AN EXPLORATION OF FACTORS WHICH INFLUENCE THE PERFORMANCE OF GRADE 12 LIFE SCIENCES LEARNERS IN TWO HIGH SCHOOLS IN THE RURAL AREAS SURROUNDING MTHATHA: VOICES OF LEARNERS

By

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DECLARATION

I, Sihele Thamsanqa declare that:

(i) The research reported in this thesis, except where otherwise indicated, is my original work.

(ii) This thesis has not been submitted for any degree or examination at any other university.

(iii) This thesis does not contain other persons' data, pictures, graphs or other information unless specifically acknowledged as being sourced from other persons.

(iv) This thesis does not contain other persons' writing unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

(a) Their words have been re-written, but the general information attributed to them has been acknowledged; and

(b) Where their exact words have been used, their writing has been placed within quotation marks, and referenced.

(v) The work described in this thesis was carried out in the School of Education, University of KwaZulu-Natal, from February 2015 to November 2017 under the supervision of Prof. R. Mudaly (Supervisor)

(vi) Ethical clearance No. HSS/1852/015M was granted prior to undertaking the fieldwork.

Signed: _____ _____ Date: 28 April 2019

As the candidate's supervisor I, Professor Ronicka Mudaly, agree to the submission of this thesis. Signed: ___ _____ Date: 28 April 2019

DEDICATION

This thesis is dedicated to the memory of my late grandmother, Gxunyekwa Sihele and my mother Nonvuselelo Sihele.

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ABSTRACT

The high failure rate among learners at schools in rural settings has serious implications for their pursuance of further education. Many learners in rural settings fail Life Sciences, and many of those who pass the subject perform too poorly to achieve the required levels for entrance into higher education. Consequently, many learners lose interest in further education and in effect give up on any chance of achieving success in life.

This study sought to uncover learners' views about the reasons for their performance in Life Sciences at schools in rural settings. It was conducted using the interpretivist paradigm. Literature which was consulted reports on and discusses issues concerning teaching and learning materials, the medium of instruction, parental support to learners, and attitudes of learners towards teaching and learning Life Sciences. Twenty Grade 12 learners studying Life Sciences from two different high schools situated in Mthatha, Eastern Cape, South Africa, were purposively selected in this qualitative study. Qualitative data were generated using three research instruments, namely, focus group interviews, individual interviews and reflective journals.

The data was analysed and themes were formulated from the responses of the participants. Bronfenbrenner's Ecological Systems Theory (EST) formed the basis for data analysis. The findings reveal both the factors that enable learners to pass Life Sciences and the factors that constrain their performance in the subject. Enabling factors were: learners' personal ambitions and motivations; the ability to relate Life Sciences to everyday life; appropriate conceptual progression in the subject; and certain strategies which make understanding the material easier. Constraining factors were: lack of parental support; inadequate time in the curriculum for teaching and learning Life Sciences; the overcrowded curriculum; inadequate teacher discipline knowledge and knowledge of pedagogy; and lack of enjoyment of the study of Life Sciences. The study exposed a great need for learning support for learners in rural settings in order to pass the subject. Learners need greater input and effort by teachers, more support from parents at home, greater involvement by the Department of Basic Education (DoBE), the support of peers in the form of study groups, and support related to the medium of instruction used at school. The study makes

recommendations concerning enabling and constraining factors to make it possible for learners to perform well in Life Sciences.

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

Ecological Systems Theory	EST
Department of Basic Education	DoBE
Learning and Teaching Support Material	LTSM
National Education Infrastructure Management	NEIM
Female Education in Mathematics and Science in Africa	FEMSA
Curriculum Assessment and Policy Statement	CAPS
United Nations Education Scientific and Cultural Organization	UNESCO
School governing body	SGB
University of KwaZulu-Natal	UKZN
Trends in International Mathematics and Science Study	TIMSS
United Nations Children's Fund	UNICEF
Qualitative Data Analysis	QDA

CHAPTER 1: INTRODUCTION

1.1 Background to the study

Vast differences in living standards, quality of life and school performance characterise urban and rural settings globally, and South Africa is no exception. The underperformance of learners in rural settings is often researched from the perspectives of experts and education authorities. An exploration of learners' views about their performance is crucial and worthy of scholarly inquiry, to enhance understanding of this phenomenon. I begin this section by providing a brief insight of my experience of teaching in a rural setting. This discussion is intersected with scholars' works on learners' performance. This is followed by an argument for the purpose of this study. The significance of the study is justified, and the research objectives, questions, design, and findings are briefly outlined.

I have six years of experience in teaching Life Sciences in the Mthatha district in the Eastern Cape. Over these years it has become apparent that many learners in rural settings perform poorly in the subject and fail to achieve a level that would allow admission to universities. Learners who realise they will not gain entrance into tertiary education quickly lose interest and their performance slips further, impacting negatively on the classroom experience and on their whole lives.

Spaull (2013) in a study conducted in South Africa found that South Africa is performing worse than many low-income African countries. The scholar explains that annually reported statistics from the National Senior Certificate (NSC) exam for Grade 12 are particularly misleading because they do not consider the learners who do not advance to Grade 12. It is estimated that out of 100 learners who begin school from Grade 1, only 50 progress to Grade 12, 40 pass Grade 12, and only 12 obtain the grades to qualify them for university entrance (Spaull, 2013). The scholar says further that people between 18-24 years old who do not acquire some form of post-secondary education are at a distinct economic disadvantage. They remain unemployed or in low paying work and as a result they do not sustain themselves adequately *(ibid).*

According to Ncanywa (2015), learners from Eastern Cape high schools in South Africa show a decline in performance in science subjects. The scholar also notes that the Eastern Cape is among the provinces with the highest number of unqualified teachers and highest learner to teacher ratios. Generally, one teacher is expected to teach more than 40 learners in the class. However, many factors collude to result in poor learner performance. I share the view of Johnson (2008, p. 1) that "overly simplistic, linear models that fail to consider the complexity of interactions that result in student achievement", abound. My view is that this applies to the South African context, where school factors are often blamed for learner underperformance. These manifest when the Department of Basic Education (DoBE) threatens to shut down schools which continue to underperform. The complex factors which exist in different contexts of learners' lives, and how these contribute to learners' underperformance, are often neglected in research. In this study, I explore these factors from learners' perspectives.

1.2 Purpose and focus of the study

The purpose of this study was to explore factors which influence the performance of Life Sciences among Grade 12 learners in two high schools in the rural areas surrounding Mthatha. The key purpose of this study was to foreground learner voices about factors which influence their performance in Life Sciences to the centre. In this study, learners were given the opportunity to articulate their lived experiences of studying Life Sciences. Twenty Life Sciences learners from two high schools were purposively selected to participate in the study.

The study focused on the factors that enable learners to pass Life Sciences, the factors that constrain learners in Life Sciences and the factors that constitute the support they need to improve in or pass Life Sciences.

