and methodology

This chapter presented the research design and methodology of the study. PAR was used as the approach for data generation. The origins of PAR, its definition, principles, strengths, weaknesses and data collection using PAR were explicated. The relationship between the transformative paradigm and PAR was discussed. The transformative paradigm was discussed in this study because it is part of the CER paradigm. In discussing the transformative paradigm, the focus was on its value and axiology, ontology, epistemology and methodology. A qualitative method was found to be suitable for this study, because it would provide an in-depth understanding and reasoning relating to the causes of poor academic performance of Grade 12 progressed learners in life sciences, and would suggest how performance could be improved. To fully conceptualise this study, the operationalisation of PAR, data analysis, the selection of participants and ethical consideration were elucidated.

5.4.4 Chapter 4: Data presentation and analysis of the results

The chapter focused on data presentation and analysis of the findings. The data presented in this chapter responded to the objectives of the study and, ultimately, to the aim, which is to design a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. Data that was gathered was analysed through the use of the thematic model suggested by Laws et al. (2003:285), which comprises seven steps. Research findings were discussed according to their themes. The data presented and analysed in this chapter contributed expressly to the formulation of a

strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.

5.4.5 Chapter 5: Conclusion of chapters and recommendations

Chapter 5 concludes this dissertation. In this chapter, I synthesised findings, and summarised the content represented in each chapter. The limitations of the study will be highlighted, as will recommendations for various areas that future studies may focus on. The recommendations can also be used by life sciences teachers, progressed learners in life sciences, parents of progressed learners and the DBE, to improve the academic performance of Grade 12 progressed learners in life sciences. In the next section, I will discuss the limitations of this study.

5.5 LIMITATIONS OF THE STUDY

The findings of this study managed to answer the research questions, even though it had some limitations. One of the limitations of this study is that it involved a minimum number of participants: data was collected from six teachers including a subject advisor, and five Grade 12 progressed learners – no parents participated, because data for this study was collected through social media using a WhatsApp group discussion, which was necessitated by Covid-19 pandemic regulations for social distancing. Furthermore, most of the progressed learners' parents are illiterate, and are unlikely to know how to use a smart cell phone to chat.

Another limitation of the study is that data collection was extended to take place over five days, because most of the participants struggled with internet connection, due to load shedding in their areas, or because of the high cost of data. Section 5.6 will present the recommendations of the study.

5.6 RECOMMENDATIONS

This study contributes a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. As the study progressed, a few areas became clear as suitable for investigation by future studies. The recommendations are as follows.

5.6.1 Recommendations for teachers

- Teachers should to attend training workshops, as it enables them to work together as a team, collaboratively. They can give each other advice, share material and prepare life sciences lessons together, as some teachers may excel in the topics that are difficult for others.
- Teachers should play a major role in encouraging learners to improve their academic performance in life sciences, by rewarding them with a token of encouragement to perform better.
- Teachers should create an environment that is conducive to progressed learners' performance, to improve their attitudes, by using methods and approaches that enhance their concentration and motivation and improve their academic performance in life sciences.
- Teachers must be ready to adapt to changes in life sciences curricula, as a new curriculum always prescribes certain specific teaching strategies. In this manner, teachers can choose the best teaching tools and strategies to enhance the academic performance of Grade 12 progressed learners in life sciences.
- Teachers should further their studies in order to gain the competencies required by the fourth industrial revolution, because ICT dominates as a pedagogical approach to teaching and learning life sciences.

5.6.2 Recommendations for learners

- Learners are encouraged to take control of their learning by working collaboratively as a team to accomplish a common goal, and to discuss the subject matter freely and make group discoveries together.
- Learner attitudes and motivation play an important role in the teaching and learning process. Learners are encouraged to display a positive attitude towards life sciences, because life sciences is a subject that requires a great deal of hard work, passion and dedication.
- Learners should take intervention programmes seriously, as they hold advantages for them in relation to improving their academic performance, to

prepare them optimally for their final examination to enter tertiary institutions, and help them to achieve positive academic results in life sciences.

- Learners should expose themselves to English by reading newspapers, magazines and other relevant resources that can build a solid background in English, and thereby enhance their confidence in understanding the subject matter better, and help them show strong knowledge and skills in relation to their life sciences academic performance.

5.6.3 Recommendations for parents

- This study encourages parents to create a positive relationship with their children, in order to boost them to achieve good academic performance in life sciences.
- Parents should take control of their children's education by becoming active participants in decision-making about the future of their children, and to restore confidence in learners by preventing them from indulging in mischievous behaviour, such as skipping classes, absenteeism and not doing homework.
- Parents should support their children's extramural activities and schoolwork, especially homework, and should establish better communication with their children's subject teachers.

5.6.4 Recommendations for Department of Basic Education

- A newly developed curriculum should be inclusive, and should include indigenous knowledge. Teachers should be trained on how the new curriculum should be taught to learners, to enhance the interest of progressed learners in life sciences. The curriculum should specify the ways it should be disseminated regarding pedagogical styles and teaching and learning materials to be utilised. Teachers should receive adequate training a year before the new curriculum is implemented, in order to adapt and solicit their opinions on the organisation of the new curriculum.
- The DBE should prioritise the availability of learning and teacher support materials, to enhance the effectiveness of teaching and learning life sciences.

The DBE should partner with NGOs to build life sciences laboratories for practical work, and provide a sufficient supply of textbooks for each learner, to improve their academic performance in life sciences.

- The DBE should invest in ICT at all schools, as it could encourage progressed learners to be creative and develop technical skills and knowledge. Teachers will also develop ICT-related pedagogical skills and knowledge.
- Teachers should be expected to teach their subjects of speciality, as it enables them to assess the subject constantly and effectively and identify areas that need more attention, in order to improve the academic performance of progressed learners in life sciences.
- The DBE should develop a programme that allows parents to be involved academically in schools, for instance, academic committees that assist in actual teaching and learning. Teachers should also be trained on how to involve parents academically.

5.6.5 Recommendations for future research

In this section, I will identify various areas of research that other scholars could explore in order to improve the academic performance of Grade 12 progressed learners in life sciences.

- I recommend that future studies focus on the role of school governing bodies in Grade 12 progressed learners' academic performance.
- I recommend that future studies focus on the use of ICT in the classroom to improve the academic performance of progressed learners in life sciences.
- Another area that future researchers can focus on is way a new curriculum's attainment standards impacts the academic performance of progressed learners in life sciences.

REFERENCE LIST

Abdelmohsen, S., Assem, A. and Ezzeldin, M., 2019. *School2Share (S2S): A computational approach for the efficient management of shared facilities in Egypt*. AR-UP Conference 2019: Architecture & Urbanism… A Smart Outlook.

Abudu, K.A. and Gbadamosi, M.R., 2014. Relationship between teacher's attitude and student's academic achievement in senior secondary school chemistry. A case study of Ijebu-Ode and Odogbolu Local Government Area of Ogun state. *Wudpecker Journal of Educational Research*, *3*(3), pp. 35–43.

Abutabenjeh, S. and Jaradat, R., 2018. Clarification of research design, research methods, and research methodology: A guide for public administration researchers and practitioners. *Teaching Public Administration*, 36(3), pp. 237–258.

Adam, A., 2000. Gender, emancipation and critical information systems. *ECIS 2001 Proceedings*, p. 25.

Adeyemi, T.O., 2010. Principals' leadership styles and teachers' job performance in senior secondary schools in Ondo State, Nigeria. *International Journal of Educational Administration and Policy Studies*, 2(6), pp. 83–91.

Adorno, T.W., 1972. Om kulturindustrien. In T.W. Adorno *Kritiske Modeller.* Kèbenhavn: Bibliotek Rhodos.

Adorno, T.W., Albert, H., Dahrendorf, R., Habermas, J., Pilot, H. and Popper, K.H., 1976. *The positivist dispute in German sociology.* London: Heinemann.

Ajagbe, A.M., Sholanke, A.B., Isiavwe, D.T. and Oke, A.O., 2015. *Qualitative inquiry for social sciences*. Proceedings of 2nd Covenant University International Conference on African Development Issues (CU-ICADI 2015). pp. 319–325.

Akinfe, E., Olofinniyi, O.E. and Fashiku, C.O., 2012. Teachers' quality as correlates of students' academic performance in biology in senior secondary schools of Ondo State, Nigeria. *Online Journal of Education Research*, 1(6), pp. 108–114.

Akiri, A.A. and Ugborugbo, N.M., 2009. Teachers' effectiveness and students' academic performance in republic secondary schools in Delta State, Nigeria. *Journal of Home and Community Science,* 3(2), pp. 107–113.

Al Mamun, A., Rahman, M., Rahman, A.R. and Hossaim, A.A., 2012. Students' attitudes towards English: The case of life science school of Khulna University. *International Review of Social Sciences and Humanities*, 3(1), pp. 200–209.

Alenezi, A.A., 2010. Students' language attitude towards using code-switching as a medium of instruction in the College of Health Sciences: An exploratory study. *Annual Review of Education, Communication and Language Sciences*, 7.

Alexander, K.L., Entwisle, D.R. and Dauber, S.L., 2003. *On the success of failure: A reassessment of the effects of retention in the primary school Grades*. Cambridge University Press.

Altunoglu, B.D., Atav, E. and Sönmez, S., 2017. The investigation of environmental risk perception and attitudes towards the environment in secondary school students. *The Turkish Online Journal of Educational Technology*, Special issue (December), pp. 436–444

Alvesson, M. and Deetz, S., 2006. Critical theory and postmodernism approaches to organizational studies. In S.R. Cleg, C. Hardy, T.B. Lawrence and W.R. Nord (Eds.), *The Sage handbook of organization studies.* Sage Publications, pp. 255–283.

Alvesson, M., 1992. Leadership as social integrative action. A study of a computer consultancy company. *Organization Studies*, 13(2), pp. 185–209.

Amani, M., Nazifi, M. and Sorkhabi, N., 2020. Parenting styles and academic achievement of early adolescent girls in Iran: mediating roles of parent involvement and self-regulated learning. *European Journal of Psychology of Education*, 35(1), pp. 49–72.

Aminu, U.Y. and Abdurrahman, M., 2019. Adapting learners' styles for effective learning of difficult concepts in biology. *ATBU Journal of Science, Technology and Education*, 7(4), pp. 86–92.

Anif, S., Sutama, S., Prayitno, H.J. and Idrus, N.B.M., 2019. Effectiveness of pedagogical competence: A development model through Association of Biology Teachers' Forum. *Jurnal Pendidikan IPA Indonesia*, 8(1), pp. 22–31.

Apel, K.O. 1990. *Diskurs und Verantwortung.* Frankfurt: Suhrkamp Verlag.

Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B. and Wong, B., 2013. 'Not girly, not sexy, not glamorous': Primary school girls' and parents' constructions of science aspirations. *Pedagogy, Culture and Society*, 21(1), pp. 171–194.

Arifin, S.R.M., 2018. Ethical considerations in qualitative study. *International Journal of Care Scholars*, *1*(2), pp. 30–33.

Astor, R.A., Jacobson, L., Wrabel, S.L., Benbenishty, R. and Pineda, D., 2017. *Welcoming practices: Creating schools that support students and families in transition*. Oxford University Press.

Balakrishnan, V., 2020. Commentary on Part 2: Inclusive education and character formation as a tug-of-war between local and global. In L. Claiborne and V. Balakrishnan (Eds.), *Moving towards inclusive education*. Brill Sense. pp. 131–135.

Baldwin, R., Cave, M. and Lodge, M., 2012. *Understanding regulation: theory, strategy, and practice*. Oxford University Press on Demand.

Balibar, E., 2007. *Debating With Alain Badiou on universalism*. Opening Statement, 2007 Koehn Event in Critical Theory.

Baloyi, H.G.2011. *Learner performance disparities between former white and black schools in Gauteng province of South Africa despite after more than a decade of democracy* (Doctoral dissertation, University of Witwatersrand, Johannesburg).

Bannon, L., Bardzell, J. and Bødker, S., 2018. Reimagining participatory design. *Interactions*, 26(1), pp. 26–32.

Bantwini, B.D. and King-McKenzie, E.L., 2011. District officials' assumptions about teacher learning and change: Hindering factors to curriculum reform implementation in South Africa. *International Journal of Education*, 3(1).

Barnes, B.R., 2019. Transformative mixed methods research in South Africa: Contributions to social justice. In S. Laher, A. Fynn and S. Kramer (Eds.), *Transforming research methods in the social sciences. Case studies from South Africa*. Wits University Press. p.303.

Battiste, M. 2007. Research ethics for protecting indigenous knowledge and heritage: Institutional and researcher responsibilities. In N.K. Denzin and M.D. Guardina (Eds.),

Ethical futures in qualitative research: Decolonizing the politics of knowledge. Routledge. pp. 111–280

Baum, F., 2016. *The new public health* (No. Ed. 4). Oxford University Press.

Baum, F.E., 2016. Power and glory: applying participatory action research in public health. *Gaceta Sanitaria,* 30(6). Doi: 10.1016/j.gaceta.2016.05.014.

Belay, M.T., Khatete, D.W. and Mugo, B.C., 2020. Availability of ICT resources for teaching and learning biology in secondary schools in the Southern Region, Eritrea. *International Journal of Technology and Systems*, 5(1), pp. 1–17.

Bergold, J. and Thomas, S., 2012. Participatory research methods: A methodological approach in motion. *Historical Social Research/Historische Sozialforschung*, 13(1), pp. 191–222.

Bertrand, M., 2016. Youth participatory action research and educational transformation: The potential of intertextuality as a methodological tool. *The Urban Review*, 48(1), pp. 15–31.

Biddle, C. and Schafft, K.A., 2015. Axiology and anomaly in the practice of mixed methods work: Pragmatism, valuation, and the transformative paradigm. *Journal of Mixed Methods Research*, 9(4), pp. 320–334.

Bleijenbergh, I., Van Arensbergen, P. and Lansu, M., 2018. Participatory action research to support diversity and inclusion. In Booysen, L.A.E., Bendl, R. and Pringle, J.K. (Eds.), *Handbook of research methods in diversity management, equality and inclusion at work*. Edward Elgar Publishing.

Bloom, H.S. and Michalopoulos, C., 2013. When is the story in the subgroups? *Prevention Science*, *14*(2), pp. 179–188.

Bogues, A., 2012. And what about the human? Freedom, human emancipation, and the radical imagination. *Boundary 2*, 39(3), pp. 29–46.

Bojuwoye, O., Moletsane, M., Stofile, S., Moolla, N. and Sylvester, F., 2014. Learners' experiences of learning support in selected Western Cape schools. *South African Journal of Education*, 34(1).

Bok, S., 1995. Shading the truth in informed consent for clinical research. *J Kennedy Inst Ethics*, *5*, pp.1–17.

Borg, M., Karlsson, B., Kim, H.S. and McCormack, B., 2012. Opening up for many voices in knowledge construction. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 13(1).

Branson, N., Hofmeyr, C. and Lam, D., 2014. Progress through school and the determinants of school dropout in South Africa. *Development Southern Africa,* 31(1), pp. 106–126.

Brennan, W.K., 2018. *Curricular needs of slow learners* (Vol. 4). Routledge.

Brennen, B.S., 2017. *Qualitative research methods for media studies*. Taylor & Francis.

Brittain, C.C., 2012. The Frankfurt School on religion. *Religion Compass*, 6(3), pp. 204–212.

Brown, A., Callahan, R.C., Harder, R.J., Orlich, D.C. and Trevisan, M.S., 2009. *Teaching strategies: A guide to effective instruction*. Cengage.

Brownell, S.E. and Tanner, K.D., 2012. Barriers to faculty pedagogical change: Lack of training, time, incentives, and … tensions with professional identity? *CBE – Life Sciences Education*, 11(4), pp. 339–346. Retrieved from: https://www.lifescied.org/doi/full/10.1187/cbe.12-09-0163

Brun, M. and Hinostroza, J.E. 2014. Learning to become a teacher in the 21st century: ICT integration in initial teacher education in Chile. *Journal of Educational Technology and Society,* 17(3), pp. 222.

Brydon-Miller, M., Kral, M., Maguire, P., Noffke, S. and Sabhlok, A., 2011. Jazz and the banyan tree. Roots and riffs on participatory action research. In N.K Denzin and Y.S. Lincoln (Eds.), *Handbook of qualitative research.* Sage Publications. pp. 387–400.

Buah, E. and Akuffo, A.F., 2017. The science topics perceived difficult by junior high school students at Techiman North District: effects on the teaching and learning of science. *Imperial Journal of Interdisciplinary Research*, 3(1), pp. 503–509.

Buckmaster, J., 2019. *Holding back English learners: The Impact of early elementary Grade retention on language development* (D.Ed. dissertation, University of Oklahoma).

Burns, D. and Darling-Hammond, L., 2014. *Teaching around the world: What can TALIS tell us*. Stanford, CA: Stanford Center for Opportunity Policy in Education.

Caldwell, J.E., 2007. Clickers in the large classroom: Current research and best-practice tips. *CBE—Life Sciences Education*, *6*(1), pp.9–20.

Carey, M.A. and Asbury, J.E., 2016. *Focus group research*. Routledge.

Carrette, J. and Keller, M., 1999. Religions, orientation and critical theory: race, gender and sexuality at the 1998 Lambeth Conference. *Theology and Sexuality*, 1999(11), pp. 21–43.

Castleberry, A. and Nolen, A., 2018. Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in Pharmacy Teaching and Learning*, 10(6), pp. 807–815.

Cekiso, M., Tshotsho, B., and Masha, R. (2015). English language proficiency as a predictor of academic achievement among primary English first additional language learners in South Africa*. International Journal of Science Education*, 9(3), pp. 325–333.

Chabot, C., Shoveller, J.A., Spencer, G. and Johnson, J.L., 2012. Ethical and epistemological insights: A case study of participatory action research with young people. *Journal of empirical research on human research ethics*, 7(2), pp. 20–33.

Chamorro-Premuzic, T. and Furnham, A., 2003. Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality,* 37(4), pp. 319–338.

Cheruvalath, R., 2017. Does attending classes help foster human values in college students? *Active Learning in Higher Education*, 18(2), pp. 143–155.

Chevalier, J.M. and Buckles, D.J., 2019. *Participatory action research: Theory and methods for engaged inquiry*. Routledge.

Chilisa, B., 2011*. Indigenous research methodologies*. Sage Publications.

Chilisa, B., Major, T.E. and Khudu-Petersen, K., 2017. Community engagement with a postcolonial, African-based relational paradigm. *Qualitative Research*, 17(3), pp. 326–339.

Chinapah, V. and Odero, J.O., 2016. Towards inclusive, quality ICT-based learning for rural transformation. *Journal of Education and Research*, 5(2/1), pp. 107–125.

Chisholm, L. and Wildeman, R., 2013. The politics of testing in South Africa. *Journal of Curriculum Studies*, 45(1), pp. 89–100.

Chouinard, J.A., 2013. The case for participatory evaluation in an era of accountability. *American Journal of Evaluation*, 34(2), pp. 237–253.

Chowa, G., Masa, R., and Tucker, J., 2013. The effects of parental involvement on academic performance of Ghanaian youth: Testing measurement and relationship using structural equation modelling. *Children and Youth Services Review*, 35(12).

Cibangu, K.S., 2012. Qualitative research: The toolkit of theories in the social sciences. In A.Lopez-Varela Azcárate (Ed.), *Theoretical and methodological approaches to social sciences and knowledge management*. InTech Open. pp. 95–126.

Cimer, A. (2011). What makes biology learning difficult and effective: Students views, *Educational Research and Reviews*, 7(3), pp.61–71.

Cimer, A., and Cimer, S. O. (2012). Issues around Incorporating Reflection in Teacher Education in Turkey. Turkish Science Education, 9(1), 17–30.

Clarke, A.E. and Fujimura, J.H. Eds., 2014. *The right tools for the job: At work in twentieth-century life sciences* (Vol. 149). Princeton University Press.

Clark-Kazak, C., 2017. Ethical considerations: Research with people in situations of forced migration. *Refuge: Canada's Journal on Refugees/Refuge: revue canadienne sur les réfugiés*, 33(2), pp.11–17.

Clegg, J. and Simpson, J., 2016. Improving the effectiveness of English as a medium of instruction in sub-Saharan Africa. *Comparative Education*, 52(3), pp. 359–374.

Coetzee, S. A. and Bray, W. 2010*. Educational management in the South African context*. Module MEDEM7W. Pretoria: Unisa.

Coghlan, D., 2019. *Doing action research in your own organization*. SAGE Publications.

Cohen, D. and Crabtree, B., 2006. *Qualitative research guidelines project. A comprehensive guide for designing, writing, reviewing and reporting qualitative research.* Robert Wood Johnson Foundation.

Cohen, L., Manion, L. and Morrison, K., 2011. *Planning educational research. Research methods in education.* New York: Routledge.

Coleman, J.S., 2018. *Parents, their children, and schools*. Routledge.

Connell, G.L., Donovan, D.A. and Chambers, T.G., 2016. Increasing the use of student-cantered pedagogies from moderate to high improves student learning and attitudes about biology. *CBE Life Sciences Education*, 15(1), p.3.

Connell, R., 2012. Masculinity research and global change. *Masculinities and Social Change*, 1(1), pp. 4–18.

Cordeiro, L. and Soares, C.B., 2018. Participation in action research in the context of primary health care. *EC Psychology and Psychiatry*, 7(4), pp. 153–159.

Corradetti C., 2012. The Frankfurt School and critical theory. *The internet Encyclopedia of Philosophy*. Retrieved from: https://iep.utm.edu/frankfur/

Cox, K. and van Gorp, A., 2018. Focus groups. In J. Hofman and A. Sutherland (Eds.), *Evaluating interventions that prevent or counter violent extremism. A practical guide.* Rand Corporation p. 69.

Cram, F. and Mertens, D.M., 2015. Transformative and indigenous frameworks for multimethod and mixed methods research. In S. Hesse-Biber and R.B. Johnson (Eds.), *The Oxford handbook of multimethod and mixed methods research inquiry*. Oxford University Press. pp. 91–109.

Cram, F. and Phillips, H., 2012. Claiming interstitial space for multicultural, transdisciplinary research through community-up values. *International Journal of Critical Indigenous Studies*, 5(2), pp. 36-49.

Creswell, J.W. and Plano Clark, V.L., 2011. *Designing and conducting mixed method research*. 2nd ed. Thousand Oaks, CA: Sage Publications.

Creswell, J.W. and Poth, C.N., 2016. *Qualitative inquiry and research design: Choosing among five approaches*. Sage Publications.

Curpus, A. 2013. *Aesthetic reasoning: The rehabilitation of the non-identical*. Romania: Oradea Teacher Training Centre.

Dahlgren, P. (Ed.), 2013. *Young citizens and new media: Learning for democratic participation*. Routledge.

Darling-Hammond, L., Oakes, J., Wojcikiewicz, S., Hyler, M.E., Guha, R., Podolsky, A., Kini, T., Cook-Harvey, C., Mercer, C. and Harrell, A., 2019. *Preparing teachers for deeper learning*. Cambridge, MA: Harvard Education Press.

Darmaji, D., Astalini, A., Kurniawan, D.A. and Perdana, R., 2019. A study relationship attitude toward physics, motivation, and character discipline students' senior high school, in Indonesia. *International Journal of Learning and Teaching*, 11(3), pp. 99–109.

Dawo, J.I., 2015. School-based teacher supervision: A vital tool for quality education in Kenya.

DBE (Department of Basic Education), 2011a. *National Curriculum Statement. Curriculum and Assessment Policy Statement. Life Sciences Grade 10-12*. Pretoria: Gauteng Department of Education.

DBE (Department of Basic Education), 2011b. *Curriculum and assessment policy statement (CAPS)*. *Grades 7–9. Natural Sciences*. Pretoria: Government Printer.

DBE (Department of Basic Education), 2011c. Report on the annual national assessments of 2011. Pretoria: Government Printers.

DBE (Department of Basic Education), 2011d. Improving the quality of learning and teaching. Strengthening curriculum implementation from 2010 and beyond. *Curriculum News,* pp. 5-16. Pretoria: Government Printers.

DBE (Department of Basic Education), 2015. Action Plan to 2019: Towards the realisation of schooling 2030. Taking forward South Africa's National Development Plan 2030. Pretoria: Department of Basic Education.

DBE (Department of Basic Education). 2011. *National Curriculum Statement (NCS) Curriculum and Assessment Policy Statement [CAPS], Life Sciences Further Education and Training Phase Grades 10–12*. Pretoria: Government Printing Works.

DBE (Department of Basic Education). 2012a. *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R–12.* Government Notices No. 1115 and 1116. Government Gazette No. 36042.

DBE (Department of Basic Education). 2012b. *Technical Report on the 2012 National Senior Certificate Examination*. Pretoria: Government Printer.

DBE (Department of Basic Education). 2012c. *National Protocol for Assessment: Grade R–12.* Pretoria: Government Printer.

DBE (Department of Basic Education). 2013a. *Technical report*. Pretoria: Government Printer.

DBE (Department of Basic Education). 2013b. *National Certificate (Vocational): Further Education and Training Colleges*. Pretoria: Department of Education.

DBE (Department of Basic Education). 2015. *National Curriculum Statement (NCS).Curriculum and Assessment Policy Statement. Life sciences Further Education and Training Phase Grade 10–12*. Pretoria: Department of Basic Education.

DBE (Department of Basic Education). 2016. *National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R–12, published as Government Notices No. 1115 and 1116 in Government Gazette No. 36045*.

DBE (Department of Basic Education). 2018. *Report of the ministerial committee on learner retention and promotion in the South African schooling system.* Pretoria: DBE.

Dearden, J., 2014. *English as a medium of instruction-a growing global phenomenon*. British Council.

Deshmukh, N. D. (2013). *Why do school students have misconceptions about life process?* Biology Education and Research in a Changing Planet: Selected Papers from the 25th Biennial Asian Association for Biology Education Conference, pp. 31-43.

Devereaux, R. 2013. *Definition of socially inclusive*. Available at

Dhurumraj, T., 2013. *Contributory factors to poor learner performance in physical sciences in KwaZulu-Natal Province with special reference to schools in the Pinetown District* (Doctoral dissertation, Unisa).

Dhurumraj, T., 2019. *Professional development for Grade ten physical science teachers*. Pretoria: Institute of Science and Technology Education College of Graduate Studies Unisa.

Diamond, L., 2015. *The role of parent members of school governing bodies in school financial management* (Doctoral dissertation, University of Cape Town).

Dube, B., 2016. *A socio-religious hybridity strategy to respond to the problems of religious studies in Zimbabwe* (Doctoral dissertation, University of the Free State).

Dube, B., 2020. Rural online learning in the context of COVID 19 in South Africa: Evoking an inclusive education approach. *Multidisciplinary Journal of Educational Research*, 10(2), p. 135. doi: 10.17583/remie.2020.5607

Dumay, J., Bernardi, C., Guthrie, J. and Demartini, P., 2016. Integrated reporting: A structured literature review. *Accounting Forum*, 40(3), pp. 166–185).

Durdella, N., 2017. *Qualitative dissertation methodology: A guide for research design and methods*. Sage Publications.

Ebersohn, L. and Ferreira, R., 2012. Rurality and resilience in education: Place-based partnerships and agency to moderate time and space constraints. *Perspectives in Education*, 30(1), pp. 30–42.

Eilam, B., 2013. Possible constraints of visualization in biology: Challenges in learning with multiple representations. In: D. Treagust and C.Y. Tsui (Eds). *Multiple representations in biological education.* Models and Modeling in Science Education, Vol. 7. pp. 55–73. Dordrecht: Springer.

Ejere, E.I. 2010. Absence from work: A study of teacher absenteeism in selected public primary schools in Uyo, Nigeria. *International Journal of Business and Management,* 5(9), pp. 115–123.

Elicondo, R., Alberto, N., Zavala, M., Alvarado, O., Suazo, V. and Verónica, S. 2013. The emancipatory paradigm and its influence on the development of the nursing knowledge. *Enfermeria Global*, 30, pp. 422–433.

Farooq, M.S., Chaundhry, A.H. and Berhanu, G. (2011). Factors affecting students' quality of academic performance: A case of secondary school level. *Journal of Quality and Technology Management*, 2(2), pp. 1–14.

Fauzi, A. and Mitalistiani, M., 2018. High school biology topics that perceived difficult by undergraduate students. *Didaktika Biologi: Jurnal Penelitian Pendidikan Biologi,* 2(2), pp. 73–84.

Feldman, A. and Bradley, F., 2019. Interrogating ourselves to promote the democratic production, distribution, and use of knowledge through action research. *Educational Action Research,* 27(1), pp. 91–107.

Fenwick, T., 2012. Complexity science and professional learning for collaboration: a critical reconsideration of possibilities and limitations. *Journal of Education and Work*, *25*(1), pp. 141–162.

Field, L., 2018. Habermas, interests and organizational learning: a critical perspective. *The Learning Organization,* 26(3). https://www.emeraldinsight.com/doi/abs/10.1108/TLO-04-2018-0060.

Filmalter, C.J., 2017. Transforming forensic care in level-one emergency departments in Gauteng through emancipatory practice development (Doctoral dissertation). University of Pretoria.

Fitzsimmons, S., 2017. "Something for everyone": Monique Hennink's focus group discussions: Understanding qualitative research. *The Qualitative Report*, 22(9), pp. 2454–2456.

Fletcher, A.J. and Marchildon, G.P., 2014. Using the Delphi method for qualitative, participatory action research in health leadership. *International Journal of Qualitative Methods*, 13(1), pp. 1–18.

Flick, U., 2018. *An introduction to qualitative research*. Sage Publications.

Foulger, T.S., 2010. External conversations: An unexpected discovery about the critical friend in action research inquiries. *Action Research,* 8(2), pp. 135–152.

Frankfurt, H., 1987. Equality as a moral ideal. *Ethics*, 98(1), pp. 21–43.

Freire, P., 1970. *Pedagogy of the oppressed*, trans MB Ramos. New York: Continuum.

Freire, P., 1970. The adult literacy process as cultural action for freedom. *Harvard educational review*, *40*(2), pp. 205–225.

Galindo, C. and Sheldon, S.B., 2012. School and home connections and children's kindergarten achievement gains: The mediating role of family involvement. *Early Childhood Research Quarterly*, 27(1), pp. 90–103.

Garbacz, S.A., Herman, K.C., Thompson, A.M. and Reinke, W.M., 2017. Family engagement in education and intervention: Implementation and evaluation to maximize family, school, and student outcomes. *Journal of School Psychology,* 62, 1–10. https://doi.org/10.1016/j.jsp.2017.04.002.

Gardner, H., 2012. The theory of multiple intelligences. *Early Professional Development for Teachers*, 133.

Gibbs, P., Cartney, P., Wilkinson, K., Parkinson, J., Cunningham, S., James-Reynolds, C., Zoubir, T., Brown, V., Barter, P., Sumner, P. and MacDonald, A., 2017. Literature review on the use of action research in higher education. *Educational Action Research*, 25(1), pp. 3–22.

Gibson, S., Benson, O. and Brand, S.L., 2013. Talking about suicide: Confidentiality and anonymity in qualitative research. *Nursing Ethics*, 20(1), pp. 18–29.

Gillis, A. and Jackson, W., 2002. *Research for nurses: Methods and interpretation*. FA Davis Company.

Glassman, M. and Erdem, G., 2014. Participatory action research and its meanings: Vivencia, praxis, conscientization. *Adult Education Quarterly*, 64(3), pp. 206–221.

Glassman, M., Erdem, G. and Bartholomew, M., 2013. Action research and its history as an adult education movement for social change. *Adult Education Quarterly*, 63(3), pp. 272–288.

Glover, A., McCormack, J. and Smith-Tamaray, M., 2015. Collaboration between teachers and speech and language therapists: Services for primary school children

with speech, language and communication needs. *Child Language Teaching and Therapy*, 31(3), pp. 363–382

Goede, R. and Taylor, E., 2019. Theory in emancipative action: Aligning action research in information systems education with critical social research in information systems. *Systems*, 7(3), p.36.

Goodall, J. and Montgomery, C., 2014. Parental involvement to parental engagement: A continuum. *Educational Review*, *66*(4), pp.399–410.

Goodyear-Smith, F., 2017. Collective enquiry and reflective action in research: towards a clarification of the terminology. *Family Practice*, 34(3), pp. 268–271.

Goonewardene, S.S. and Persad, R., 2018. *Prostate Cancer Survivorship*). Cham: Springer.

Goos, M., 2013. Grade retention. The role of the national education policy and the effects on the students' academic achievement, psychosocial functioning, and school career (PhD thesis). KU Leuven.

Gordon, P.E., 2013. Between Christian democracy and critical theory: Habermas, Böckenförde, and the dialectics of secularization in postwar Germany. *Social Research: An International Quarterly*, 80(1), pp. 173–202.

Gredig, D. and Marsh, J.C., 2010. Improving intervention and practice. In I. Shaw, K. Briar-Lawson, J. Orme and R. Ruckdeschel (Eds.) *The Sage handbook of social work research*. Sage Publications. pp. 64–82.

Groundwater-Smith, S., Dockett, S. and Bottrell, D., 2014. *Participatory research with children and young people*. Sage Publications.

Guba, E.G. and Lincoln, Y.S., 2005. Paradigmatic controversies, contradictions, and emerging confluences. In N.K. Denzin and Y.S. Lincoln (Eds.), *Handbook of Qualitative Research*. Sage Publications. pp. 191–215.