1.3 Rationale for the study

The rationale for the study is underpinned by the poor performance of Life Sciences learners in Grade 12 in rural contexts. The motivation for this study is based on my personal experience as a Life Sciences teacher within a rural setting and an intersecting discussion about learner performance, which is supported by recent statistical data. The performance of learners in rural settings has long been a concern

of the DoBE since these learners fail to gain entrance into tertiary institutions and as a result, hamper their opportunities of achieving professional success. The DoBE invests financially in trying to prepare learners for their future careers. Parents, too, spend money on books and uniforms, yet the results are frequently disappointing since the learners either fail matric (Grade 12) outright or achieve poor marks which are inadequate to gain entry to the tertiary education they need in order to change their economic situations.

In the past few years the Eastern Cape was ranked second last among the nine provinces in South Africa in the Grade 12 Life Sciences examination. In 2014 the Eastern Cape Province obtained an overall pass rate of 61% in Grade 12 in Life Sciences (School Subject Report, Eastern Cape Department of Education, 2014). Mthatha as a district was among the best performing districts in the province, with 76% of learners achieving above 30% in Life Sciences (School Subject Report, Eastern Cape Department of Education 2014). Of great concern is the gap between the performance of schools located in rural settings and those in urban settings. Schools in rural settings usually perform poorly in all subjects, and both the literature and the findings in this study show that many learners of Life Sciences fail to achieve the minimum of 50% for admittance to universities.

In South African contexts, schools are categorised into quintiles, ranging from quintile one to quintile five. Van Wyk (2015) states that schools in South Africa are classified into five quintiles based on the socio-economic status of the community in which the school is located. Schools in quintile one are the poorest while those in quintile five are the least poor.

According to Khumalo (2014, p. 1), the quintile system is a redistributive strategy of resources that calls upon provincial education departments to categorise all public schools according to their level of economic and social disadvantage, with poverty level, geographical area where the school is situated, literacy level of the local community around the school, and income levels as the major criteria.

According to Dass and Rinquest (2017), the quintile model is a system used by the government in order to fund schools. This model classifies schools according to their needs such as resources, infrastructure, sociol-economic background of learners and parental status, and the location of school. The schools that fall under quintile one to

three are referred to as no fee schools because these schools are located in rural settings and have poor resources and most of the parents in these communities are unemployed. As a result, these learners do not pay school fees. They are funded by the government, which contributes a minimum of R1211 per child per annum (Dass & Rinquest, 2017).

Schools which are categorised as being in quintile four and five are referred to as fee paying schools since they charge learners school fees. Most of these schools are located in urban suburbs. Parents of learners in schools in this category are able to pay school fees because they are usually employed and these schools generally have better resources and infrastructure. They are funded to a lesser degree by the government which contributes a minimum of R204 per child. According to the Department of Education (DoE) (Mtshali, 2014), Limpopo province has the highest number of poor schools that are classified as quintile one schools. Limpopo has 28.2% quintile one schools and only 5% of schools fall under quintile five. This is followed by the Eastern Cape province with 27.3% of schools that are quintile one and 11.4% of schools that are quintile five. This indicates that the government still has a long way to go in order to balance the levels of education in terms of resource provision in South Africa.

Learner performance is measured using rating scales. Table 1.1 shows rating scales in a South African context.

Table 1.1: Codes and percentages for reporting in Grades R - 12

RATING CODE	DESCRIPTION OF COMPETENCE	PERCENTAGE
7	Outstanding achievement	80-100
6	Meritorious achievement	70-79
5	Substantial achievement	60-69
4	Adequate achievement	50-59
3	Moderate achievement	40-49
2	Elementary achievement	30-39
1	Not achieved	0-29

Source: National Curriculum and Assessment Policy Statement for Life Sciences Grades 10 to 12 (2011)

Learners who achieve at level 7 are regarded as the best performers while those that achieve at level 1 are regarded as poor performers in the subjects, including Life

Sciences. The statistical data which shows learner performance in Mthatha district is presented in Tables 1.2 and 1.3.

Tables 1.2 and 1.3 show the results of Grade 12 learners in 2013 at urban schools numbered 1 and 2, and rural schools numbered 3 and 4, in the Mthatha Education District. A majority of the learners in schools 3 and 4 achieve rating at levels 1, 2 and 3, indicating poorer performance compared to their urban counterparts. This gap between the urban and rural schools is highlighted by Matshe (2014, p. 1), who states that "South Africa has a fragmented and racially divided education system which impacted negatively on the rural communities. What rural schools are experiencing today comes as a direct result of the impact of the system, which is hard to overcome."

Table 1.2: Performance of Grade 12 learners in Life Sciences in Mthatha high schools in urban settings in 2013, where both schools are in the quintile 4 category

School 1	Level 1 0-29	Level 2 30-39	Level 3 40-49	Level 4 50-59	Level 5 60-69	Level 6 70-79	Level 7 80-100
No. of learners 245	36	54	65	38	32	10	10
Percentage pass	15%	22%	27%	15%	13%	4%	4%
School 2	Level 1 0-29	Level 2 30-39	Level 3 40-49	Level 4 50-59	Level 5 60-69	Level 6 70-79	Level 7 80-100
No. of learners 303	5	30	86	76	59	37	10
Percentage pass	1%	10%	28%	25%	19%	12%	3%

Source: (Mthatha Education District Data Base, 2013)

Table 1.3: Shows performance of learners in Life Sciences in Grade 12 in Mthatha high schools in rural setting in 2013, where School 3 and 4 are in the quintile 3 category

School 3	Level 1 0-29	Level 2 30-39	Level 3 40-49	Level 4 50-59	Level 5 60-69	Level 6 70-79	Level 7 80-100
No. of learners 18	9	6	3	0	0	0	0
Percentage pass	50%	33%	17%	0%	0%	0%	0%
School 4	Level 1 0-29	Level 2 30-39	Level 3 40-49	Level 4 50-59	Level 5 60-69	Level 6 70-79	Level 7 80-100
No. of learners 35	30	4	0	1	0	0	0
Percentage pass	86%	11%	0%	3%	0	0	0

Source: (Mthatha Education District Data Base, 2013)

Table 1.2 shows that schools in urban settings have a high number of learners studying Life Sciences and that most of them performed well. In total, 548 learners in Mthatha urban schools wrote Life Sciences in 2013, and 272 were able to achieve a pass mark of more than 50% (Level 4 to 7). Of those who passed, 20 learners passed with marks of 80% to 100%, which is Level 7, as indicated in Table 1.2. However, the

learners from high schools in a rural setting reflected in Table 1.3 struggled to get a pass mark of 50% or perform at level 4. A total of 53 learners from the two rural schools wrote the subject, with 14 passing and none attaining a pass at levels 5, 6 or 7. As a teacher of Life Sciences who works with learners from rural setting, I wanted to explore the reasons for this poor performance of learners in rural settings.

1.4 Problem Statement and Significance of the study

Based on the literature studies cited in the background section, education in rural settings is beset with challenges. When the results (based on learner achievement) in a subject such as Life Sciences within a rural, public school setting is examined, underachievement in the rural setting is revealed. The problem, then, is the underachievement of learners in Life Sciences within a specific rural setting in South Africa.

The findings of this study will contribute to existing knowledge on the reasons for poor performance in Life Sciences among learners in rural settings, from their perspectives. The results will help identify the problems that cause learners from rural areas to perform poorly in Life Sciences. I envisage that findings that emerge from this study will assist in improving the performance of Life Sciences in rural contexts and also assist parents, schools and the DoBE officials to offer the kind of support required by learners in order to pass the subject.

1.5 Research objectives

The research objectives were to:

- Explore learners' views about factors which contribute to their performance in Life Sciences;
- Explore what enables learners in their performance in Life Sciences, and why this is the case;
- Explore what constrains learners in their performance in Life Sciences, and why this is the case; and
- Explore how learners can better access support to perform successfully in Life Sciences classrooms in rural contexts.

1.6 Research questions

There were two main research questions with sub-questions:

1. What are learners' views about factors which contribute to their performance in Life Sciences within a rural setting?
    - 1.1 What enables learners in their performance in Life Sciences within a rural setting? Why is the case?
    - 1.2 What constrains learners in their performance in Life Sciences within a rural setting? Why is the case?
2. How can learners access support to perform successfully in Life Sciences classrooms in a rural context?

1.7 Research design

A case study design was used to explore the opinions and experiences of 20 Grade 12 learners who were studying Life Sciences at schools in rural areas. The qualitative study was embedded in the interpretive paradigm in order to develop a deep understanding of factors that contribute to performance of Grade 12 learners in schools located in rural areas.

Data collection was accomplished using three methods, namely, focus group interviews, individual interviews and reflective journals. Results were triangulated to ensure the validity, trustworthiness, and reliability of data generated from the participants. The data collected were analysed and the findings that emerged provided answers to the two research questions of this study.

1.8 Findings

The findings that emerged from this study were generated by analysing the learners' views about factors which contributed to and constrained their performance in Life Sciences within a rural setting, and the support they needed in order to perform successfully in Life Sciences.

Eight themes emerged from responses to research question one, and five themes emerged from responses to research question two. The first research question sought to uncover both the factors that enable learners to perform in Life Sciences and the factors that constrain learners in Life Sciences.

The factors that enabled learners were: learners' personal ambitions and motivation; the ability to relate Life Sciences to everyday life; certain methods which make understanding of the material easier than others. The factors that hindered learner performance were: lack of parental support; inadequate time in the curriculum for teaching and learning Life Sciences; the overcrowded curriculum; inadequate teacher knowledge of the discipline and methodology; and lack of enjoyment of the study of Life Sciences.

It also emerged that learners need greater support from teachers and schools, from parents, from the DoE regarding books, equipment and materials, and language use. Many learners felt they needed help with English because terminology in Life Sciences was complex.

1.9 Structure of the thesis

The thesis report is organised in the following way: Chapter one provides an introduction to the study, the background, purpose, rationale, and significance of the study, its aims and research design, and a study overview and summary of findings.

Chapter two provides a review of the literature on factors which influence the performance of Life Sciences learners in schools in rural settings. The literature reviewed focused on South African and international contexts. Topics reviewed included the contexts of teaching and learning of Life Sciences, parental support, the availability of teaching and learning materials, medium of instruction, and attitudes of learners towards Life Sciences were all topics which were discussed through the literature. The review included factors that affect teaching and learning Life Sciences, such as material resources, and the availability of textbooks, physical resources such laboratories, and the availability of equipment and materials, such as chemicals, specimens, and models in order to do experiments and practical work.

Chapter three presents the research methodology and discusses the qualitative approach within an interpretative paradigm, which was used in the study. The chapter discusses the various methods of data collection used such as the focus group interviews, individual interviews, and reflective journals. Research rigour, ethical considerations, and limitations are also presented in this chapter.

Chapter four presents the findings and a data analysis. Content analysis was used to interpret the data generated from the participants. The many themes were drawn from analysis and were presented as findings related to each research question.

Chapter five presents a conclusion, a summary of the findings and recommendations to improve learners' performance in Life Sciences in schools located in rural settings.

1.10 Conclusion

This chapter has provided an introduction and background to the study. The purpose and focus of the study, its rationale, and its significance have been explained, and the research aims, questions, and methodology have been briefly outlined. A detailed discussion of the literature pertaining to factors which influence the learning of Life Sciences in schools located in rural settings follows in Chapter 2.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter comprises a review of the literature, focusing on the factors which influence the performance of learners in schools in rural settings with a particular emphasis on learners who study Life Sciences. The purpose of this literature review is to examine the factors that constrain and enable academic success in this subject for learners in rural settings. Thus, the scope of the review includes an overview of teaching and learning in schools in rural settings; the availability of teaching and learning materials for Life Sciences in schools in rural settings; parental support to learners; the medium of instruction for teaching and learning Life Sciences, and the attitudes of learners towards Life Sciences. The chapter also includes a detailed description of Bronfenbrenner's ecological system theory used to guide this study and a justification for selecting this theory.

2.2 Overview of teaching and learning in schools in rural settings

Schulze and Lemmer (2017, p. 1) state that "in South Africa, poor performance in sciences has consistently been shown by the dismal performance of secondary school learners in international assessments such as the Trends in International Mathematics and Science Study (TIMSS)." These poor results are found nationally and are highly prevalent particularly in rural settings. Redding and Walberg (2012) concur that the potential of learners in rural communities to learn is determined by both external and internal factors, such as attitudes and motivation (internal factors), the physical structure of the school and the nature of the community at large (external factors). The authors maintain that schools in rural communities find it more difficult to improve teaching and learning than schools in urban settings do. For instance, Redding and Walberg (2012) argue that many learners find English as a medium of learning challenging since English is not their mother tongue. They can neither express themselves properly nor understand the content that is taught in school *(ibid).*

Some studies have revealed that schools themselves lack infrastructure and resources. For example, Sullivan, Perry and McConney (2013) point out that schools in rural settings lack infrastructure, such as laboratories, desks, and safe buildings as well as adequate shelter. Many schools in rural settings are underdeveloped and lack classrooms, equipment, sanitation facilities, adequate transport systems and basic technology (Mulkeen, 2005). All these contribute to why learners in schools located in rural settings perform poorly compared with those in an urban setting (Gardiner, 2008). Specifically, Sedibe (2011) observes that between 1980 and 2000, there was constant fluctuation in the overall pass rates of learners because schools were experiencing shortages of learning materials. Many learners could not access learner support materials and resources (textbooks, furniture, laboratories, and classrooms) for education.

The National Education Infrastructure Management System Report (2007), cited by Gardiner (2008, p.13) in agreement with the above findings, found that “many schools in rural settings are still lacking clean running water, electricity, libraries, laboratories, and computer labs.” The foregoing therefore relates the true picture and situation of schools in rural settings.