Guido, R.M.D., 2018. Attitude and motivation towards learning physics. *ArXiv preprint arXiv: 1805.02293*.

Günther, K., 1993. Critical remarks on Robert Alexy's "Special‐Case Thesis". *Ratio Juris*, 6(2), pp. 143–156.

Guy, B.R., 2018. *Empowered in STEM: Using participatory action research to create accessible and inclusive undergraduate research experiences for women and women of colour* (Doctoral dissertation, University of Cincinnati).

Haambokoma, C., 2007. Nature and causes of learning difficulties in genetics at high school level in Zambia. *Journal of International Development and Cooperation*, 13(1), pp. 1–9.

Habermas, J., 1979. Interview with Jürgen Habermas, trans. C. Cronin. In A. Bächtier, J.S. Dryzek, J. Mansbridge, and M.E. Warren (Eds.), *the Oxford Handbook of Deliberative Democracy*. Oxford University Press. pp. 871–882.

Habermas, J., 1984. Habermas: Questions and counterquestions. *Praxis International*, 4(3), pp. 229–249.

Habermas, J., 1987. *Der philosophische diskurs der moderne*. MIT Press.

Habermas, J., 1990. *Moral consciousness and communicative action*. MIT Press.

Halinen, I., Harmanen, M. and Mattila, P., 2015. Making sense of complexity of the world today: Why Finland is introducing multiliteracy in teaching and learning. In *Cidree Yearbook: Improving literacy skills across learning* (pp.136–153). Consortium of Institutions for Development and Research in Education in Europe.

Hanks, C., 2015. The double-edge of reason: Jürgen Habermas and the Frankfurt School. In B.A. Levinson, J.P.K. Gross, C. Hanks, J. Heimer Dadds, K. Kumasi and J Link (Eds.), *Beyond critique*. *Exploring critical social theories and education.* Routledge. pp. 92–124.

Hardt, H., 1993. Authenticity, communication, and critical theory. *Critical Studies in Media Communication*, 10(1), pp. 49–69.

Hartley, J., 2015. Australian higher education policy and inclusion of people with disabilities: A review. *Journal of Postsecondary Education and Disability*, 28(4), pp. 413–419.

Hayhurst, L.M., Giles, A.R. and Radforth, W.M., 2015. 'I want to come here to prove them wrong': using a post-colonial feminist participatory action research (PFPAR) approach to studying sport, gender and development programmes for urban indigenous young women. *Sport in Society*, 18(8), pp. 952–967.

Hebert-Beirne, J., Felner, J.K., Kennelly, J., Eldeirawi, K., Mayer, A., Alexander, S., Castañeda, Y.D., Castañeda, D., Persky, V.W., Chávez, N. and Birman, D., 2018. Partner development praxis: The use of transformative communication spaces in a community-academic participatory action research effort in a Mexican ethnic enclave in Chicago. *Action Research*, 16(4), pp. 414–436.

Held, D., 1980. *Introduction to critical theory: Horkheimer to Habermas* (Vol. 261). University of California Press.

Held, V., 1993. *Feminist morality: Transforming culture, society, and politics*. University of Chicago Press.

Herr, K. and Anderson, G.L., 2015. *The action research dissertation*. Sage Publications. [DX Kindle version].

Hill, H. C., Blazar, D., and Lynch, K., 2015. Resources for teaching: Examining personal and institutional predictors of high-quality instruction. *AERA Open,* 1(4), pp. 1–23.

Hlabane, A.S. 2014. *Exploring effects of incorporating English language in secondary school science education: A case of secondary school physical sciences learners in Mpumalanga province* (Unpublished Master's dissertation, Unisa, Pretoria).

Hlabane, A.S., 2016. A literature study on learning difficulties experienced by physical sciences learners in South African schools. OISTE conference. Retrieved from: https://pdfs.semanticscholar.org/70ed/d7efc819fb8ec43459830aa783615f1d76a4.pdf

Hlalele, D., 2012. Social justice and rural education in South Africa. *Perspectives in Education*, 30(1), pp. 111–118.

Hlalele, D., 2014. Rural education in South Africa: Concepts and practices. *Mediterranean Journal of Social Sciences*, 5(4), p. 462.

Hoang, H., 2017. *Online development contests for youth empowerment: a critical discourse analysis of three online photo contests for youth* (Master's thesis, University of Lapland).

Holman, J., 2011. *Subject knowledge and pedagogy science teacher training.* London, UK: Welcome Trust.

Horkheimer, M. and Adorno, T.W., 1972. *Dialectic of enlightenment,* trans. John Cumming. New York: Continuum.

Horkheimer, M. and Adorno, T.W., 2002. *Dialectic of enlightenment: Philosophical fragments*. Ed. G.S Noerr, trans. E Jephcott. Stanford, CA: Stanford University Press.

Horkheimer, M., 1972. *Critical theory: Selected essays* (Vol. 1). A and C Black.

Horkheimer, M., 1972. *Social-philosophical studies: essays, speeches and lectures 1930–1972. With an appendix on university and studies* (Vol. 4003). Athenaeum Fischer Taschenbuch Verlag. pp. 246

Horkheimer, M., 1993. Reason against itself: Some remarks on enlightenment. *Theory, Culture and Society*, 10(2), pp. 79–88.

Hornby, G. and Lafaele, R. 2011. Barriers to parental involvement in education: an explanatory model. *Educational Review*, 63(1), pp. 37–52

Hornby, G. and Lafaele, R. 2011. Barriers to parental involvement in education: an explanatory model. *Educational Review*, 63(1), pp. 37–52.

Horton, J., Macve, R. and Struyven, G., 2004. Qualitative research: experiences in using semi-structured interviews. In C. Humphrey and B. Lee (Eds.), *the real life guide to accounting research*. *A behind-the-scenes view of using qualitative research methods*. Elsevier. pp. 339–357.

How, A., 2017. *Critical theory*. Macmillan International Higher Education.

http://www.ehow.com/about_5480210_definition-socially-inclusive.html

Hughes, G.D., 2012. Teacher retention: Teacher characteristics, school characteristics, organizational characteristics, and teacher efficacy. *The Journal of Educational Research*, *105*(4), pp. 245–255.

Im, M.H., Hughes, J.N., Kwok, O.M., Puckett, S. and Cerda, C.A., 2013. Effect of retention in elementary Grades on transition to middle school. *Journal of School Psychology*, 51(3), pp. 349 365.

Indriani, F., 2019. *Study program: English education* (Doctoral dissertation, State Islamic University).

Instefjord, E.J. and Munthe, E., 2017. Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and Teacher Education*, 67, pp. 37–45.

Irvine, A., Drew, P. and Sainsbury, R., 2013. 'Am I not answering your questions properly?' Clarification, adequacy and responsiveness in semi-structured telephone and face-to-face interviews. *Qualitative Research*, 13(1), pp. 87–106.

Isingoma, P., 2013. *Overcrowded classrooms and learners' assessment in primary schools of Kamwenge District, Uganda* (Doctoral dissertation).

Israel, B.A., Schulz, A.J., Parker, E.A., Becker, A.B., Allen, A.J., Guzman, J.R. and Lichtenstein, R., 2017. Critical issues in developing and following CBPR principles. *Community-based participatory research for health: Advancing social and health equity*, pp.31–46.

Jamil, H., 2014. Teacher is matter for education quality: A transformation of policy for enhancing the teaching profession in Malaysia. *Journal of International Cooperation in Education*, 16(2), pp. 181–196.

Janes, J.E., 2016. Democratic encounters? Epistemic privilege, power, and community-based participatory action research. *Action Research*, 14(1), pp. 72–87.

Jimerson, S.R. and Renshaw, T.L., 2012. Retention and social promotion. *Principal Leadership*, 13(1), pp. 12–16.

Johnson, P., 2006. *Habermas: rescuing the public sphere*. Routledge.

Jönsson, J.H., 2010. Beyond empowerment changing local communities. *International Social Work*, 53(3), pp. 393–406.

Kaahwa, J., 2012. The experiences of Ugandan females in mathematics. *Science Journal of Psychology*, 2012, Article ID sjpsych-103. Doi: 10.7237/sjpsych/103

Kabunga, A., Habiba, C.M. and Mnjokava, C.E., 2018. Learners' attitudes and performance in science subjects in A-Level in Secondary schools, in Mbarara, Uganda. *The Journal of Educational Research,* 2(5), pp. 10–25.

Kallio, H., Pietilä, A.M., Johnson, M. and Kangasniemi, M., 2016. Systematic methodological review: developing a framework for a qualitative semi‐structured interview guide. *Journal of Advanced Nursing*, 72(12), pp. 2954–2965.

Kanters, M.A., Bocarro, J.N., Filardo, M., Edwards, M.B., McKenzie, T.L. and Floyd, M.F., 2014. Shared use of school facilities with community organizations and afterschool physical activity program participation: a cost‐benefit assessment. *Journal of School Health*, 84(5), pp. 302–309.

Karsai, I. and Kampis, G., 2010. The crossroads between biology and mathematics: The scientific method as the basics of scientific literacy. *Bioscience*, 60(8), pp. 632–638.

Kavanagh, L. 2013. *A mixed methods investigation of parental involvement in Irish immersion primary education*: *Integrating multiple perspectives* (Doctoral dissertation, University College Dublin).

Keletso, S., 2017. Drawings to improve inclusive science teaching. In P. Katz (Ed.), *Drawing for science education. An international perspective*. Brill Sense. pp. 227–233

Keller, M.M., Neumann, K. and Fischer, H.E., 2017. The impact of physics teachers' pedagogical content knowledge and motivation on students' achievement and interest. *Journal of Research in Science Teaching*, 54(5), pp. 586–614.

Kellner, D., 1993. Critical theory today: Revisiting the classics. *Theory, Culture and Society*, 10(2), pp. 43–60.

Kemmis, S., 2001. Educational research and evaluation: Opening communicative space. *The Australian Educational Researcher*, *28*(1), pp.1–30.
Kemmis, S., McTaggart, R. and Nixon, R., 2013. *The action research planner: Doing critical participatory action research*. Springer Science & Business Media.

Kgosidialwa, T.K., 2010. Parental involvement and expectations of children's academic achievement goals in Botswana: Parents' perceptions (Unpublished PhD dissertation, University of Northern Colorado).

Khan, C. and Chovanec, D., 2010. Is participatory action research relevant in the Canadian workplace? *Journal of Contemporary Issues in Education*, 5(1).

Kiadese, A.L., 2011. An assessment of the teaching effectiveness of prevocational subjects teachers in Ogun State Nigeria. *International Journal of Vocational and Technical Education*, *3*(1), pp. 5–8.

Kika, J. and Kotze, J., 2019. Unpacking Grade repetition patterns in light of the progression policy in the further education and training phase. SALDRU Working Paper Number 243 Version 1/ NIDS Discussion Paper 2019/10. Cape Town: SALDRU, University of Cape Town.

Killam, L., 2013. *Research terminology simplified: Paradigms, axiology, ontology, epistemology and methodology*. Laura Killam.

Kim, J., 2016. Youth involvement in participatory action research (PAR). *Critical Social Work*, 17(1).

Kincheloe, J.L. and McLaren, P., 2011. Rethinking critical theory and qualitative research. In: K. Hayes, S.R. Steinberg and K. Tobin (Eds). *Key works in critical pedagogy*. Bold Visions in Educational Research, Vol. 32. pp. 285–326. Sense Publishers.

Kincheloe, J.L., McLaren, P. and Steinberg, S.R., 2011. Critical pedagogy and qualitative research. In S.R. Cleg, C. Hardy, T.B. Lawrence and W.R. Nord (Eds.), *The Sage handbook of organization studies*. Sage Publications, pp. 163–177.

King, N., Horrocks, C. and Brooks, J., 2018. *Interviews in qualitative research*. Sage.

Kirschner, F., Paas, F., Kirschner, P. A., and Janssen, J. (2011). Differential effects of problem-solving demands on individual and collaborative learning outcomes. *Learning and Instruction,* 21, pp. 587–599.

Kleickmann, T., Richter, D., Kunter, M., Elsner, J., Besser, M., Krauss, S. and Baumert, J., 2013. Teachers' content knowledge and pedagogical content knowledge: The role of structural differences in teacher education. *Journal of Teacher Education*, 64(1), pp .90–106.

Klev, R. and Levin, M., 2016. *Participative transformation: Learning and development in practising change*. Routledge.

Komba, C.K., Hizza, E.L. and Jonathan, W.T., 2013. *Factors influencing academic performance of ward secondary schools: A case of selected schools in Moshi*

municipality and Moshi district. MUCCoBS Working Paper Series No. 1/2013. Moshi, Tanzania: Moshi University College of Cooperative and Business Studies.

Kral, M., 2018. Community participation as an ethical principle for research. *International Review of Qualitative Research*, 11(2), pp. 148–157.

Kral, M.J. and Kidd, S., 2018. Community-based participatory research and community empowerment for suicide prevention. In J.K Hirsch, E.C. Chang and J.Kelliher Rabon (Eds.), *A positive psychological approach to suicide*: *Theory, research and prevention*. Cham: Springer. pp. 285–299.

Kralik, D., Koch, T., Price, K. and Howard, N., 2004. Chronic illness self‐management: Taking action to create order. *Journal of Clinical Nursing*, 13(2), pp. 259–267.

Kuckartz, U. and Rädiker, S., 2019. *Analyzing qualitative data with MAXQDA: Text, audio and video.* Cham: Springer.

Kwatubana, S. and Makhalemele, T. 2015. Parental involvement in the process of implementation of the National School Nutrition Programme in public schools. *International Journal of Educational Sciences,* 9(3), pp. 315–323.

Labov, J.B., Reid, A.H. and Yamamoto, K.R., 2010. Integrated biology and undergraduate science education: a new biology education for the twenty-first century? *CBE – Life Sciences Education*, 9(1), pp. 10–16.

Lake, D. and Wendland, J., 2018. Practical, epistemological, and ethical challenges of participatory action research: A cross-disciplinary review of the literature. *Journal of Higher Education Outreach and Engagement*, 22(3), pp. 11–42.

Langdon, J. and Larweh, K., 2015. Moving with the movement: Collaboratively building a participatory action research study of social movement learning in Ada, Ghana. *Action Research*, 13(3), pp. 281–297.

Lau, E.Y., Li, H. and Rao, N., 2011. Parental involvement and children's readiness for school in China. *Educational Research*, 53(1), pp. 95–113.

Laws, S., Harper, C. and Marcus, R. (2003). *Research for development: A practical guide*. Utah State University.

Mothwa, M.M., 2011. *Teachers' experiences of incorporating indigenous knowledge in the life sciences classroom* (Doctoral dissertation, University of Johannesburg).

Lebata, M.C. 2014. *An investigation of performance in the biology 5090 at selected high schools in Lesotho* (Master' dissertation, Unisa).

Lebata, M.C. and Mudau, A.V., 2014. Exploring factors affecting performance in biology 5090 at selected high schools in Lesotho. *Mediterranean Journal of Social Sciences*, 5(8), p. 271.

Lee, O. and Buxton, C.A., 2010. *Diversity and equity in science education: Research, policy, and practice*. Multicultural Education Series. Teachers College Press.

Leepo, S.R., 2015. *Strategies to deal with academic underperformance in Grade 12 in the Free State* (Doctoral dissertation). Welkom, South Africa: Central University of Technology.

Lewin, M., 1992. The impact of Kurt Lewin's life on the place of social issues in his work. *Journal of Social Issues*, *48*(2), pp.15–29.

Lewis, S., 2015. Qualitative inquiry and research design: Choosing among five approaches. *Health Promotion Practice*, 16(4), pp. 473–475.

Linklater, A., 2005. Dialogic politics and the civilising process. *Review of International Studies*, 31(1), pp. 141–154.

Llamas, A.V. and Tuazon, A. P. 2016. School practices in parental involvement, its expected results and barriers in public secondary schools. *International Journal of Educational Science and Research*, 6(1), pp. 69–78.

Lockeman, K.S., Dow, A.W. and Randell, A.L., 2020. Notes from the field: Evaluating a budget-based approach to peer assessment for measuring collaboration among learners on Interprofessional teams. *Evaluation and the Health Professions*, 43(3), pp. 197–200.

Lorini, M.R., 2018. Collective empowerment through information and communication technologies: co-creation processes in underserved communities in Cape Town (Doctoral dissertation). Cape Town: University of Cape Town.

Lowe, A., Norris, A.C., Farris, A.J. and Babbage, D.R., 2018. Quantifying thematic saturation in qualitative data analysis. *Field Methods*, 30(3), pp.191–.

Lykes, M.B., 2017. Community-based and participatory action research: Community psychology collaborations within and across borders. In M.A. Bond, C.B. Keys, I Serrano-García and S. Shinn (Eds.), *Handbook of community psychology*. Washington, DC: American Psychological Association.