In addition to the challenges inherent in a lack of adequate infrastructure and resources, du Plessis (2014) finds that schools in rural settings have the additional struggle of attracting effective teachers. Many teachers do not want to be appointed in rural communities because of the inaccessibility of the schools and their lack of basic resources. In particular, schools in rural settings find it extremely difficult to recruit and retain specialists in Mathematics and Science. Rosenberg, Christianson, Angus, and Rosenthal (2014) affirm that distance also plays a part because schools in rural settings are difficult to access and getting there from nearby towns is time-consuming. Moreover, very few well-qualified teachers are interested in working in schools where there are minimal opportunities for personal and career development. Rural settings do not allow opportunities for teachers to study part-time since universities and colleges are located a great distance away from the villages. Therefore, many schools and districts are facing a shortage of Mathematics and Science teachers in South Africa. The DoBE has however tried to overcome the problem of teacher shortage by compensating teachers with more money and awarding certificates to qualified teachers who teach in the rural settings (Paton-Ash & Wilmot, 2015).

Mulkeen (2005) points out that the teachers who work in rural settings spend less time in classrooms than teachers in urban areas do; much time is spent getting to and from workshops and conducting personal business, particularly at the end of each month when many teachers abscond to do their banking and shopping. In addition to the preceding challenges, studies have also found that teachers in rural settings often lack adequate subject knowledge for teaching Life Sciences (Lebata & Mudau, 2014).

Overcrowding is a further characteristic of schools situated in rural settings. Many classrooms in rural settings in the Eastern Cape, KwaZulu-Natal and Limpopo are overcrowded (Gardiner, 2008). Despite the preceding challenges facing teaching and learning in general and Life Sciences in particular in schools in rural settings, it is worth noting that Life Sciences is important to learners because it forms the basis of many fields of study such as medicine, pharmacy and other paramedical sciences (Ali, Toriman & Gasim, 2014).

It must be noted that this situation regarding education in rural settings is not peculiar to South Africa alone, and international scholars such as Sullivan *et al.* (2013) have maintained that it is pervasive and historically omnipresent. They add that globally, schools in rural settings do not perform as well as those in urban settings, for many of the reasons outlined above. It is essential, therefore, that schools in rural settings find ways to attract and retain capable Life Sciences teachers and overcome their many other challenges in relation to teaching the subject effectively.

2.3 Material factors affecting the teaching and learning of life sciences in schools in rural settings

According to Visser, Juan, and Feza (2015), “The consensus amongst South African studies show that the availability or scarcity of key school resources has impacts on educational outcomes, the better the levels of resources then the better the educational outcomes.” Spaull (2013), in a study conducted in South Africa, identifies two kinds of schools, namely, those which are: (a) wealthy functional schools and, (b) poor dysfunctional schools, and the roles they play in providing quality education to learners. Spaull’s findings suggest that the latter kind of schools have no, or less educational resources and they have less qualified teachers, while the former (wealthy, functional schools) are schools with better resources that are able to attract highly qualified teachers with expertise and better subject qualifications.

Three particular material factors will now be discussed, namely, textbook challenges, physical structures, and the shortage of learning materials.

2.3.1 Textbook challenges

Sedibe (2011) found that schools in rural areas are not supplied with books on time because the DoE frequently orders and delivers them late. As a result, teachers who can access photocopiers make photocopies of textbooks for learners, but the majority lack this basic piece of school equipment. A few learners buy their own textbooks and most learners share textbooks.

Legotlo, Maaga, and Sebego (2002) agree that the sharing of textbooks in schools in rural settings is an ongoing challenge. As many as four or five learners may share one book. In some schools, there are no textbooks to be shared, and it is only the teacher who has a copy *(ibid).* In such cases, the teacher may try to photocopy notes for a group of learners, but this consumes both time and money and it is frequently done during teaching time – thus consuming the much-needed teaching and learning time.

In other countries, such as Ghana, textbook shortages in rural settings has also been reported by the United Nations Educational and Scientific and Cultural Organization (2016). Their report shows that learners in Ghana in rural settings share textbooks due to an acute shortage of textbooks in schools. The situation results in teachers having to write notes on the chalkboard for the learners to copy, and this reduces the time for teaching and learning. Similarly, Makori and Onderi (2014), in a study conducted in Kenya, reveal that learners from Nyamira County village also experience shortages of textbooks.

Namupala (2013), in a study conducted in Onamutai circuit of Oshana region of Namibia, discovered that many learners in rural schools did not have the required textbooks. About 35 learners were found to have only six textbooks between them, and in some schools, learners depended solely on notes provided by the teacher. The study found that the shortage of textbooks impacted the learners negatively (*ibid*). The teachers were forced to compromise the quality of teaching time because they had to travel about 10 kilometres to cluster centres where they could obtain resources such as those required for photocopying of materials for the learners. This situation contributes to the poor performance of learners in Namibia. Similar findings were

established by Nyaumwe, Bappoo, Buzuzi, and Kasiyandima (2004) who attributed Zimbabwean learners' poor performance in Mathematics to, among other things, the lack of Mathematics textbooks.

2.3.2 Physical structures

Visser *et al.* (2015) found that the condition of the school environment such as class size and availability of general school resources may have both positive and negative effects on the performance of students. For instance, classes that are too large will have a negative effect on the performance of learners. De Waal (2013) observed that there are schools that are built with mud in rural areas. These mud schools lack toilets and running water and have very poor infrastructure and too few classrooms. This leads to overcrowding with several grades having to share classrooms. Sedibe (2011), states that some schools in rural settings have classrooms that are still locked by the DoE because water is not available in the toilets. In some schools, toilets have no seats, because they have been stolen by community members. Arguably, in such situations, learners are adversely affected. Sedibe (2011) adds that a shortage of classrooms leads to overcrowding and poor attendance of learners in the school, resulting in poor academic performance and a high learner drop-out rate. In some schools, the situation is worse because different grades are taught together in the same class *(ibid).* Nkosi and Farhangpour (2017) agree with the argument that a shortage of classrooms has negative effects on the academic outcomes of learners.

According to Gardiner (2008, p. 8) "The Constitution, the South African Schools Act, and various education policy documents say that all South African learners should have access to the same quality of learning and teaching, similar facilities and equal educational opportunities. However, this is not yet the case. Many people and their schools, particularly but not only in rural areas, struggle with real difficulties such as the lack of classrooms, poor access to services such as water and electricity, no landline telephones and hence no internet, very few public or school libraries and the like".

Mbajiorgu *et al.* (2014) argue that many years after South Africa became a democratic state, there are many schools in rural areas that face these challenges. Schools in rural settings continue to lack basic infrastructure, and the DoE has not yet addressed these challenges.

It is worth reiterating that these challenges are not limited to South Africa. Globally, schools in rural settings are overcrowded due to the shortage of classes. Findings of the Female Education in Mathematics and Science in Africa (FEMSA) cited by O'Connor (1998) reveal that shortages of classes in schools in rural settings lead to overcrowding of learners in one class. The author highlighted that in some schools he found 120 learners in one class. The situation makes individual attention to learners extremely difficult.

Epri (2016) in his research study conducted in Papua New Guinea schools found that after the Government of Guinea implemented a free education policy, the number of learners in school increased. However, no new buildings were constructed, and the infrastructure remained the same. Schools were forced to increase in the number of learners in each of the classes based on the new policy, and many classes were overcrowded. It was also discovered that educators were overburdened with large class sizes and this made teaching and marking difficult to cope with and thereby impacted learners' performance drastically.

According to the United Nations Children's Fund (Ninnes, 2011, p. 17), there is a clear relationship between the quantity and quality of school infrastructure and the quality of learning. When classrooms are too cold or too hot or let in rain, or when there are not enough toilets or water for drinking and hand washing, learners can be disadvantaged through either themselves or their teachers being uncomfortable or sick, or by learning resources being damaged by elements.

The United Nations Children's Fund (Ninnes, 2011) also reveals that in Namibia more than 20% of schools have no toilets and water for teachers and learners. Many schools in Namibia are located in rural settings with no physical facilities and other educational resources such as laboratories, libraries, electricity, water and hostels for residence. These schools have a huge number of learners who travel long distances to school. The shortage of these physical structures leads to problems of low morale and lack of commitment by both learners and teachers (Namupala, 2013).

Haruna and Liman (2015), in a study conducted in Sokoto state, Nigeria, discovered that learners are studying under trees because there is a shortage of classrooms and many of the schools have no water, electricity and toilets. They further revealed that on average there is one toilet to 600 learners. The authors commented that this

situation is unhygienic and can result in environmental hazards which can have a detrimental effect on students' health and thereby affect their performance in their studies *(ibid).*

2.3.3 Learning materials

Lingam and Lingam (2013) argue that many schools in rural settings have few or no resources when compared to schools in urban settings. The authors found that schools in urban settings have adequate resources because, apart from government funding, they also receive sponsorships from the business community. Schools in rural settings have less proximity to businesses and cannot access sponsorship in the same way that schools in urban settings can, and therefore survive on government funding only. Sullivan *et al.* (2013) add that there is a wide gap between schools in urban settings compared to rural settings in terms of both resources and infrastructure. Urban schools are more resourceful and have the materials needed to ensure some measure of teaching and learning. Findings from the study revealed that urban high school principals were far less likely to complain about a lack of resources or infrastructure, while principals overseeing schools in rural areas were very likely to do so.

According to Samikwo (2013), schools in rural settings continue to experience shortages of resources and tools to learn. Lebata *et al.* (2014) found that many schools in rural areas continue to use chalkboard notes, with the teacher writing notes on the board and learners copying them. Schools do not have enough teaching resources, teaching and learning become arduous tasks in such conditions *(ibid).* Sedibe (2011) adds that schools that have insufficient and unfairly distributed materials have a poor culture of learning and teaching, and as a result, learners perform poorly. Such schools may experience high failure rates due to the lack of reference materials. Teachers constitute the only source of information in such settings, with learners depending on teachers for all their science knowledge (Sedibe, 2011).

Clearly, there is consensus among many authors that a scarcity of resources such as laboratories contributes to the poor performance of learners in Life Sciences, particularly in Grade 12, because the subject is a ''hands-on'' one. Lebata *et al.* (2014) point out that the shortage of resources in most schools in rural settings prevents teachers from using the experimental method in Life Sciences. Talking and explaining

is not sufficient in this subject, and as a result, learners lose interest in studying it because they find it difficult to understand. The lack of opportunities to conduct, observe and describe experiments, negatively affects the performance of Life Sciences learners.

In other Southern African countries such as Kenya it has been discovered that a shortage of learning materials impacts negatively on learners' performance in sciences. Makori and Onderi (2014, p. 22) in a study conducted in Kenya explain that "Science subject demands a lot of practical work, shortage of teaching and learning resources lead to passive learning with profound effect on learners' academic performance". Albert, Osman, and Yungungu (2014), in their research conducted in Kenya, found that the teaching and learning materials used by teachers such as visual aids and flip charts can improve learning of learners in Life Sciences. These scholars found that the inadequacy of teaching and learning materials such as chemicals, charts, apparatus, and models contributed to teachers' inability to perform the experiments and practical tasks in class. As a result, many learners in that area performed poorly in Life Sciences (Albert *et al.,* 2014).

Previous studies confirm that the shortage of learning materials has a negative effect on the performance of learners particularly in Life Sciences in high schools in rural settings.

2.4 Medium of instruction

In South Africa, all subjects are taught in English or Afrikaans, except in cases where the mother tongue of learners is taught as a subject, and this poses a problem for learners who study science subjects, especially Life Sciences (Lebata & Mudau, 2014). Life Sciences concepts and terminology are frequently misunderstood, and a lack of understanding leads to loss of interest in the subject. Learners regard the subject as one of the most difficult because of the language barrier, and textbooks for Life Sciences, which are written in English, adds to difficulties for learners to understand the meaning of concepts (Lebata & Mudau, 2014). These scholars add that many learners in schools in rural settings cannot express themselves in the English language and thus can neither answer teachers' questions adequately in class, nor express themselves clearly in examinations.

Mtsi and Maphosa (2016) and Mbajiorgu *et al*. (2014) agree that the majority of learners from schools in rural settings cannot communicate their science knowledge in English. These learners find it difficult to understand science questions in class and to express the answers. These scholars further explain that learners do not understand Life Sciences because it contains complex terms and concepts, some of which learners are unable to pronounce and understand. This situation leads to teachers in rural areas having to code switch to try and simplify the subject. Thus, many of these learners would prefer to be taught science subjects in their mother tongue. Owen-Smith (2010) observes that South African school policy requires learners to be taught in their mother tongue from Grades to three 3 and to be taught in English from Grades 4 to 12, but learners from rural settings find this swap particularly difficult because of their low exposure to English before Grade 4.

Visser *et al*. (2015), in a study conducted in South Africa, reveal that home and school resources are predictors of Mathematics performance. They found that children from high socio-economic backgrounds, who speak the language (English) of the test at home, and who have at least one parent with Grade 12 level education who speaks English fluently, performed better in school.

Furthermore, Mtsi and Maphosa (2016) say that the use of English plays a dominant role in the quality of education in schools in rural settings. English, they maintain, is effectively a foreign language for learners in rural settings. Setati, Adler, Reed, and Bapoo (2002) point out that there are 11 official languages in South Africa, but question papers and textbooks in schools are all written in English or Afrikaans. Most schools in South Africa, including those in rural settings, use English as the language of instruction in all subjects. Having used exclusively IsiXhosa, IsiZulu or any other official language within their homes, most learners from rural settings struggle to grasp concepts in this ‘foreign’ language (English). This challenge is exacerbated when it comes to the precise language of Life Sciences, and this contributes to the high failure rate in the Life Sciences (Bapoo, 2002). According to Kioko (2015), learners who are given the opportunity to use their home language in schools in rural settings for learning subjects such as Life Sciences gain far greater knowledge than those who are taught in English.