MacDonald, D. (Ed.), 2012. *Transient techniques in electrochemistry*. Springer Science and Business Media.

MacDonald, C., 2012. Understanding participatory action research: A qualitative research methodology option. *The Canadian Journal of Action Research*, 13(2), pp.34–50.

Madsen, W. and O'Mullan, C., 2018. Power, participation and partnerships: Reflections on the co-creation of knowledge. *Reflective Practice*, 19(1), pp. 26–34.

Mafora, P., 2013. Learners' and teachers' perceptions of principals' leadership in Soweto secondary schools: a social justice analysis. *South African Journal of Education*, 33(3).

Mahlomaholo, S., 2009. Critical emancipatory research and academic identity. *Africa Education Review,* 6(2), pp. 224–237.

Majamana, Y., 2018. *Educators' and learners' views on factors that contribute to poor performance of Grade 12 physical science learners in the uMkhanyakude District in KwaZulu-Natal* (Doctoral dissertation, University of Zululand).

Malada, B., 2010. We ignore proper education at our peril. *Sunday Tribune*, September 19, p. *22*.

Malekela, G.A., 2010. English as a medium of instruction in post-primary education in Tanzania: is it a fair policy to the learners? In. Brock-Utne, Z. Desai, M.A.S. Qorro and Allan Pitman (Eds.), *Language of instruction in Tanzania and South Africa – Highlights from a project*. Brill Sense. pp. 33–41

Maluleka, S. 2011. Curriculum: back to the blackboard. *Daily News*, 10 August: 3.

Manias, E. and Street, A., 2000. Possibilities for critical social theory and Foucault's work: A toolbox approach. *Nursing Inquiry*, 7(1), pp. 50–60.Mann, C., 2003. Summary report of findings of the project on indicators of academic performance. *Cambridge University Reporter*, 12(2).

Manqele, C.M., 2017. *An evaluation of learner-centred teaching as part of curriculum delivery in under-resourced schools* (Unpublished doctoral dissertation, University of South Africa, Pretoria).

Mapolisa, T. and Tshabalala, T., 2014. Experiences during teaching practice: perspectives of Zimbabwean primary school student teachers. *Journal of Educational Research and Studies*, 2(2), pp. 16–23.

Marcuse, H. (1964) *One-dimensional man: Studies in the ideology of advanced industrial societies.* Boston: Beacon Press.

Mart, T.C. 2013. A passionate teacher: Teacher commitment and dedication to student learning. *International Journal of Academic Research in Progressive Education Development*, 2(1), pp. 437–442.

Martí, J., 2016. Measuring in action research: Four ways of integrating quantitative methods in participatory dynamics. *Action Research*, 14(2), pp. 168–183.

Matimbe, R.T., 2014. Master of education in educational management: Financial management in education (Master's dissertation, ZOU, Harare).

Mavhunditse, T., 2014. *Legal perspectives in education* (Master's thesis, Zimbabwe Open University, Harare).

Maxwell, M.L., Abrams, J., Zungu, T. and Mosavel, M., 2016. Conducting community-engaged qualitative research in South Africa: Memoirs of intersectional identities abroad. *Qualitative Research*, 16(1), pp. 95–110.

Mbajiorgu, C.A., Oguttu, J.W., Maake, M.S., Heeralal, P.J.H., Ngoepe, M.G., Msafu, M. M. and Kaino, L.M. 2014. Factors that impact on the teaching and learning of agriculture science in FET schools in Mpumalanga: A case of Mandlethu FET School. *Journal of Human Ecology,* 45(2), pp. 137–145.

Mbatha, Z.M., 2018. *Developing a framework of parental involvement to enhance academic performance of learners in schools* (Doctoral dissertation, University of the Free State, Bloemfontein).

McCaleb, S.P., 2013. *Building communities of learners: A collaboration among teachers, students, families, and community*. Routledge.

McDonald, K.E., Kidney, C.A. and Patka, M., 2013. 'You need to let your voice be heard': research participants' views on research. *Journal of Intellectual Disability Research*, 57(3), pp. 216–225.

McKernan, J.A., 2013. The origins of critical theory in education: Fabian socialism as social Reconstructionism in nineteenth-century Britain. *British Journal of Educational Studies*, 61(4), pp. 417–433.

McLaughlin, L., 1993. Feminism, the public sphere, media and democracy. *Media, Culture and Society*, 15(4), pp. 599–620.

McLaughlin, N., 1999. Origin myths in the social sciences: Fromm, the Frankfurt School and the emergence of critical theory. *Canadian Journal of Sociology/Cahiers canadiens de sociologie*, 24(1), pp. 109–139.

McNiff, J. and Whitehead, J., 2006. *Action research: Living theory*. Sage Publications.

McNiff, J. and Whitehead, J., 2011. *All you need to know about action research*. Sage Publications.

Mega, C., Ronconi, L. and De Beni, R., 2014. What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology*, 106(1), p. 121.

Melis, L., Song, C., De Cristofaro, E. and Shmatikov, V., 2019. *Exploiting unintended feature leakage in collaborative learning*. In 2019 IEEE Symposium on Security and Privacy (SP) (pp. 691–706). IEEE.

Memar, N., Krishna, A., McMeekin, D.A. and Tan, T., 2018. Gamifying information system testing – Qualitative validation through focus group discussion. In B. Anderson, B. Johansson, S. Carlson, C. Barry, M. Lang, H. Linger and C. Schneider (Eds.), *Designing digitalization* (ISD2018 Proceedings). Lund, Sweden: Lund University.

Menjo, E. 2013. An assessment of effectiveness of the secondary school science pedagogy and curriculum relevance to students' needs in Baringo Central, Kenya. *Journal of Emerging Trends in Educational Research and Policy Studies,* 4(3), pp. 433–441.

Mertens, D.N., 2010a. Transformative mixed methods research. *Qualitative Inquiry*, 16(6), pp. 469–474.

Mertens, D.M., 2010b. Philosophy in mixed methods teaching: The transformative paradigm as illustration. *International Journal of Multiple Research Approaches,* 4(1), pp. 9–18.

Mertens, D.M., 2012a. Transformative mixed methods: Addressing inequities. *American Behavioral Scientist*, 56(6), pp. 802–813.

Mertens, D.M., 2012. Ethics and social justice in ethnocultural qualitative research.

Mertens, D.M., 2013. What does a transformative lens bring to credible evidence in mixed methods evaluations? *New directions for evaluation*, *2013*(138), pp.27–35.

Mertens, D.N. 2015. Philosophical assumptions and evaluation. *Spasio filofica* 1(2015), pp. 75–85.

Mertens, D.M., 2017. Transformative research: personal and societal. *International Journal for Transformative Research*, 4(1), pp. 18–24.

Mertens, D.M., Bledsoe, K.L., Sullivan, M. and Wilson, A., 2010. Utilization of mixed methods for transformative purposes. In A. Tashakkori and C. Teddlie (Eds.), *Sage handbook of mixed methods in social and behavioral research*, *2*. Sage Publications. pp. 193–214.

Mertens, D.M., Holmes, H.M. and Harris, R.L., 2009. Transformative research and ethics. In D. M Mertens and P.E. Ginsburg (Eds.), *the handbook of social research ethics*. Sage Publications. pp. 85–101.

Milner, A.R., Templin, M.A. and Czerniak, C.M., 2011. Elementary science students' motivation and learning strategy use: Constructivist classroom contextual factors in a life science laboratory and a traditional classroom. *Journal of Science Teacher Education*, 22(2), pp. 151–170.

Mishra, L., 2016. Focus group discussion in qualitative research. *Techno learn: An International Journal of Educational Technology*, 6(1), pp. 1–5.

Mizell, H., 2010. *Why professional development matters*. Oxford, OH: Learning Forward.

Mkonongwa, L.M. and Komba, S.C., 2018. Enhancing the quality of teaching and learning in Tanzania through improved English language teaching and educational management skills. *International Journal of Research*, 7(2), pp. 1–14.

Modisaotsile, M.B. 2012. *The falling standard of basic education in South Africa. Africa Institute of South Africa*. Policy briefing No. 72. Africa Institute of South Africa.

Moloi, K., 2019. Learners and educators as agents of social transformation in dysfunctional South African schools. *South African Journal of Education*, 39(4).

Moore, A. 2015. *Understanding the school curriculum: Theory policies and principles.* New York: Routledge.

Moore, T., McKee, K. and McLoughlin, P.J., 2015. Online focus groups and qualitative research in the social sciences: their merits and limitations in a study of housing and youth. *People, Place and Policy*, 9(1), pp. 17–28. Doi: 10.3351/ppp.0009.0001.0002

Morales, M.P.E., 2016. Participatory action research (PAR) cum action research (AR) in teacher professional development: A literature review. *International Journal of Research in Education and Science*, 2(1), pp. 156–165.

Morin, A., Eisenbraun, B., Key, J., Sanschagrin, P.C., Timony, M.A., Ottaviano, M. and Sliz, P., 2013. Cutting edge: Collaboration gets the most out of software. *Elife*, 2, p. 1456.

Morris, R. and Perry, T., 2017. Reframing the English grammar schools debate. *Educational Review*, 69(1), pp. 1–24.

Motshekga, A., 2011. Statement by the Minister of Basic Education, Mrs Angie Motshekga, MP, on the progress of the review of National Curriculum Statement. https://www.gov.za/statement-minister-basic-education-mrs-angie-motshekga-mp-progress-review-national-curriculum

Motshekga, A. 2018. Speech delivered at the announcement of the 2017 National Senior Certificate examinations results, by Angie Motshekga, minister of Basic Education. Auckland Park, Johannesburg. Retrieved from: http://www.gov.za/minister-angie-motshekga-announcement-2017-matric-results

Movahedzadeh, F., 2011. Improving students' attitude toward science through blended learning. *Science Education and Civic Engagement*, 3(2), pp.13–19.

Mukminin, A., Habibi, A., Prasojo, L.D., Idi, A. and Hamidah, A., 2019. Curriculum reform in Indonesia: moving from an exclusive to inclusive curriculum. *CEPS Journal*, 9(2), pp. 53–72.

Müller, R., 2014. Racing for what? Anticipation and acceleration in the work and career practices of academic life science postdocs. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 15(3).

Munje, P. and Maarman, R., 2016. A capability analysis on the implementation of the school progression policy and it impact on learner performance. *Journal of Education*, 66, pp. 185–205.

Mupa, P. and Chinooneka, T., 2019. Factors contributing to ineffective teaching and learning in primary schools: Why are schools in decadence? *Journal of Education and Practice*, 6(19), pp. 125–132.

Murphy, M. and Fleming, T. Eds., 2010. *Habermas, critical theory and education*. Routledge.

Murray, N. and Hicks, M., 2016. An institutional approach to English language proficiency. *Journal of Further and Higher Education*, 40 (2), pp. 170–187.

Muspikawijaya, Iswari, R., and Marianti, A. (2017). Analisis Kesulitan Peserta Didik SMA/MA Kabupaten Luwu Timur dalam Memahami Konsep pada Materi Metabolisme Sel [Difficulty analysis of high school/MA students in East Luwu Regency in understanding the concepts of cell metabolism material]. *Journal of Innovative Science Education*, *7* (2), 252–263.

Muzah, P. 2011. *An exploration into the school-related factors that cause high matriculation failure rates in physical science in public high schools of Alexandra Township* (Unpublished Master's dissertation, Unisa, Pretoria).

Mwaba, K. 2011. *The performance of female pupils in physical science at Serenje Technical High School academic production unit*. Working paper. University of Zambia.

Mwenda, E., Gitaari, E., Nyaga, G., Muthaa, G. and Reche, G. 2013. Factors contributing to students' poor performance in mathematics in public secondary schools in Tharaka South district Kenya. *Journal of Education and Practice*, 4(7), pp. 93–99.

Myende, P.E., 2015. Tapping into the asset-based approach to improve academic performance in rural schools. *Journal of Human Ecology*, 50(1), pp. 31–42.

Najafi, M., Ebrahimitabass, E., Dehghani, A. and Rezaei, M., 2012. Students' attitude towards science and technology. *Interdisciplinary Journal of Contemporary Research in Business*, 3(10), pp. 129–134.

Narinasamy, I. and Mamat, W.H.W. 2013. Caring teacher in developing empathy in moral education. *The Malaysian Online Journal of Educational Science,* 1(1), pp. 1–19.

Née-Blackwell, R.W., Lowton, K., Robert, G., Grudzen, C. and Grocott, P., 2017. Using experience-based co-design with older patients, their families and staff to improve palliative care experiences in the emergency department: a reflective critique on the process and outcomes. *International Journal of Nursing Studies*, 68, pp. 83–94.

Nelson, G. and Evans, S.D., 2014. Critical community psychology and qualitative research: A conversation. *Qualitative Inquiry*, 20(2), pp. 158–166.

Nelson, M.T., 2019. *Impact of the relationship between English Language arts teacher team collaboration in creating common formative assessment, on the academic achievement of middle school students* (Doctoral dissertation, William Howard Taft University).

Ngada, J.A., 2009. Teacher quality: Antecedent to quality education and national development. *The Nigerian Journal of Research and Production Volume*, 15(2).

Ngema, M.H., 2016. *Factors that cause poor performance in science subjects at Ingwavuma Circuit* (Doctoral dissertation, Unisa).

Ngwenyama, O.K., 1991. The critical social theory approach to information systems: problems and challenges. In H-E. Nissen, H. Klein and R. Hirschheim (Eds.),

Information Systems Research: Contemporary Approaches and Emergent Traditions. Elsevier. pp. 267–280.

Nicolaides, A. and Dzubinski, L., 2016. Collaborative developmental action inquiry: An opportunity for transformative learning to occur? *Journal of Transformative Education*, 14(2), pp. 120–138.

Nkoane, M.M. 2010. Critical liberatory, inclusive pedagogy: Arguing for a zero defect Discourse. *Acta Academica,* 43(4), pp. 111–126.

Nkoane, M.M., 2012. Critical emancipatory research for social justice and democratic citizenship. *Perspectives in Education*, 30(4), pp. 98–104.

Nkoane, M.M., 2013. Creating sustainable postgraduate supervision learning environments through critical emancipatory research. *TD: The Journal for Transdisciplinary Research in Southern Africa*, 9(3), pp. 393–400.

Nolan, M., 2018. *Investigating impacts on the environmental literacy of secondary school students attending a summer science program* (Master's thesis, College of Environmental Science and Forestry, Syracuse, New York).

Ntekane, A., 2018. *Parental involvement in education*. (Bachelor degree dissertation, Makerere University, Kampala, Uganda). Doi: 10.13140/RG.2.2.36330.21440

Oeste-Reiß, S., Bittner, E. and Söllner, M., 2017. *Yes you can – Empowering lecturers to simulate collaboration among learners in the disciplines of problem-solving and critical thinking regardless of class size.* 13th International Conference on Wirtschaftsinformatik (WI) Conference, Switzerland.

Ogbonnaya, U.I. 2011. *Exploring the relationship between mathematics teachers' subject matter knowledge and their teaching effectiveness* (Unpublished Doctoral thesis, Unisa, Pretoria).

Oghuvbu, E.P., 2010. Attendance and academic performance of students in secondary schools: A correlational approach. *Studies on Home and Community Science*, 4(1), pp. 21–25.

Ogunkola, B. J. and Samuel, D. (2011). Science teachers' and students' perceived difficult topics in the integrated science curriculum of lower secondary schools in Barbados. *World Journal of Education,* 1(2), pp. 17–29.

Ogunmade, T.O., 2005. The status and quality of secondary science teaching and learning in Lagos State, Nigeria (Doctoral thesis, Edith Cowan University).

Ohia, A.O., 2018. Students' access to quality of learning resources for enhanced performance in secondary schools in Abia State, Nigeria. *International Journal of Academic Research in Business and Social Sciences,* 8(7), pp. 148–155.

Oluwaseun, K.A., Onovroghene, S.M. and Isaac, O.A., 2018. Examination of the availability and adequacy of biology education resources in the curricula of open and conventional universities in Southwestern Nigeria. *Journal of Emerging Trends in Educational Research and Policy Studies,* 9(6), pp. 282–292.

Onah, F.E. and Eguzo, G.O., 2020. Assessment of needed biology material resources for sustainable educational goals in Imo State secondary schools. *Journal of the Nigerian Council of Educational Psychologists*, 12(1).

Onur, A., Sahin, E. and Tekkaya, C., 2012. An investigation on value orientations, attitudes and concern towards the environment: the case of Turkish elementary school students. *Environmental Education Research*, 18(2), pp. 271–297.

Ortiz Aragón, A. and Glenzer, K., 2017. Untaming aid through action research: Seeking transformative reflective action. *Action Research*, 15(1), pp. 3–14.

Ortiz, J.L., Conkey, A.A., Brennan, L.A., Fedynich, L.V. and Green, M., 2020. Wild Bird Workshop: A professional development opportunity for educators. *The American Biology Teacher*, 82(1), pp. 3–10.