Ngema (2016) in a study conducted in South Africa found that learners from the Ingwavuma circuit have a challenge with English and IsiZulu. Because of this, they preferred teachers to code switch when they taught science in class although the examinations and tests were written in English and there is no code-switching.

Lebata *et al.* (2014), in a study conducted in Lesotho found that many learners were not fluent in English and this affected achievement in Life Sciences negatively. Many learners cannot read and write in English. Therefore, these learners find it difficult to understand questions asked in the examination (Lebata *et al.*, 2014). The scholars further explain that may learners from Lesotho could not interpret Life Sciences questions and that resulted in the loss of marks during examination. Further, Lebata *et al.* (2014) add that learners from Lesotho in Moreneng high school experienced challenges in the Life Sciences terminology. These learners were unable to read or write some Life Sciences terms. The situation makes learners lose interest in Life Sciences.

Similarly, Nzelum and Okafor (2010) in a research study conducted in Nigeria, showed that among factors that affected learners' performance in Life Sciences was learners' understanding of terms and concepts. The scholars explained that due to learners' failure to understand some terms and concepts of Life Sciences they began to doubt their intellectual abilities and to believe that their efforts to achieve better in Life Sciences would be unsuccessful.

Kioko (2015) states that learners who are taught in their mother tongue show more involvement in class activities than those who are taught in English in rural settings. They ask questions and are more willing to venture answers to questions posed by the teacher *(ibid).* Thus, the use of the home language enables learners to develop new knowledge and ideas about topics taught in class (Kioko, 2015).

2.5 Parental support for learners

2.5.1 Parental support in rural settings

Martinez (2015) explains that the interest and involvement of parents in a child's education has an influence on the child's performance in school activities. The author adds that such interest may include participation in parent teacher conferences, contributing to extracurricular activities of the child, monitoring a child's grades,

imparting parental values in a child, helping a child with his/her homework, and providing intrinsic and extrinsic motivation for him/her, all of which will improve the child's educational performance *(ibid).*

Muola (2010, p. 216) argues that "low correlation between parental encouragement and academic achievement motivation may imply that the nature of the encouragement given to the child by his parents is important as far as academic achievement motivation is concerned". The scholar asserts that some educated parents who encourage their children expect their children to perform better and obtain higher marks in the subject. He warns, however, that this can create anxiety and fear of failure in the child instead of providing effective motivation to do well in terms of academic performance. Studies have revealed certain factors that contribute to the low level of support provided by many parents in rural settings, as explained below.

2.5.1.1 Socio-economic background

Page (2016), in a study conducted in Western Cape Province, South Africa, found that teachers believed that the poor socio-economic conditions of parents hinders parental involvement in their children's education and in school activities. It was found that these parents could not afford to visit schools due to financial constraints and they could not easily discover the areas where their children may need help. The scholar found that poverty and unemployment in South African rural communities pose a great constraint on the parental involvement, especially in previously disadvantaged schools. This has a negative impact on the performance of their children. Rosenberg *et al*. (2014) and Matshe (2014) argue that parents who are not employed or who emerge from lower socio-economic settings do not support their children academically. This scholar maintains that parents who survive on social grants from the government are generally not educated and cannot understand much of what their children are learning therefore they do not assist their children.

Mafa and Esther (2013) found that schools in rural settings are often far from homes, and some parents do not visit the schools due to the distances they would have to travel, and the financial resources required to travel. Page (2016, p. 5) reiterates that "parental involvement in their children's schooling is a critical factor that influences the success of learners".

Studies reveal that South Africa and Nigeria experience similar challenges regarding learners' performance. Machebe and Ifelunni (2014) in a study located in Enugu state, Nigeria, found that parents from low-social economic backgrounds found it difficult to provide their children with educational opportunities, such as having tutors, buying study materials and assisting at home with homework, while middle-income parents could do so.

Mupa and Chinooneka (2015) conducted their study in Zimbabwe and concur that there are certain environmental home conditions that impact the learner's achievements negatively. Children that lack support at home, who do not have a background which has resources such as reading materials, sometimes perform poorly at school. Ogoye-Ndegwa, Mengich, and Abidha (2007) conducted a study in Kenya which investigated parental participation in their children's homework and reported that "socio-economic status is a very crucial issue in many African communities where illiteracy and poverty levels are high, thus limiting parental involvement in homework" (p. 122). In some schools in Kenya, due to the shortage of learning materials, learners share textbooks and many parents are unable to buy their children subject specific textbook copies because they lack the financial means to do so *(ibid).* The scholars add that due to unemployment and low socio-economic backgrounds families are also faced with high levels of poverty, overcrowded homes and little opportunity for their children to study effectively at home.

2.5.1.2 Parents' level of education

According to Mji and Makgato (2006), many South African parents find it difficult to support their children because they are illiterate and because they do not know the content of the subjects. Mafa and Esther (2013) state that in rural settings parents do not visit schools to monitor the progress of their children because they are uneducated themselves and do not believe that they can contribute positively. They do not monitor their children's work, and this contributes to low academic performance of children. Manilal (2014) in a study located in South Africa, KwaZulu Natal, found that uneducated parents are limited in terms of what they can do to contribute to their children's performance in education because of their lack of formal educational knowledge in the subjects.

Humble and Dixon (2017) conducted in Kinondoni in Tanzania and found that learners from rural settings commonly have the problem of parents being disconnected from their children's school work because they are illiterate. Memon, Joubish, and Khurram (2010), who conducted a study in Karachi, Pakistan, observed that learners from educated families performed better in Grade 12 examinations than those from illiterate families.

Akinsanya, Ajayi, and Salomi (2011) state that the educational status of parents in a British setting plays a critical role in the academic performance of children. Children from educated families are exposed to more opportunities to learn at home, with relevant learning materials being plentiful, compared to children from poor, rural families. These scholars also point out that learners from poor families have limited chances of studying at home since they have almost no learning materials and typically many chores to do before they can do their homework.

Essay (2018) asserts that although teachers teach, parents must still assist learners at home. The author acknowledges that parents in rural communities are typically not well educated but can assist by giving moral support and encouragement to their children's study despite the lack of financial and academic means. Such parents can still contribute to their children's learning *(ibid).* In Namibia, a study conducted by Erlendsdóttir (2010) found that parents who were able to support their children at home and who were able to encourage their children about the importance of education and the expectations they have from their children, obtained better outcomes from them. This, therefore, shows that involvement of parents in their children's education usually has a positive effect on their performance in academic work. In a study of the relationship between academic achievement motivation and home environment among standard eight pupils by Muola (2010), conducted in Kenya, it was found that a more favourable home environment motivates a child to perform well in school. Those parents with high education qualifications were found to have high occupational status, inferring that these types of parents would be able to provide the necessary learning facilities and be able to assist the child with homework. The author indicates that children of educated parents have higher chances of completing their studies. On the other hand, children whose parents have low educational status may not be able to get adequate educational support such as provision of physical resources, including textbooks and study guides from their parents *(ibid).*

2.5.1.3 Excessive home chores

Gardiner (2008) reveals that there are numerous problems in the relationship between rural community members and schools, which include the expectation that children will perform many domestic tasks in the early hours of the morning and after school. These duties clash with the routines and time tables of the school. Akinsanya *et al*. (2011) concur that uneducated parents of learners in rural communities expect children to do housework both before and after school. This situation limits time available for studying at home and as a result, the academic performance of such children is poor compared to that of children living in cities.

Mbajiorgu *et al.* (2014) agree that those children who attend schools in rural areas find it difficult to study since they have too much household work to do at home. This situation leads to insufficient time to study and sometimes exhaustion on the part of learners, who frequently get to bed late, having had no time for homework. Nkosi and Farhangpour (2017) agree with the view of Mbajiorgu *et al.* (2014) that school children, especially girls in rural communities, are given more chores. The scholars admit that girls carry out several home chores and do certain undefined jobs excessively to the point that they become distracted or exhausted or lose focus and concentration in the class. The authors observe that this situation impacts the learners negatively because they score lower marks and sometimes repeat grades. Girls in rural settings are frequently given more work to perform and these domestic activities reduce the chances of girls obtaining rest because girls have a dual task of completing home chores and school work (Wittenberg, 2005).

This phenomenon is not peculiar to South Africa. In Morocco, for instance, children from rural settings have more domestic chores to undertake. In a study conducted by Emmanuel (2015) in a Morocco in rural district, girls were found to be given more work at home. They were required to cook and take care of their siblings. that the scholar found that this usually results in the girls of Morocco performing very poorly in school. Therefore, it creates a gender imbalance in the level of education as far as Morocco is concerned and this gender imbalance disadvantages girls in their academic pursuits when compared to their male counterparts. Ogoye-Ndegwa *et al.* (2007) found that in Kenya parents expect their children to assist them after school. Children are expected to undertake certain domestic chores is based on the traditional gendered division of

labour, where boys take care of animals and girls fetch water, firewood and help in the evening to prepare the family meal before they eventually clear the table and wash the dishes. The scholars point out that many learners that combine working at home with schooling are disadvantaged since this constitutes educational inequalities between them and those who do not have chores.

2.5.1.4 The poor relationship between parents and schools

A report entitled Education in South Africa's Rural Communities, published by the Nelson Mandela Foundation in 2005, focused on the poorest areas in former homelands in the Eastern Cape, KwaZulu-Natal,and Limpopo. The report mentioned the generally poor relationship that exists between parents of children in rural settings and their children's teachers (Nelson Mandela Foundation, 2005). Gardiner (2008) found that some teachers accused parents of being uncooperative, and some parents found teachers to be arrogant and fault finding. In other words, neither the communities nor the schools appeared to have accepted each other in ways that were mutually supportive.

The importance of participation by community members in matters of formal schooling was also raised in the Report of the Ministerial Committee on Rural Education, published by the DoE in 2005 (Gardiner, 2008). This report stresses that local government and school governing bodies (SGBs) need to work together in the interest of schools. The Eastern Cape, for example, has established District Education Forums which promote co-operative management of basic facilities and services for schools and the broader school communities (Gardiner, 2008).

Nhlabati (2015) in a study conducted in South Africa, Mpumalanga province, Breyten circuit, found that many parents in rural settings do not have a good relationship with the schools because they feel intimidated by the teachers when they visit schools. The author adds that other parents reported not attending the SGB meetings because they have to travel long distances in order to reach the school. This means that they are not aware of their children's performance and programmes that are taking place at school. Similarly, Gwija (2016) found that many parents in rural settings do not involve themselves in the school activities such as SGB meetings because the parents claimed that their places of work are too far from homes.

South Africa's rural setting is plagued by these problems which also exist in other countries such as Ghana. Gyamfi and Pobbi (2016) in a study located in Ghana found low parental involvement in monitoring school activities of children. The parents, especially those with low socio-economic status, highlighted the contributing factors such as intensive work schedules, and not being given time off by their employers to attend school meetings and other school functions *(ibid).*

A study conducted in Norway showed that parental involvement in the children's education is influenced by the parental level of education (Baeck, 2010). The preceding scholar contends that those parents who are educated are more recognised by the teachers when there is a school meeting *(ibid)*, and this advantages their children.

2.5.2 Parental support in urban areas

Manilal (2014) conducted a study in KwaZulu-Natal, South Africa, and found that parents from privileged families were more concerned about their children's education they employed various strategies in order to be involved in their children's education. These parents provided care and support for their children by engaging themselves in their children's education at home and supported their social wellness. Menheere and Hooge (2010, p. 144) state that "parental involvement in children's education matters. It matters for their achievement, motivation and wellbeing at school. In past decades, parental involvement in children's education has received considerable attention from many researchers and has become a key component in school policy and government policy concerning family education programs both in the United State of America and in Western Europe".

Rafiq, Fatima, Sohail, Saleem, and Khan (2013), in a study in Pakistan, Lahore, found that parents who are highly educated (and usually live in urban settings) support their children's education. At home, they assist with homework and motivate their children to study. Also, these scholars point out that parents who are educated see the need to buy study materials for their children. Sapungan and Sapungan (2014) who conducted a study in Calapan in the South city of Philippi, say that parents who are concerned about their children's education support their children in school activities and frequently talk to them about their schoolwork and performance. These parents

take the time to discuss their children's progress and identify their weaknesses and strengths.

Usaini and Abubakar (2015) conducted research in Kuala Terengganu, Malaysia. They found that parents from educated middle class families supported their children by buying all required learning materials such as books and stationery for them. As a result, learners from these families performed well at school, while learners from poorer families did not. Erlendsdóttir (2010) conducted a study in Tanzania and found that parents in urban settings were highly involved with their children's education. They encouraged their children regarding their expectations towards their future in their educational career. In addition, these parents were found to recognise the importance of staying involved in their child's education. The scholar adds that many parents in urban settings consider themselves to have a good relationship with the teachers and school of their children. This involvement is said to have a positive impact on the performance of the learner in school *(ibid).*

Lee and Bowen (2006) found in their study in America that parents who had a university degree and who attended school activities with their children or school meetings arranged by school, often had conversations about educational issues with their children at home, and they expected their children to be more successful in their educational career. However uneducated parents were found to be less involved in their children's education; the research found that these parents claimed that they were unable to assist their children due to their level of education. They could not even assist in homework or any other school related issues since they had limited knowledge of education.