Osman, A., Ogolla, B.O., Owino, O.A. and Yungungu, A.M., 2015. The relationship between students' attitude towards biology and performance in Kenya Certificate of Secondary Education biology in selected secondary schools in Nyakach, Kenya. *Research Journal of Educational Studies and Review*, 1(5), pp. 111–117.

Owens, M.T., Trujillo, G., Seidel, S.B., Harrison, C.D., Farrar, K.M., Benton, H.P., Blair, J.R., Boyer, K.E., Breckler, J.L., Burrus, L.W. and Byrd, D.T., 2018. Collectively improving our teaching: attempting biology department–wide professional development in scientific teaching. *CBE—Life Sciences Education, 17*(1), p .2.

Owiti, M.D.O., 2001. *Making informed choices*. A trainer's manual for civic education. Nairobi: Civic Education for Marginalised Communities (CEDMAC), Constitution and

Reform Consortium (CRECO), Ecumenical Civil Education Programme (ECEP) and gender Consortium (GC).

Owolabi, O.T. and Adedayo, J.O., 2012. Effect of Teacher's Qualification on the Performance of Senior Secondary School Physics Students: Implication on Technology in Nigeria. *English Language Teaching*, *5*(6), pp.72–77.

Ozcan, N., 2003. *A group of students' and teachers' perceptions with respect to biology education at high school level* (Unpublished Master's thesis, Middle East Technical University, Ankara).

Ozer, E.J., 2017. Youth‐led participatory action research: Overview and potential for enhancing adolescent development. *Child Development Perspectives*, 11(3), pp. 173–177.

Ozmen, F., Akuzum, C., Zincirli, M. and Selcuk, G., 2016. The communication barriers between teachers and parents in primary schools. *Eurasian Journal of Educational Research*, 66, pp. 27–46.

Pali, B., 2019. Aligning action research and restorative justice: Highlighting epistemological tensions. *Journal of Extreme Anthropology*, 3(1), pp. 7–29.

Palinkas, L.A., Aarons, G.A., Horwitz, S., Chamberlain, P., Hurlburt, M. and Landsverk, J., 2011. Mixed method designs in implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, *38*(1), pp. 44–53.

Papanastasiou, E.C. and Zembylas, M., 2002. The effect of attitudes on science achievement: A study conducted among high school pupils in Cyprus. *International Review of Education*, *48*(6), pp.469–484.

Pardede, P., 2020. Secondary school EFL teachers' perception of ICT use in learning and teaching. *JET (Journal of English Teaching)*, 6(2), pp. 144–157.

Parkinson, A. 2014. Adorno on the airwaves: Feeling reason, educating emotions. *German Politics and Society,* 32(110), pp. 43–59.

Parveen, S., Hussain, S. and Reba, A., 2016. The impact of parental involvement on children's education. *PUTAJ-Humanities and Social Sciences*, 23(2), pp. 239–251.

Pathak, A. and Intratat, C., 2016. Use of semi-structured interviews to investigate teacher perceptions of student collaboration. *Malaysian Journal of ELT Research*, 8(1), p. 10.

Peters, M. 2005. Critical pedagogy and the future of critical theory. In I. Gur-Ze'ev (Ed.), *Critical theory and critical pedagogy today: Towards a new critical language in education:* Haifa: University of Haifa. pp. 35–38.

Percy-Smith, B., 2018. Participation as learning for change in everyday spaces: Enhancing meaning and effectiveness using action research. In C. Baraldi and T Cockburn (Eds.) *Theorising childhood*: *Citizenship, rights and participation.* Cham: Palgrave Macmillan. pp. 159–186.

Perez, A.L. and Alieto, E., 2018. Change of 'tongue' from English to a local language: A correlation of mother tongue proficiency and mathematics achievement. *Asian ESP Journal,* 14(7.2), pp. 132–150.

Picklo, D.M. and Christenson, S.L., 2005. Alternatives to retention and social promotion: The availability of instructional options. *Remedial and Special Education*, 26(5), pp. 258–268.

Porter, S., 2002. Critical realist ethnography. In T. May (Eds.), *Qualitative research in action*. Sage Publications. pp. 53–72. https://dx.doi.org/10.4135/9781849209656.n2

Postone, M., Moishe, P., Galambos, L. and Sewell, J.E., 1995. *Time, labor, and social domination: A reinterpretation of Marx's critical theory*. Cambridge University Press.

Powers, C. and Allaman, E., 2012. How participatory action research can promote social change and help youth development. *Berkman Center Research Publication*, (2013–10).

Prakash, G., 1992. Postcolonial criticism and Indian historiography. *Social Text*, 31/32, pp. 8–19.

Pretorius, S.G. 2010. The South African education system. In: E. Lemmer, and N. van Wyk (Eds.*). Themes in South African education*. Cape Town: Heinemann (pp. 117–140).

Priyadarshini, S.S. and Thangarajathi, S., 2017. Effect of selected variables on regular school teachers' attitude towards inclusive education. *Journal on Educational Psychology*, 10(3), pp. 28–38.

Rabgay, T., 2018. The effect of using cooperative learning method on tenth Grade students' learning achievement and attitude towards biology. *International Journal of Instruction*, 11(2), pp. 265–280.

Rabionet, S.E., 2011. How I learned to design and conduct semi-structured interviews: An ongoing and continuous journey. *Qualitative Report*, 16(2), pp. 563–566.

Ratcliff, W.C., Raney, A., Westreich, S. and Cotner, S., 2014. A novel laboratory activity for teaching about the evolution of multicellularity. *The American Biology Teacher*, 76(2), pp. 81–87.

Ravi, S.S. (2011). *A comprehensive study of education*. New Delhi: PH Learning Publisher.

Reece, A.J. and Butler, M.B., 2017. Virtually the same: A comparison of STEM students' content knowledge, course performance, and motivation to learn in virtual and face-to-face introductory biology laboratories. *Journal of College Science Teaching*, 46(3).

Reed, P., 2014. Staff experience and attitudes towards technology-enhanced learning initiatives in one faculty of health and life sciences. *Research in Learning Technology*, 22. Doi: 10.3402/rlt.v22.22770

Reinaldo, L.C. 2014. Difficulty of science and biology teachers to teach entomology in elementary and high school in the state of Para, Northern Brazil. *American Journal of Educational Research*, 2(6), pp. 289–392.

Republic of South Africa. 1996. South African Schools Act, No. 84. *Government Gazette,* 377(17579). Pretoria: Government Printer.

Republic of South Africa. 1996. Constitution of the Republic of South Africa Act 108 of 1996. *Government Gazette,* 378(17678). Pretoria: Government Printer.

Reynoso, L.C., 2019. English teachers' effectiveness and students' English proficiency at selected colleges in Dili, East Timor: Input for enhancement programs. *English Language Teaching*, 12(10).

Ripamonti, S., Galuppo, L., Gorli, M., Scaratti, G. and Cunliffe, A.L., 2016. Pushing action research toward reflexive practice. *Journal of Management Inquiry*, *25*(1), pp.55–68.

Rissanen, A., 2016. *The effect of student engagement on final Grades, attendance and student experiences in large classroom in an undergraduate biology course at Memorial University* (Doctoral dissertation, Memorial University of Newfoundland).

Rissanen, A., 2018. Student engagement in large classroom: the effect on grades, attendance and student experiences in an undergraduate biology course. *Canadian Journal of Science, Mathematics and Technology Education*, 18(2), pp. 136–153.

Roderick, R., 1986. *Habermas and the foundations of critical theory*. Macmillan International Higher Education.

Rogayan Jr, D.V., 2019. Biology Learning Station Strategy (BLISS): Its effects on science achievement and attitude towards biology. *International Journal on Social and Education Sciences*, 1*(*2), pp. 78–89.

Romm, N.R., 2015. Reviewing the transformative paradigm: A critical systemic and relational (Indigenous) lens. *Systemic Practice and Action Research*, 28(5), pp. 411–427.

Roseman, J. E., Stern, L., and Koppal, M. (2010). A method for analyzing the coherence of high school biology textbooks. *Journal of Research in Science Teaching,* 47(1), pp. 4770.

Ross, P.M., Taylor, C.E., Hughes, C., Whitaker, N., Lutze-Mann, L., Kofod, M. and Tzioumis, V., 2010. Threshold concepts in learning biology and evolution. *Biology International*, 47, pp. 47–54.

Ross, T., 2016. The differential effects of parental involvement on high school completion and postsecondary attendance. *Education Policy Analysis Archives/Archivos Analíticos de Políticas Educativas*, 24, pp. 1–38.

Feldman, A and Rowell, L., 2019. Knowledge democracy and action research. *Educational Action Research*, 27(3), pp. 335–346.

Rowell, L.L. and Hong, E., 2017. Knowledge democracy and action research: Pathways for the twenty-first century. In L.L. Rowell, C.D. Bruce, J.M Shosh and M.M

Riel (Eds.), *The Palgrave international handbook of action research*. New York Palgrave Macmillan. pp. 63–83.

Rudiana, D., Sabandar, J. and Subali, B., 2018. Focus group discussion in mathematical physics learning. *Journal of Physics: Conference Series*, 83(1), p. 012010.

SACE. 2010. A review of teacher demand and supply. Identifying gaps and the role of sace. South Africa.

Samuel, A.O. and Adekunle, A.O., 2019. Teacher preparation and teaching professional competence among Federal Colleges of Education graduates in South West-Nigeria. *Journal of Education and Human Development*, 8(1), pp. 93–105.

Samuel, K.B. and Dudu, W.T., 2017. Bridging the knowledge gap in the teaching and learning of science subjects: An opportunity created for 'progressed learners' in one district of the North West Province. *Rethinking Education in the 21st Century*. Published by African Academic Research Forum.

Samuel, R.S., 2011. *A comprehensive study of education*. PHI Learning.

Sanchez, C.N.P., Montesinos, M.B. and Rodriguez, L.C., 2013. Family influences in academic achievement. A study of the Canary Islands. *Reigta Inter de Socio*, 71, pp. 169–187.

Sandwick, T., Fine, M., Greene, A.C., Stoudt, B.G., Torre, M.E. and Patel, L., 2018. Promise and provocation: humble reflections on critical participatory action research for social policy. *Urban Education*, 53(4), pp. 473–502.

Santrock, J.W., 2006. *Human adjustment*. McGraw-Hill.

Sapungan, G.M. and Sapungan, R.M., 2014. Parental involvement in child's education: Importance, barriers and benefits. *Asian Journal of Management Sciences & Education*, *3*(2), pp. 23–43.

Saputro, A.D., Irwanto, I., Atun, S. and Wilujeng, I., 2019. The impact of problem solving instruction on academic achievement and science process skills among prospective elementary teachers. *Elementary Education Online*, 18(2).

Sathy, V. and Hogan, K.A., 2019. Want to reach all of your students? Here's how to make your teaching more inclusive. *Chronicle of Higher Education*, July, p. 22.

Saunders, C., 2015. *Investigating the use of formative and peer assessment in the scientific discipline: Are they effective learning resources?* 12th Annual Conference of the International Society for the Scholarship of Teaching and Learning (p. 60).

Savin-Baden, M. and Major, H.C. (2013) *Qualitative research: the essential guide to theory and practice*. London: Routledge.

Schmidt, J. 2007. The eclipse of reason and the end of the Frankfurt school in America. *German Critique* 34(1), pp. 47–76.

Scotland, J., 2012. Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching*, 5(9), pp. 9–16.

Seashore Louis, K., Dretzke, B. and Wahlstrom, K., 2010. How does leadership affect student achievement? Results from a national US survey. *School effectiveness and school improvement*, 21(3), pp. 315–336.

Sedibe, M., 2011. Inequality of access to resources in previously disadvantaged South African high schools. *Journal of Social Sciences*, 28(2), pp. 129–135.

Setati, C.M. 2011. *English as a language of learning and teaching science in rural secondary schools: A study of the Vlakfontein Circuit in Limpopo* (Unpublished Doctoral thesis, Unisa, Pretoria).

Shahnazarian, D., Hagemann, J., Aburto, M. and Rose, S., 2013. I*nformed consent in human subjects research*. Office for the Protection of Research Subjects (OPRS), University of Southern California. Retrieved from oprs.usc. Edu/files/2013/04/Informed-Consent-Booklet-4-13.

Shangase, B.B., 2013. *Strategies for the implementation of further education and training learner attainment improvement plan* (Doctoral dissertation, University of the Free State, Qwaqwa Campus).

Sharpe, R. and Abrahams, I., 2020. Secondary school students' attitudes to practical work in biology, chemistry and physics in England. *Research in Science and Technological Education*, 38(1), pp. 84–104.

Sheperd, D.L. 2013. *The impact of teacher subject knowledge on learner performance in South Africa: A within-pupil across-subject approach.* International Workshop on Applied Economics of Education.

Sherab, K., 2013. Strategies for encouraging behavioural and cognitive engagement of pre-service student-teachers in Bhutan: an action research case study. *Educational Action Research*, 21(2), pp. 164–184.

Siddiqui, I.J., 2011. Lack of Parental Involvement: Stress Prone Children. *International Journal of Education & Allied Sciences*, *3*(2).

Silverman, D. and Torode, B., 2011. *The material word (Routledge Revivlas): Some theories of language and its limits*. Routledge.

Sinnerbrink, R., 2012. Critical theory as disclosing critique: A response to Kompridis. *Constellations*, 25 October, https://doi.org/10.1111/cons.12003

Soltani, A. (2011). Attitude towards biology and its effects on student's achievement. *International Journal of Biology*, 3(4), pp. 100–104.

Somekh, B. and Zeichner, K., 2009. Action research for educational reform: Remodelling action research theories and practices in local contexts. *Educational Action Research*, 17(1), pp. 5–21.

Soranzo, B., Nosella, A. and Filippini, R., 2017. Redesigning patent management process: an action research study. *Management Decision*, 55(6), pp. 1100–1121.

SACE (South African Council for Educators) 2010. *The supply and development of teachers by public higher education institutions in South Africa.* Prepared by Chief Directorate: Teacher Education, Universities Branch, Department of Higher Education and Training, July 2010.

Spaull, N. 2013. *South Africa's education crisis: The quality of education in South Africa 1994–2011*. Report. Johannesburg: Centre for Development and Enterprise.

Spengler, J.O., Connaughton, D.P. and Carroll, M.S., 2011. Addressing challenges to the shared use of school recreational facilities. J*ournal of Physical Education, Recreation and Dance*, 82(9), pp. 28–33.

Speziale, H.S., Streubert, H.J. and Carpenter, D.R., 2011. *Qualitative research in nursing: Advancing the humanistic imperative*. Lippincott Williams and Wilkins.

Steele, J.L., Hamilton, L.S. and Stecher, B.M., 2010. *Incorporating student performance measures into teacher evaluation systems.* Technical Report. Rand Corporation.

Steinberg, S.R. and Kincheloe, J.L., 2010. Power, emancipation, and complexity: Employing critical theory. *Power and Education*, 2(2), pp. 140–151.

Stewart, P. and Lucio, M.M., 2017. Research, participation and the neo-liberal context: The challenges of emergent participatory and emancipatory research approaches. *Ephemera*, 17(3), pp. 533–556.

Stott, A., Dreyer, H. and Venter, P., 2015. Consequences of the progression law in the FET phase: A case study. *Journal of Education*, (63), pp. 89–109.

Stotsky, S., 2012. *The death and resurrection of a coherent literature curriculum: What secondary English teachers can do*? R&L Education.

Stoudt, B.G., Fox, M. and Fine, M., 2012. Contesting privilege with critical participatory action research. *Journal of Social Issues*, 68(1), pp. 178–193.

Stringer, E.T., 2013. *Action research*. Sage Publications.

Stuart, K., 2014. Collaborative agency to support integrated care for children, young people and families: an action research study. *International Journal of Integrated Care*, 14(2). Doi: http://doi.org/10.5334/ijic.1171

Stuckey, H.L., 2013. Three types of interviews: Qualitative research methods in social health. *Journal of Social Health and Diabetes*, 1(2), pp. 56–59.

Syahid, A.A., Sunarya, D.T., Sudin, A., Sunaengsih, C. and Karlina, D.A., 2019, October. ICT competences of primary school teachers. In *Journal of Physics: Conference Series*, 1318(1), p. 12148).

Taylor, S., 2019. How can learning inequalities be reduced? Lessons learnt from experimental research in South Africa. In *South African Schooling: The Enigma of Inequality* (pp. 321–336). Springer, Cham.

Thomas, E.E., Stornaiuolo, A. and Campano, G., 2018. Collective knowledge production and action. *Research in the Teaching of English*, 53(2), pp. 97–101.

Thurmond, J., Goodman, J.L., Strelets, V.B., Attrill, H., Gramates, L.S., Marygold, S.J., Matthews, B.B., Millburn, G., Antonazzo, G., Trovisco, V. and Kaufman, T.C., 2018. Fly Base 2.0: the next generation. *Nucleic Acids Research*, 47(D1), pp. D759–D765.

Tibell, L.A. and Rundgren, C.J., 2010. Educational challenges of molecular life science: characteristics and implications for education and research. *CBE—Life Sciences Education*, 9(1), pp. 25–33.

Tondeur, J., Pareja Roblin, N., Van Braak, J., Voogt, J. and Prestridge, S., 2017. Preparing beginning teachers for technology integration in education: ready for take-off? *Technology, Pedagogy and Education*, 26(2), pp. 157–177.

Topor, D.R., Keane, S.P., Shelton, T.L. and Calkins, S. 2010. Parent involvement and student academic performance: A multiple mediational analysis. *Journal of Prevention & Intervention Community*, 38(3), pp. 183–197.

Topping, K. and Wolfendale, S. (Eds.), 2017. *Parental involvement in children's reading*. Routledge.

Traitler, R., 2015. Mission on the move for justice and peace. The case of the European Project for interreligious learning. *International Review of Mission,* 104(1), pp. 83–90.

Tsanwani, A., Harding, A., Engelbrecht, J. and Maree, K. 2014. Perceptions of teachers and learners about factors that facilitate learners' performance in Mathematics in South Africa. *African Journal of Research in Mathematics, Science and Technology Education,* 18(1), pp. 40–51.

Tshiredo, L.L., 2013. *The impact of the curriculum change in the teaching and learning of science: A case study in under-resourced schools in Vhembe district* (Doctoral dissertation, Unisa).

Turago, D., 2010. *The role of action research in enhancing quality of education: The case of some selected secondary schools in city government of Addis Ababa* (Master's thesis, Addis Ababa University).

Van Der Berg, S. and Hofmeyr, H., 2018. *Education in South Africa: background note for the South Africa systematic country diagnostic* (No. 127304, pp. 1–34). The World Bank.

Vassallo, B. 2014. What makes them still tick? A study of job (dis) satisfaction among long serving teachers in Malta. *The Online Journal of New Horizons in Education*, 4(1), pp. 97–116.

Vebrianto, R., Rery, R.U. and Osman, K., 2016. BIOMIND portal for developing 21st century skills and overcoming students' misconception in biology subject. *International Journal of Distance Education Technologies (IJDET)*, 14(4), pp. 55–67.

Wabuke, J.M., Barmao, C.C. and Jepkorir, M., 2013. Overcoming teacher related challenges to performance in biology subject among secondary school students in Eldoret Municipality, Kenya. *Journal of Emerging Trends in Educational Research and Policy Studies*, 4(1), pp. 79–87.

Wabule, A., 2019. Beyond rules of procedures: Utilising participatory action research (PAR) to enhance reflective practice and normative professionalism. *Systemic Practice and Action Research*, 33(1), pp.1–16.

Wagoner, B.L., 2012. *The subject of emancipation: Critique, reason and religion in the thought of Theodor W. Adorno, Max Horkheimer and Paul Tillich* (Doctoral dissertation, Harvard University).

Walker, M., 2018. Political agency and capabilities formation through participatory action research. *Journal of Human Development and Capabilities*, 19(1), pp. 53–69.

Walker, L., Neoh, K., Gilkes, H. and Rayment, C., 2018. A qualitative study using semi-structured interviews of palliative care patients' views on corneal donation and the timing of its discussion. *Palliative Medicine*, 32(8), pp. 1428–1437.

Walther, G., 2016. Developing an 'ethics for neuroscientists' course: between emancipation, practicality, and postmodernity in educational action research. *Educational Action Research*, 24(4), pp. 571–582.

Walton, E., 2011. Getting inclusion right in South Africa. *Intervention in School and Clinic*, 46(4), pp. 240–245.

Wang, V.C.X. 2013. *Handbook of research on teaching and learning in K-20 education.* Chicago: Macmillan.

Wang, V.X. (Ed.), 2018. *Critical theory and transformative learning*. IGI Global.

Wasserman, E. and Zwebner, Y., 2017. Communication between teachers and parents using the WhatsApp application. *International Journal of Learning, Teaching and Educational Research*, 16(12), pp. 1–12.

Wasserman, I.C., 2018. Participants as collaborators: Coordinated Management of Meaning (CMM) as collaborative research method. In L. BooysenL, R. Bendl and J. Pringle (Eds.), *Handbook of research methods in diversity management*. Edward Elgar Publishing. pp. 247–269.

Weimer, M., 2013. *Learner centred teaching: five key changes to practice,* 2nd ed. San Francisco: Jossey-Bass.

Wheatland, T., 2009. *The Frankfurt School in exile*. Minneapolis: University of Minnesota Press.

Whitehead, J., Delong, J. and Huxtable, M., 2017. Participation and democratization of Knowledge: Living theory research for reconciliation. Conference of the Action Research Network of the Americas (ARNA 2017), 12–16 June 2017, Cartagena, Colombia. (Unpublished)

Wigston, D. 2007. Empirical or critical communication research? *Communicatio: South African Journal for Communication Theory and Research,* 41(1), pp. 32–47.

Wirtz, A.L., Cooney, E.E., Chaudhry, A. and Reisner, S.L., 2019. Computer-mediated communication to facilitate synchronous online focus group discussions: Feasibility Study for qualitative HIV research among transgender women across the United States. *Journal of Medical Internet Research*, 21(3), pp. 1256.

Woodford, C., 2018. Critical theory today: missing emancipation. *European Political Science,* 17, pp. 313–317.

Woodin, T., Carter, V.C. and Fletcher, L., 2010. Vision and change in biology undergraduate education, a call for action—initial responses. *CBE—Life Sciences Education*, 9(2), pp. 71–73.

Woodyatt, C.R., Finneran, C.A. and Stephenson, R., 2016. In-person versus online focus group discussions: A comparative analysis of data quality. *Qualitative Health Research*, 26(6), pp. 741–749.

Wynne‐Jones, S., North, P. and Routledge, P., 2015. Practising participatory geographies: potentials, problems and politics. *Area*, 47(3), pp. 218–221.

Yan, J., 2016. Discussion on the mode of art education resources sharing between universities and primary and secondary schools. In *2016 3rd International Conference on Education, Language, Art and Inter-cultural Communication (ICELAIC 2016)*. Atlantis Press.

Yanar, Z.M., Fazli, M., Rahman, J. and Farthing, R., 2016. Research ethics committees and participatory action research with young people: the politics of voice. *Journal of Empirical Research on Human Research Ethics*, 11(2), pp. 122–128.

Yates, J. and Leggett, T., 2016. Qualitative research: An introduction. *Radiologic Technology*, 88(2), pp. 225–231.

Yikici, B., Altinay, Z., Altinay, F. and Dagli, G., 2016. The evaluation of strategies used to improve teaching and learning in education society. *The Anthropologist*, 23(3), pp. 462–479.

Young, S. and Sternoa, B.M. 2011. Practicing culturally responsive pedagogy in physical education. *Journal of Modern Education Review,* 1(2011), pp. 1–9.

Yulianti, K., Denessen, E.J.P.G. and Droop, M., 2018. The effects of parental involvement on children's education: A study in elementary schools in Indonesia. *International Journal about Parents in Education*, 10(1), pp. 14–32.

Yulianti, K., Denessen, E., Droop, M. and Veerman, G.J., 2019. Transformational leadership for parental involvement: How teachers perceive the school leadership practices to promote parental involvement in children’s education. *Leadership and Policy in Schools*, October, pp.1–16. Doi: 10.1080/15700763.2019.1668424

Yusuf, M.O. and Afolabi, A.O., 2010. Effects of computer assisted instruction (CAI) on secondary school students' performance in biology. *Turkish Online Journal of Educational Technology-TOJET*, 9(1), pp. 62–69.

Zeidan, A., 2010. The relationship between Grade 11 Palestinian attitudes toward biology and their perceptions of the biology learning environment. *International Journal of Science and Mathematics Education*, 8(5), pp. 783–800.

Zisanhi, D. 2013. Challenges of using English as a medium of instruction in a South African context: A view from FET learners and educators (Unpublished Master's dissertation, Unisa, Pretoria).

Zuber-Skerritt, O., 2018. An educational framework for participatory action learning and action research (PALAR). *Educational Action Research*, 26(4), pp. 513–532.

APPENDICES

APPENDIX A: ETHICAL CLEARANCE

UNIVERSITY OF THE FREE STATE
UFS UV

GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

03-Nov-2019

Dear Miss Ndaba, Xolisile XP

Application Approved

Research Project Title:
A strategy to enhance the academic performance of grade 12 progressed learners in life science

Ethical Clearance number:
UFS-HSD2019/1522

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Prof Derek Litthauer
Chairperson: General/Human Research Ethics Committee

Digitally signed by Derek Litthauer
Date: 2019.11.03 20:28:51 +02'00'

205 Nelson Mandela Drive
Park West
Bloemfontein 9301
South Africa

P.O. Box 339
Bloemfontein 9300
Tel: 051 401 9398 / 7619 / 3682
RIMS@UFS.ac.za
www.ufs.ac.za

APPENDIX B: PERMISSION LETTER TO CONDUCT RESEARCH IN ESTCOURT

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma **Tel:** 033 392 1063 **Ref.:**2/4/8/1900

Xolisile Perseviarance Ndaba
P.O. Box 137
LOSKOP
3330

Dear Ms Ndaba

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"A STRATEGY TO ENHANCE ACADEMIC PERFORMANCE OF THE GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES"**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 12 August 2019 to 10 January 2022.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

Uthukela District

Dr. EV Nzama
Head of Department: Education
Date: 21 August 2019

APPENDIX C: CONSENT FORM: LEARNERS

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

RESEARCH STUDY INFORMATION LEAFLET AND PARENTAL CONSENT FORM

DATE

August-September 2019

TITLE OF THE RESEARCH PROJECT

A STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

RESEARCHERS NAME(S) AND CONTACT NUMBER:

Ndaba Xolisile Perseviarance *2009174075* *078 138 2954*

FACULTY AND DEPARTMENT:

Education

School of Education Studies

STUDYLEADER(S) NAME AND CONTACT NUMBER:

Dr Dube Bekithemba

+2758 718 5498/ +2760 429 5398

WHAT IS THIS RESEARCH PROJECT ALL ABOUT?

The aim of the study will be to design a strategy to enhance the academic performance of the Grade 12 progressed learners in life sciences. The study will provide insight into the causes of poor academic performance of progressed learners in Grade 12 and hopes to navigate and create an environment for both teachers and learners that is conducive to produce quality results in life sciences.

WHY HAVE YOUR CHILD BEEN INVITED TO TAKE PART IN THIS RESEARCH PROJECT?

I am asking for the permission to include your child in this study because he/she is doing life sciences in Grade 12. Your child has been selected by simple strategic sampling from the population of all Grade 12 progressed learners to participate. Your child will share his/her opinions and experiences as a progressed learner in life sciences.

WHO IS DOING THE RESEARCH?

I am Xolisile Ndaba, a Masters student from the University of the Free State (QwaQwa campus) supervised by Dr B. Dube. I am currently employed by the Department of Education in KwaZulu-Natal at Amahlubi Secondary School. I am conducting this research because I have observed that most of the progressed learners in Grade 12 performs poorly in life sciences. Therefore, the aim is to come up with a strategy to enhance the academic performance of the Grade 12 progressed learners in life sciences.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This study has received approval from the Research Ethics Committee of UFS. A copy of the approval letter can be obtained from the researcher.

Approval number: *to be advised.*

WHAT WILL HAPPEN TO YOUR CHILD IN THIS STUDY?

Participants will have to complete a questionnaire, whereby he or she select the relevant answer to the questions based on the Grade 12 progressed learners poor academic performance in life sciences and also participate in the focus group discussion. The questionnaire and the focus group discussion will be done during extra mural activity time (School sport's day), so that it cannot disrupt the teaching and learning. The questionnaire will take approximately 30 minutes to complete and focus group discussion may take 1 hour.

CAN ANYTHING BAD HAPPEN TO YOUR CHILD?

It is not anticipated that the participants will be at any risk during the study. However, the participants will be asked to nominate an adult who he or she will tell if something painful, scary or uncomfortable rises with or during the course of the study.

CAN ANYTHING GOOD HAPPEN TO YOUR CHILD?

Participation in the study may not result in any immediate and direct benefits for the participants. However, it is anticipated that the study will come up with a strategy to enhance academic performance of Grade 12 progressed learners in life sciences and create an

environment for both teachers and learners that will be conducive to produce quality results in life sciences.

WILL ANYONE KNOW YOUR CHILD IS PART OF THE STUDY?

Participation anonymity in the study will be kept confidential. Participants' names and their schools are not requested in this study therefore, obtained data will be treated with great confidentiality but the information about him/her will only be given to the study sponsor's the study sponsor.

WHO CAN YOU TALK TO ABOUT THE STUDY?

Apart from the child's headmaster, class educator and nominated adult, he or she may contact my supervisor Dr B. Dube directly to his phone number: +2760 429 5397 and email to: dubeb@ufs.ac.za if any problems arise regarding the study.

WHAT IF YOU DO NOT WANT YOUR CHILD TO DO THIS?

Your child participation in this study is entirely voluntary and he or she is under no obligation to take part in this study. Your child have a right to omit any question if so desired, or to withdraw before from discussing and answering the survey at any time without penalty. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. Please note that it will not be possible to withdraw from this study once I have submitted the questionnaire because of the non-identifiable material since none of your particulars are being required when completing the questionnaire and when participating in the focus group discussion.

PLEASE RETURN

Name of child: _____

Name of Parent: _____

Do you understand this research study and are you willing

- to let your child take part in it? Yes ☐ No ☐

Has the researcher answered all your questions? Yes ☐ No ☐

Do you understand that you can withdraw from the study at any time? Yes ☐ No ☐

I give the researcher permission to make use of the data gathered from

- my child's participation Yes ☐ No ☐

_____ _____

Signature of Parent *Date*

APPENDIX D: CONSENT FORM: TEACHERS

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

RESEARCH STUDY INFORMATION LEAFLET AND CONSENT FORM

DATE

August/ September 2019

TITLE OF THE RESEARCH PROJECT

A STRATEGY TO ENHANCE ACADEMIC PERFORMANCE OF THE GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

PRINCIPAL INVESTIGATOR / RESEARCHER(S) NAME(S) AND CONTACT NUMBER(S):

Ndaba Xolisile Perseviarance *2009174075* *078 138 2954078*

FACULTY AND DEPARTMENT:

Faculty: Education Faculty: Education

Department: School of Education Studies

STUDYLEADER(S) NAME AND CONTACT NUMBER:

Dr Dube Bekithemba

+2758 718 5498/ +2760 429 5398

WHAT IS THE AIM / PURPOSE OF THE STUDY?

The aim of the study will be to design a strategy to enhance the academic performance of the Grade 12 progressed learners in life sciences. The study will provide insight into the causes of poor academic performance of progressed learners in Grade 12 and hopes to navigate and create an environment for both teachers and learners that is conducive to produce quality results in life sciences.

WHO IS DOING THE RESEARCH?

I am Xolisile Ndaba, a Masters student from the University of the Free State (QwaQwa campus) supervised by Dr B. Dube. I am currently employed by the Department of Education in KwaZulu-Natal at Amahlubi Secondary School. I am conducting this research because I have observed that most of the progressed learners in Grade 12 performs poorly in life sciences. Therefore, the aim is to come up with a strategy to enhance the academic performance of the Grade 12 progressed learners in life sciences.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This study has received approval from the Research Ethics Committee of UFS. A copy of the approval letter can be obtained from the researcher.

Approval number: *to be advised.*

WHY ARE YOU INVITED TO TAKE PART IN THIS RESEARCH PROJECT?

You have been selected by simple strategic sampling from the population of all Grade 12 life sciences educators in the Uthukela District to participate in completion of questionnaire and focus group discussion based on a strategy to enhance the academic performance of the Grade 12 progressed learners in life sciences. You are being chosen to participate in this study because of your experience in teaching the progressed learners. Hence, I invite you to take part in this survey. Approximately, 5 schools that performs poorly in life sciences will participate, 3 progressed learners, parents, and teacher from each school and a subject advisor. Total participants will be 26.

WHAT IS THE NATURE OF PARTICIPATION IN THIS STUDY?

Participants will have to complete a questionnaire, whereby he or she select the relevant answer to the questions based on the Grade 12 progressed learners poor academic performance in life sciences and also participate in the focus group discussion. The questionnaire and focus group discussion will be done during extra mural activity time (School sport's day), so that it cannot disrupt the teaching and learning. The questionnaire will take approximately 30 minutes to complete and focus group discussion may take 1 hour. It is not anticipated that the participants will be at any risk during the study. However, the participants will be asked to nominate someone who he or she will tell if something painful, scary or uncomfortable rises with or during the course of the study.

CAN THE PARTICIPANT WITHDRAW FROM THE STUDY?

Participation in this study entirely is voluntary and there is no penalty or loss of benefit for non-participation. Being in this study you are under no obligation to consent to participation.

You have a right to omit any question if so desired, or to withdraw before from answering this survey at any time without penalty. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. Please note that it will not be possible to withdraw from this study once I have submitted the questionnaire because of the non-identifiable material since none of your particulars are being required when completing the questionnaire. With focus group discussion the participant is allowed to withdraw at any time.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

Participation in the study may not result in any immediate and direct benefits for the participants. However, it is anticipated that the study will come up with a strategy to enhance academic performance of Grade 12 progressed learners in life sciences and create an environment for both teachers and learners that will be conducive to produce quality results in life sciences. Participation anonymity in the study will be kept confidential. Participants' names and their schools are not requested in this study therefore, obtained data will be treated with great confidentiality but the information about him/her will only be given to the study sponsor.

WHAT IS THE ANTICIPATED INCONVENIENCE OF TAKING PART IN THIS STUDY?

It is not anticipated that you will be at any risk arising out of or during the study. However you will be asked to nominate someone who you will tell if you are in pain, sick or in any way uncomfortable with or during the study. You are also free to contact the researcher directly or the supervisor of the researcher.

WILL WHAT I SAY BE KEPT CONFIDENTIAL?

Your names will not be recorded, anywhere and no one will be able to connect you to the answers you give. Your answers will be given a fictitious code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings. Your answers may be reviewed by people responsible for making sure that the research is done properly, including the transcriber, external coder, and the members of the Research Ethics Committee. These individuals will maintain confidentiality by signing a confidentiality agreement. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records. After accurately ensuring confidentiality on the data collected, your anonymous data may be used for other purposes, such as research report, journal articles and conference presentation. Privacy will be protected in any publication of the information by the use of code numbers and pseudonyms. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. Please not that since this study also include focus group discussion it is sometimes impossible to make an absolute guarantee of confidentiality and anonymity because a focus group discussion is based on the structured discussion between six to eight people, in which participants are provided with an opportunity and space to discuss a particular topic. While every effort will be made by the researcher to ensure that you will not be connected to the information that you share during the focus group, I cannot guarantee that other participants in the focus group will treat information confidentially. I shall, however, encourage all participants to do so. For this reason, I advise you not to disclose personally sensitive information in the focus group. You are allowed to refuse to take part even if you have agreed to participate. You can stop being in the study at any time without getting in trouble.

HOW WILL THE INFORMATION BE STORED AND ULTIMATELY DESTROYED?

Hard copies of your answers will be stored by the researcher for a period of five years in a locked cupboard/filing cabinet at the University of the Free State, QwaQwa campus for future research or academic purposes; electronic information will be stored on a password protected

computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies of data collected will be shredded at the University of the Free State after five years. The data stored on password protected computer will be deleted at the same time as the hard copy data will be shredded. There are no foreseeable risks about this study. Every data collected will be treated with great confidentiality a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Hard copies of data collected will be shredded at the University of the Free State after five years. The data stored on password protected computer will be deleted at the same time as the hard copy data will be shredded. There are no foreseeable risks about this study. Every data collected will be treated with great confidentiality.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICPATING IN THIS STUDY?

There will be no payment for participation in this study. You will not be asked to incur any expenses through your participation in the study.

HOW WILL THE PARTICIPANT BE INFORMED OF THE FINDINGS / RESULTS OF THE STUDY?

If you would like to be informed of the final research findings, please contact Xolisile Ndaba on 078 138 2954 or email me at 2009174075@ufs4life.ac.za or ndabax.p@webmail.co.za. The findings are accessible for 5 years. Please do not use home telephone numbers. Departmental and/or mobile phone numbers are acceptable. Should you require any further information or want to contact the researcher about any aspect of this study, please contact Xolisile Ndaba on the above contact details. Should you have concerns about the way in which the research has been conducted, you may contact Dr Bekithemba Dube on +2760 429 5398/ +2758 7185498 or email at dubeb@ufs.ac.za.

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

CONSENT TO PARTICIPATE IN THIS STUDY

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

I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable). I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

I agree to the recording of the *questionnaire and focus group discussion*.

I have received a signed copy of the informed consent agreement.

Full Name of Participant: _____

Signature of Participant: _____ Date: _____

Full Name(s) of Researcher(s): _____

Signature of Researcher: _____ Date: _____

APPENDIX E: EMPIRICAL DATA GENERATION FROM WHATSAPP GROUP: LEARNERS

WELCOMING NOTE: (WHATSAPP GROUP DISCUSSION)

Researcher	Good morning and thank you so much guys for being part of my study in this difficult time that we are facing in our country. Please guys, we are facing covid-19 and it is real. Please stay at home and be safe. Dear learners let us please co-operate with these ground rules for our WhatsApp group : NB: Please note that some of these ground rule were raised participants 1. Please DO NOT Mention your identity (name and surname) or disclose your personal sensitive information in the group. 2. Feel free to DIRECT MESSAGE to the researcher if you have to. 3. Participation in this study is VOLUNTARY. 4. RESPECT and PROFESSIONALISM is highly appreciated. 5. Messages should only be broadcasted between 10h00 am to 12:00 pm. 6. All RESPONSES are valid- there is NO right or wrong answers. 7. Participants are welcome to ask for CLARIFICATION. 8. Kindly stick on the relevant topic.

	Thank you in advance for your cooperation and commitment. Learners, tomorrow we will be discussing about the challenges you are facing in learning Life sciences. NB: Please kindly make yourself available at 10am to 12 pm to discuss.
Olwethu	Ok Ms will do. Thank you. We start at what time miss?
Researcher	Thank Olwethu. Guys let us discuss the time that will be convenient to all of us.
Mbali	Morning. I suggest 10h00am-12h00pm. Just for two hours. I think it will be suitable for all of us.
Nokuphiwa	Seconded! Two hours is fine for me.
Researcher	Alright guys. Thank you once more. Let us all be online at 10h00am. And kindly please comply with the covid-19 regulations. Please stay home and wear your musk at all times. Tomorrow we will also be joined by my supervisor Dr Dube to observe the proceedings of my data collection. Enjoy your day guys. Thank you!

CHALLENGES EXPERIENCED BY PROGRESSED LEARNERS IN LIFE SCIENCES	
Researcher	Morning and welcome leaners. Thank you for the opportunity that you have given me. Today we will be discussing about the challenges that life sciences progressed learners are experiencing in life sciences.
Dr B. Dube(Supervisor)	Welcome leaners. Your participation will be highly appreciated. If you have concerns regarding the study, please feel free to contact me on my numbers noted on the consent forms that you received. Stay home and be safe.
Mhlengih	Thank you Sir.
Researcher	So learners let get into business of the days. To remind you once more. Today we are looking at the challenges that you are facing as progressed learners, at the same time we can also coming up with the solutions to overcome those challenges.
Nokwanda	Morning everyone. OK I think as Life Sciences learners we need a small workshop from Grade 9 teachers advising us what is expected from Grade 10-12 when choosing

	subjects like Life Sciences and what is expected from us, when choosing life sciences as one of our major subject.
Researcher	That a very good point. You mean it happens that you choose a subject without having enough knowledge about of what the subject entails?
Mbali	Exactly Miss. And to add on that I think life sciences should be taught by one teacher because you get used to his/ her teaching styles, being taught by many teachers in one subject confuses me a lot.
Mhlengih	Haaa! Mbali, I don't agree with you on that one. What if we were taught by an incompetence teacher for an entire year? We are lucky because out teacher is so competence and she's paying attention to us progressed learners. For other learners who are not lucky, I think collaboration of teachers in life sciences will work for them in order to improve their performances.
Olwethu	Yes! That is so true Mhlengih. I fully agree with you.
Nokwanda	Yes Mhlengih, I'm also with you on that one. I strongly agree with you. And to add on your point. We as progressed learners we prefer to be taught by newly qualified teachers because it seems that the old teachers do not understand what the new curriculum really want them to do!

Mhlengih	Exactly! Newly qualified teachers will understand us better than the old teachers.
Researcher	You are raising a very good point learners. Let's continue.
Olwethu	Yes miss. New qualified teacher are also familiar with the use of technology. Just like you miss, you play videos for us for each and every topic and thus help us to understand life sciences better.
Mhlengih	Another problem miss that I'm having in life sciences is the terminology. Life sciences is so tricky for me. When it comes to meiosis, protein synthesis is the main problem for me, I'm struggling to differentiate the steps of DNA transcription and DNA replication.
Nokuphiwa	Morning guys, I'm sorry for being late. I agree with you Mhlengih. I am also having the same problem.
Olwethu	We have a negative attitude towards life sciences because it has difficult words that are even hard to pronounce. And it demotivate us even more if the teacher is moving at a higher pace and we ended up losing interest completely.

Mbali	Yes! Olwethu, thank for raising that point. Life sciences need time on each topic for us to understand it better. And more revision.
Nokwanda	Bafethu! Life science Terminologies are simple just that they are all nearly the same. Only you need to do is to practice them daily.
Researcher	Thank you Olwethu. Your point is noted.
Olwethu	There's another important point that I want to raise miss. Life sciences is an interesting subject but I'm struggling a lot to memorise some content because of the shortage of textbooks and laboratory equipment for life sciences at our school.
Mhlengih	Haaa! Olwethu, thanks man for raising that point. At my school we do have a life sciences laboratory but we have never used it ever because of the shortage of equipment, text books and study guides are not enough for all of us. We are sharing in pairs. This make it hard for me to use the study guides and textbook because the partner that I'm sharing with always says he forgot the study guide at home.
Mhlengih	Another thing miss, I think our parents need to understand that we are doing matric so, in some of the house duties we must not be involved because we need to focus on our studies.

Mbali	Yeah Mhlengih. Our parents don't understand that we need them to be involved in our school work so, that they can be able to help us where they can.
Nokuphiwa	Yooh! Guys, please say that again. When I arrive at home from school I have to cook and bath the kids. I don't have time for homework's because the time I finish, I'm already dead.
Researcher	Wow guys! Im so impressed by your participation and contribution. Thank you so much. Tomorrow we will be discussing about the solutions to the problems that you have noted. Have a lovely day.
Mbali	Thank you miss. Same time tomorrow?
Mhlengih	Yes! Thank you miss.

SOLUTIONS TO IMPROVE THE PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Good morning learners. I hope you all had a very good night sleep. Today we will be discussing the solutions to the problems that you have noted yesterday. I welcome all of you.
Nokwanda	Morning miss. Thank you. Nokuphiwa, I hope you are not late today.
Nokuphiwa	Hahaha! I'm early today. Morning all.
Olwethu	Morning. My suggestion on choosing life sciences stream in Grade 10. I think we really need a workshop in Grade 9 and the school should set requirements that in order to do life science you need certain marks at the end of Grade 9 to do life science in Grade 10 so that there won't be a problem with learners failing life science.
Mhlengih	Yes, I agree with you on that one. My suggestion is based on the motivation of learning life sciences. We, progressed learners we are not self-motivated of which

	makes us not take our school work seriously. I think our life sciences teacher should motivate us and encourage us to study every day.
Researcher	That is a good point Mhlengih. Thank you. Do you think negative attitude have any influence on the subject?
Olwethu	Yes, it counts miss because if u don't like the subject you will never pass it.
Nokwanda	Another helpful strategy on life sciences terminology. Our teacher needs to teach us as learners on how to pronounce and write the terms. By writing a list of terms on the chalkboard and let us write the description or write the description and let us write the correct term.
Researcher	That is a very good point Nokwanda. It’s noted. Thank you.
Olwethu	I think it’s going to be better if we learn a topic and watch a movie based on that topic. It will help us to remember very quickly. Watching a video on mitosis make us to understanding it better and be able to different it from meiosis

Mbali	I agree with you Olwethu, especially on meiosis and genetics.
Researcher	It’s noted Olwethu, that’s a very good suggestion. Another suggestion guys.
Mhlengih	To be taught by teachers whose subject specialisation is not life sciences lack the use of available life sciences equipment because he/she is lacking practical investigation skills.
Nokuphiwa	Yes! Mhlengih. I strongly agree with you. I’m still struggling to differentiate the validity and reliability. I wish my teacher can make more clarity on that one.
Olwethu	We as progressed learners we not disciplined. Being disciplined as a learner changes a bad attitude.
Nokwanda	We need competent teachers whose specialisation is life sciences. Therefore, it will be easier for us to understand the subject content better.
Mbali	During camps it’s chaotic Mem. I think parents should also be involved during camps so, that they will help teachers to monitor us.

Nokwanda	Mem, I think teacher should further their studies in order to be in line with the new education system, it is important for our Life Sciences teachers to attend relevant workshops assigned by Dept of Education and collaborate with other teachers and share their teaching methods.
Nokuphiwa	Please guys, don't forget our parents. They also need a workshop on how to treat us when we are doing Grade 12. We need time to focus. They really need to understand that.
Olwethu	Yes! Nokuphiwa. My mom really need to attend that workshop. She really contribute to my bad performances in life sciences.
Researcher	Yooh guys. Your participation is amazing. Please continue with that spirit. You are noting very good and significant solutions. Thank you so much. Let us continue tomorrow. If you are running out of data. Please don't hesitate to inbox me so that I can sort you. Tomorrow we will be looking at the conditions for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. When we talk about the conditions we are referring on what has been done to help in improving the academic performances of progressed learners in life sciences. Have a lovely day my good people!

Nokuphiwa	Wow! Thanks miss. That is so generous of you. Have a lovely day too.
Olwethu	Thank you Mem. Same time, same place!

CONDITIONS FOR THE SUCCESSFUL IMPLEMENTATION OF A STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Good morning learners. In today's discussion we will be looking at the conditions for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. Yesterday I highlighted that conditions are referred on what has been done to help in improving the academic performances of progressed learners in life sciences.
Nokwanda	Morning guys.

Mbali	Morning everyone. The first condition that I can identify is that extra classes and camps works for us. Our Teacher is able to finish the curriculum on time so that we can go back and feel the gaps where we missed the topic and as we need to be attended individually. Am I correct guys?
Mhlengih	Yes, you are correct Mbali.
Nokuphiwa	Collaboration of English teachers and life sciences teachers really works for us in understanding the life sciences terms better.
Olwethu	Yes Nokuphiwa. It really helps a lot. Being poor in English affects our performance in life science because life science is a subject that is taught in English and which has tough terminologies and if you are good in English you will understand what is being asked in a statement or question.
Mbali	Yes Olwethu. I fully agree with you. I'm from a rural school and in rural schools most of us are exposed to English when we are only at school, teachers try their best in teaching us the content and the vocabulary.
Nokwanda	At my school we are lucky that we have many teachers who are teaching life sciences.

Researcher	How is it advantage you as progressed learners?
Nokwanda	It is an advantage us because we are able to get assistance to any teacher whenever we need help regarding life sciences. And our teachers' team work when it comes to challenging topics.
Olwethu	Watching a video helps a lot since some learners are visual, so having videos on a particular topic could help a lot.
Mhlengih	I think Mem we can proceeding to the next topic while we are still thinking of the conditions.
Researcher	I agree with you Mhlengih. Guys our next topic are the threats that can hinder the success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. For example: bad attitude leads to bad performances. I hope we all get that.
Mhlengih	Yes Miss.

Olwethu	Yes Miss. Let’s continue. I have a signal problem, I think it is because of load shedding.

THREATS THAT CAN HINDER THE SUCCESS OF THE STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Ok, learners let us continue with the threats as they are the opposite of the conditions as they hinder the success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.
Mhlengih	Yes Mem, threat are the opposite of the conditions? Am I correct?
Researcher	Yes, Mhlengih you are correct.
Mhlengih	Mem, most of us as progressed learners do not attend camps and holiday classes that always impact our performances in life sciences since we are losing the content that was taught on that particular day.

Researcher	Thank you so much Mhlengih, that a very good point.
Olwethu	During camps and extra classes most of the learners lack disciple especially us the progressed learners.
Mhlengih	I agree with Olwethu. We lack discipline, we don’t have respect for our teachers during camps because of overcrowding. Some learners attend classes when they feel like.
Mbali	Being disciplined have many benefits such as when you are disciplined you will be able to work with others and you will be able to listen to instructions and you won’t wait for the teacher to tell you to study you will be ahead already.
Researcher	That is true Mbali. Thank you. Any threat, guys?
Olwethu	Understanding and writing English is the main problem for us progressed learners that's why we have the difficulty in understanding the meaning of words in exams and that makes us fail.
Nokwanda	Yes, English is very challenging when we write exams you find out that I can be able understand what the question wants but I don't have a proper way to answer the question correctly.

Mhlengih	I agree with guys.
Researcher	Let’s call it a day guys. Thank you so much for you participation. Let us meet tomorrow same time, same WhatsApp group! Tomorrow is our final meeting and we will be discussing about the anticipated successes of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. Here we will be discussing what are your expectations from this study, for example: I'm expecting this study to create a positive attitude of leaners and teachers towards life sciences. Have a lovely day learners!
Olwethu	Thank you Mem.

ANTICIPATED SUCCESSES OF THE STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES.

Researcher	Good morning all. Today is our last day and I would like to take this opportunity to pass my gratitude to all of you by participating in this study. Our today’s topic is based on the anticipated success as I highlighted to you yesterday.

Nokuphiwa	Morning guys. My anticipated success for this study is to encourage our teachers to give us our marked scripts and feedback on time so that we can also be able to monitor our achievement.
Mhlengih	Seconded Nokuphiwa. I strongly agree with you.
Nokwanda	Another thing that will encourage us to get high marks scores is that our life sciences teachers should rewards us with anything or R10-R20 each learner that scored maybe 70% and up wards.
Olwethu	Hahaha…! I like the sound of that Nokwanda.
Mbali	I also hoping this study will encourage our parents to support us as they will motivate us not to give up easily when we feel discouraged and not to bunk classes as they will monitor our school attendance.
Mhlengih	Can this study encourage anyone who can be able to donate textbooks to us, so that all of us can have individual textbook. And maybe with the laboratory equipment's for the practicals.

Researcher	Learners, I'm so impressed. Thank you so much for your participation. I really don't know how I can show my appreciations to you. Thank you so much for your willingness, time and commitment to participate in this study. If you need any help regarding life sciences. I'm willing to help. You can inbox me on my WhatsApp. Thank you so much once more for your contributions May Almighty God bless you abundantly!
Nokwanda Mbali Nokuphiwa Olwethu Mhlengih	Thank you so much Miss, we also benefited a lot from your study. Be blessed too.

APPENDIX F: EMPIRICAL DATA GENERATION FROM WHATSAPP GROUP: TEACHERS

WELCOMING NOTE: (WHATSAPP GROUP DISCUSSION)

Researcher	Good morning colleagues and thank you so much for being part of my study in this difficult time that we are facing in our country. Please guys, we are facing covid-19 and it is real. Please stay at home and be safe. Dear colleagues let us please co-operate with these ground rules for our WhatsApp group : NB: Please note that some of these ground rule were raised participants 1. Please DO NOT Mention your identity (name and surname) or disclose your personal sensitive information in the group. 2. Feel free to DIRECT MESSAGE to the researcher if you have to. 3. Participation in this study is VOLUNTARY. 4. RESPECT and PROFESSIONALISM is highly appreciated. 5. Messages should only be broadcasted between 10h00 am to 12:00 pm. 6. All RESPONSES are valid- there is NO right or wrong answers. 7. Participants are welcome to ask for CLARIFICATION. 8. Kindly stick on the relevant topic.

	Thank you in advance for your cooperation and commitment. Colleagues, tomorrow we will be discussing the challenges you are facing in learning Life sciences. NB: Please kindly make yourself available at 10am to 12 pm to discuss.
Qhawe	Morning to you too. You are welcome!
Thando	Morning all. Thank you for the invite.

CHALLENGES EXPERIENCED BY PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Morning and welcome colleagues. Thank you for the opportunity that you have given me. Today we will be discussing about the challenges that life sciences progressed learners are experiencing in life sciences.
Mthombeni	Morning Miss Ndaba. Thank you for the invite.
Dr Dube (Supervisor)	Welcome colleagues. Your participation will be highly appreciated. If you have concerns regarding the study, please feel free to contact me on my numbers noted on the consent forms that you received and signed. Stay home and be safe.
Researcher	Colleagues, to remind you once more. Today we are looking at the challenges that you are facing as progressed learners, at the same time we can also

	coming up with the solutions to overcome those challenges.
Dr Dube (Supervisor)	Thanks colleagues hope to learn a lot.
Qhawe	Good morning all. I think the shortage of trained educators in Life Sciences is a very big challenge for progressed learners because those teachers are not familiar with the new methods and strategies to be utilise in a diverse classroom.
Researcher	Ok that's so interesting. Can you kindly elaborate further on that point?
Qhawe	The shortage of trained educators in Life Sciences is a very big challenge for progressed learners because teachers play a significant role in the performance of learners meaning they should be passionate about teaching Life Sciences, understand the terms as they are and that it is not an easy subject but needs to be practised daily in order to enjoy it. That will also help learners to fall in love with the subjects of their educator knows his or her story.
Mabaso	Morning. To add on that one. The teacher who is not well trained for life sciences could display a negative attitude towards the subject and that might affect the learners' attitude towards the subject especially the progressed learners.
Researcher	That's so true. Thanks for your effective participation.

Qhawe	Another challenge that I think the progressed learners come across with in life sciences are the concepts or terminologies. Terminologies is the main problem especially for progressed learners. They mostly lack understanding of them and sometimes reading their text books and slides can make them think they know the terms very well.
Thando	I believe, the grasp of understanding the terminology used in life science, is by breaking up the words (especially long words) in most cases they are two part word and can help with proper pronunciation of words and understanding.
Mazibuko	I think progressed learners are lazy to study. Life sciences is pure science and it requires learners to study it every day. I'm not sure if the problem is with the teacher or the progressed learners?
Qhawe	I agree with you Mazibuko. Life sciences requires application. Especially in genetics. It requires learners to recall the rules and theories of which they are more similar but applied differently. So if the teacher's pace will be faster. Learners will find it difficult to see the differences and similarities between genetics theories.
Mthombeni	Sometimes reading their text books and slides can make them think they know the terms very well.
Mabaso	Yes, only to find out that they won't be able to recall them because they never practice how to pronounce and write them.
MaCingwane	Morning colleagues. Progressed learner have a negative attitude towards life sciences and they lack motivation. I don't think they are lazy.

Mabaso	Being progressed kills self-esteem some progressed learners they have been progressed most of their schooling that make these learners feel incompetent. Teaching them life science is just too much for them and saps the negative attitude to the teacher.
MaCingwane	The lack of resources like laboratory facilities also contribute to the poor performance of progressed learners, life sciences is a practical subject and learners needs to perform practical activities. Some of the topics in life sciences need to be taught through by conducting experiments in a laboratory.
Mazibuko	I also believe more practicals which can help with visual memory. It is not easy to forget what you have seen.
Thando	Learners who lack attention from their parents tend to be underperforming in their studies than those who does get attention and support from their parents. Parental involvement solve many educational problems concerning their children.
Mazibuko	Lack of parental support is one of the factors faced by progressed learners. Parental support plays an important role in the learner's academic success. If the parents don't bother themselves about the learner's academic, the learner will be demotivated. Subject like Life Sciences requires a learner to do a lot of studying to understand it better. Parents can help the learner by encouraging he or she to study and also ask a learner to identify the challenges he or she experience in the subject.

Researcher	That's a good point colleague. To add on that one. Parental involvement plays a significant role in each and every child's life. Parents are considered to be the first teacher. Parental involvement does not contribute on the well- being of a child but it also enhance the child's attitude towards his/her academic performance and promotes good behaviour and taking responsibilities. Colleagues thank you so much for your contributions. Tomorrow we will be discussing about the solutions to the problems that you have noted today. Have a lovely day!
Qhawe	Thank you Ms Ndaba. Colleagues, the starting time is 10h00am, let us all be online by that time.
Researcher	Thank you so much Qhawe.

SOLUTIONS TO IMPROVE THE PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Good morning colleagues. I hope you all had a very good night sleep. Today we will be discussing the solutions to the problems that you have identified yesterday. I welcome all of you.

Mthombeni	Morning all.
Qhawe	Morning colleagues. My solution is based on the insufficient of trained teachers in life sciences. We, as life sciences educators, we need to be effectively and sufficiently grounded in the scientific knowledge and understanding of life Sciences and we should be able to apply the best and relevant methods that would help us to produce good results for progressed leaners in the classroom.
Mthombeni	I agree with you Qhawe. My worry is that in many schools learners are made to do life Science in the General stream and most of the learners who are in the General stream struggle to understand and enjoy Life sciences because it link more with science subjects. The solution in this one is that only learners who are in the science stream should learn life sciences.
Researcher	Thank you Mthombeni.
Mabaso	Morning all. Learners are different, unique individuals and their level of thinking is not the same. I suggest that life sciences should have various syllabus to cater different learners. Back in the years, we used to have standard Grade and higher Grade systems in [life sciences].
Mazibuko	That is so true Mabaso. Life science has its own language each chapter, each unit moreover each page of the book has new term to learn, to understand, to spell, to pronounce and to use.

MaCingwane	Yes! Exactly my point. I suggest that the DBE should adopt the inclusive approach that will specify the minimum requirements for each learner and acknowledges their potentials in order to receive the necessary support.
Mazibuko	Guys, don’t you think this will be a burden to us, as it going to add an extra work by catering each learner’s needs and our classes are overloaded already. I see this idea as time consuming and we do not have enough time.
Thando	I agree with you Mazibuko. At least if the DBE could minimise the content to be taught to learners.
Mabaso	Our laboratories should be fully equipped with the best teaching aids and progressed learners should be given practical worksheet to help them understand.
Researcher	Yes. That's will be the best strategy to help progressed learners to be ‘hands-on' to improve their understanding.
Qhawe	Positive attitude contributes to positive results, attitude towards the Life Sciences affects the whole career choices of learners. Learners need to be motivated in order to change their negative attitude towards the subject as it going to affect their performance.
MaCingwane	Progressed learners especially in life sciences needs a teacher who is dedicated and optimistic because even the simplest task can become long and difficult for progressed leaners to master. It is at

	times like this that teachers must offer hope and encouragement by celebrating any and all victories no matter how big or small the accomplishment is. This will enables learners to participate actively and build their confidence.
Mazibuko	Parents can help the learner by encouraging he or she to study and also ask a learner to identify the challenges he or she experience in the subject. If the learner identifies his or her weaknesses in Life sciences, the parent can discuss these challenges together with subject teacher to help learner.
Mthombeni	Yes colleague, parental involvement plays a significant role in each and every child's life. Parents are considered to be the first teacher. Parental involvement does not contribute only on the well-being of a child but it also enhance the child's attitude towards his/her academic performance and promotes good behaviour and taking of responsibilities.
Qhawe	The learners who get more attention from their parents tend to be more successful in their studies than those who does not get attention and support from their parents.
Researcher	Colleagues, thank you so much for your active participation and inputs. We have managed to identify the challenges and solutions. And that means a lot to me. Thank you once again. Tomorrow colleagues we will be discussing about the Conditions for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners. Same time, same WhatsApp group.
Dr Dube (Supervisor)	Noted Me Ndaba.

Thando	You are welcome dear.
Mthombeni	Thanks.

CONDITIONS FOR THE SUCCESSFUL IMPLEMENTATION OF A STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Colleagues, good morning and welcome! I hope you had a great night. Today colleagues we will be discussing about the conditions for the successful implementation of a strategy to enhance the academic performance of Grade 12 progressed learners. To clarify on today's discussion, we are looking at the things such as interventions that might help the progressed learners to improve their academic performances.
Qhawe	Morning to you too Ms.
Mazibuko	Morning colleagues. I think one of the ways which may be effective to enhance the performance of Grade 12 progressed learners in life sciences is to attend camps and extra classes. As it helps them to understand the content better as they are also able to discuss the challenging topics in groups.

Qhawe	I also think attending the school camps during holidays and extra classes are the most valuable and successful strategies in helping the Grade 12's especially the progressed learners as they are taught by different professional educators with lots of experience.
Thando	Yes, camps and extra lessons really works for my progressed learners.
Mazibuko	Progressed learners have been encourage to participate and co-operate with other learners during tutorial lessons in order to be free in asking questions and assistance from their peers.
Researcher	That's absolutely correct. In this regard tutorial lesson will help progressed learners not to struggle alone but be able to work smarter in groups with other learners by sharing knowledge and experiences in finding a solution to a common problem.
Mthombeni	If a learner lack English proficiency as a medium of instruction, it's easy for that learner to performs poorly because he/she will fail to understand and communicate his/her ideas in English since life sciences is read and taught in English. English educators should play a big role especially in the essay writing questions.
MaCingwane	That's so true. To add on that one. If a learner lack English proficiency as a medium of instruction, it's easy for that learner to perform poorly because he/she will fail to understand and communicate his/her ideas in English. Proficiency in English lead to good academic performance as learners will be able to understand Life Sciences language interpretation very well.

Qhawe	Educators attend relevant Life Sciences workshops assigned by the Dept of Education twice in a term to check and guide them if they're following the right teaching procedures and methods as they're advised and team-teaching is mostly advised.
Thando	Teachers who attend life sciences workshops are usually equipped with various methods of teaching which involves the progressed learners.
MaCingwane	That's a good point. During workshops, we collaborate in life sciences teaching and curriculum delivery to modify teaching methods and styles to meet present standards.
Researcher	Colleagues I really appreciate your spirit and commitment. I've run out of words of how can I thank you. Thank you so much colleagues. Our next topic are the threats that can hinder the success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences. For example: bad attitude leads to bad performances.
MaCingwane Thando Mabaso Qhawe Mazibuko	You are welcome Ms Ndaba.

THREATS THAT CAN HINDER THE SUCCESS OF THE STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Good morning colleagues, many of our colleagues have indicated that there will be a load shedding in their areas so, I'm pleading to you colleagues for us to do two topics today. We will discuss the threats as they are the opposite of the conditions as they hinder the success of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences and also the anticipated successes of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.
MaCingwane	Morning to you too Ms Ndaba, that is so true and when load shedding occurs we also lost the network signal.
Qhawe	Morning. Most of the progressed learners do not attend camps and extra classes and that impact their performance negatively.
Thando	Yes Qhawe. Progressed learners take such programmes for granted. They know that they would be available to them in every term. They mostly absent themselves.
Mazibuko	To add on that one. For me, it is really hard to teach the progressed learners during camps. They are impulsive, some they leave while the lesson is in progress and some absent themselves.
Thando	The lack of English proficiency in progressed learners arises the negative attitude and pose anxiety towards life sciences. In rural schools most learners are exposed to English when they are only

	at school in the formal context but teachers try their best to extend learners knowledge of concepts and add learners' basic vocabulary that could help them in answering the questions.
MaCingwane	I for one I can agree with your point. I used to teach at a rural school and most of the progressed learners comes from rural environments and they are only exposed to English when they are at school, bearing in mind that even their parents are helpless because they didn't even finished their formal education. And thus add a huge burden to them to cope with language comprehension.
	Most of the teachers do not attend workshops and they end-up lacking to use numerous teaching methods and styles that will cater for different learners.
MaCingwane	Attending workshops helped me a lot as I was able to learn new skills on how best other topics would be treated in life sciences.
Mabaso	Teachers need to attend relevant life sciences workshops in order to dispense the life sciences curriculum to the learners effectively.
Researcher	Thank you so much colleagues, let us now discuss the anticipated successes of the strategy to enhance the academic performance of Grade 12 progressed learners in life sciences.
Qhawe	Alright Ms. No problem.
Thando	You are mostly welcome. Let's continue.

ANTICIPATED SUCCESSES OF THE STRATEGY TO ENHANCE THE ACADEMIC PERFORMANCE OF GRADE 12 PROGRESSED LEARNERS IN LIFE SCIENCES

Researcher	Colleagues, anticipated success is based on your expectations from this study. For example, I'm expecting this study to create a positive attitude of progressed learners towards life sciences.
Thando	Alright, I hope this study will be able to help us life sciences teachers and our progressed learners and also the curriculum planners to be able to organise a curriculum that will cater all learners according to their capabilities.
Qhawe	This study should help us life sciences teachers to be mostly involved in the curriculum development since we are the one who implement it and delivers the content to the learners and how these learners should be assessed.
Mabaso	In this study it must be raised that life sciences teachers that are teaching during weekends and holidays should be receiving incentives as a token of appreciation and encouragement.
MaCingwane	Seconded!
Mazibuko	The Department of Basic Education should recruit life science teachers by giving them bursaries to further their studies part time as to be in line with the changing time of the fourth industrial revolution.

MaCingwane	I hope this study will also encourage the schools to improvise for the use wall charts at least as they will assist to simulate the real life situation to improve progressed learners' performance.
Thando	Yeah! At least MaCingwane, charts will do.
Researcher	Colleagues, I'm astonished. I've ran out of words on how to thank you. I really don't know how I can show my appreciations to you. Thank you so much for your willingness, time and commitment to participate in this study. Be blessed!
Dr. Dube(Supervisor)	Thanks colleagues for assisting Ms Ndaba. We really appreciate and Me Ndaba will convey her thanks on her dissertation for the good work you have done.
MaCingwane Thando Mabaso Qhawe Mazibuko	You are welcome Ms. We have also learnt a lot from your study. Thanks to you too.