Ghazi, Ali, Shahzad, and Khan (2010) add that children are more motivated if parents regularly discuss the importance of education at home. Engaged parents sometimes reward their children if they perform well, and this further motivates their children to perform better in school *(ibid).*

2.5.2.1 Level of education and socio-economic background

Page (2016) conducted a study in South Africa in the Western Cape Province and found that parents from educated families usually support their children's education. Parental involvement included: assisting the children with homework, overseeing their

children's performance at school from day to day, helping them in preparation for tests or examinations and assisting with school projects or assignment *(ibid).* The scholar asserts that parental support provided to the children brings about enjoyment, happiness, appreciation and promotes mutual interaction and communication between children and their parents. It also develops in the children the habit of appreciating the parent's role as a mediator of school work. The scholar adds that these learners that come from educated families usually perform well at school *(ibid).*

Studies in South Africa that focused on the influence of family experiences and motivation for sciences learning and achievement are limited. However, an analysis that was conducted by Reddy *et al.* (2012) shows that South African performance in TIMSS in 2011 points attention to family variables as an explanation for the TIMSS results. These results, the scholars submit, give a strong positive relationship between participants' science achievement and parental education. The results revealed that only 19% of South African participants in TIMSS in 2011 had at least one parent who was educated (having completed Grade 12) *(ibid).*

Maswikiti (2005) in a study conducted in Western Cape Province, South Africa, on the influence of socio-economic status and quality of education on school children's academic performance in South Africa, discovered that there is an important difference between children from high socio-economic status parents and children from low socio-economic status parents in terms of educational outcomes. According to Maswikiti (2005), parents that are educated may earn high salaries at their places of work. This affords these parents the opportunity to be able to send their children to well performing schools that are excellently equipped with all necessary educational resources, such as laboratories, well qualified teachers and good infrastructure. The scholar adds that parents' income has a significant effect on the child's performance. The children from parents with high socio-economic status, according to Maswikiti (2005), in general, do better in intelligence tests and academic work. The scholar explains that children from uneducated families perform more poorly than children from educated families. The scholar adds that the children from a low socio-economic status are also faced with many obstacles such as drug abuse, parental fights at home and domestic settings that are not conducive to learning. These preceding factors are unsuitable for high academic performance, so this puts the learners from low socio-

economic backgrounds at a significant disadvantage compared to their high socio-economic status counterparts.

Ireson and Rushforth (2014), who conducted research in England, state that parents who are educated and employed help their children at home with homework and may go to the extent of hiring tutors for each subject to enhance their children's education. In the developed settings parents with good jobs can afford to support their children's education because they are economically buoyant *(ibid).*

Similarly, Akinsanya *et al.* (2011) in British studies, agree that children with well-educated and formally employed parents benefit from parental support for schoolwork at home, with such support taking the form of, for example, nutritious meals and learning materials (stationery, textbooks and study guides). However, these scholars argue that the opposite effect can also apply, with some highly qualified parents being so busy at work that they leave home early, return home late and are too exhausted at the end of each day to help with homework or meaningful support. These learners may find that despite their parents' high qualifications, they perform poorly and even repeat grades. Akinsanya *et al.* (2011) note that, in general, the educational levels of parents plays a major role in influencing children's academic performance. Learners from educated families are exposed to many opportunities to learn informally, such as the presence of magazines, opportunities to watch educational television programmes and take part in discussions on topics of broad interest.

Similarly, in a study conducted in Nigeria, Egunsola (2014) notes that highly educated parents tend to involve themselves in the education of their children at home and encourage their children to talk about what they have learned each day. Such parents also provide textbooks for sciences to make the subjects easy for their children. Learners from educated parents have many learning aids at home which teach informally, such as television, computers with internet and digital devices for recording events. All these informal aids enhance learning generally, and they indirectly make science easier. Egunsola (2014) thus concludes that learners from wealthier, urban homes perform well in examinations due to the support from their families. Erlendsdóttir (2010), in a study conducted in Namibia, adds that parents in urban settings introduce their children to local libraries, visit museums to extend their scope of knowledge and make them more aware of the community during school holidays.

2.6 Attitudes of learners towards the teaching and learning of life sciences

2.6.1 Pedagogical practice and the shortage of qualified teachers in science subjects

Hussaini, Foong, and Kamar (2015), in a study, conducted in Birnin Kebbi Metropolis, Nigeria, focusing on attitudes of secondary students towards Biology, found that attitudes play an important role in learners' performance and success. They argued that this is why it is vital for science teachers to stimulate a positive attitude towards learning science. These scholars maintain that many learners are not interested in science subjects because of the pedagogical method used by teachers in the classroom, which leads to poor learner performance.

Kirima and Kinyua (2016), in a study located in Meru Central sub country in Kenya, found that teachers with many years of teaching experience have a more positive influence on the performance of learners in Life Sciences than less experienced teachers. Experienced teachers exhibited a more positive attitude, had a better grasp of content, and used more interesting teaching approaches than less experienced ones, which influenced learners' motivation, attitudes and performance. Hence learners taught by experienced teachers tended to study better, learned more and recalled more because they found pleasure in the learning experience *(ibid).*

According to Thornburg (2009), the shortage of qualified teachers is a problem internationally. This scholar submits that there is a large shortage of qualified teachers for Mathematics and Sciences in schools and many teachers in these subjects teach without teaching certificates or degrees. This challenge has led the DoE in South Africa to appoint Mathematics and Science teachers from outside the country as a measure to solve the problem. Thornburg (2009) adds that the unavailability of qualified teachers has a ripple effect and is one of the reasons for the low number of learners taking science courses at universities or colleges in the country. Thornburg (2009, p. 3) contends that "the strongest influence on the performance of students in class is whether they have a teacher with a bachelor degree in the subject they teach".

2.6.2 Learners' career ambitions and enjoyment of science

Najafi, Ebrahimitabass, Dehghani, and Rezaei (2012) conducted a study in Isfahan, Iran, and found that some learners show a positive attitude towards studying science

because they believe that they may find a cure for diseases such as HIV/AIDS and cancer when they pursue science careers at university. These scholars add that some learners are attracted to science courses at universities since they expect such courses to create better job opportunities for them. Soltani and Nasr (2010) conducted a study about attitudes towards Biology and its effects on students in Iran. They confirmed that learners found Life Sciences more enjoyable and fun when they were able to associate the subject with personal goals and a sense of future achievements. Teachers should be aware of this link and be aware that Life Sciences can be fun and interesting with the right approach. Thus, they should strive to stimulate positive attitudes in learners towards Life Sciences *(ibid).* Albert *et al.* (2014) also found that positive attitudes stimulate the thinking, feeling and reacting components of a learner, thereby influencing the learner's performance. Negative attitudes contribute to demotivating learners and lead to poor performance. These scholars added that motivated learners develop ambitions regarding the subject's role in their future careers. Once this happens, they begin to increase the effort they put into the subjects that can meet the minimum requirements for university entrance.

Olusola and Rotimi (2012) also found that learners show a positive attitude to studying sciences when it is in line with their career choices. However, many learners do not see the value of sciences and are prevented from imagining careers in this field, due to the shortage of teachers in the sciences. These learners have low self-esteem regarding science and do not develop an appreciation for it. Albert, Osman and Yungungu (2014) corroborate that those learners who perform well in science have a positive attitude towards it and this attitude informs their ambitions and future careers.

A report by White and Harrison (2012) arising from a study conducted in the United Kingdom (UK) under the topic, "UK school students' attitudes towards science and potential science based careers", emphasised that in the UK, despite the fact that many learners between age 10 to 11 enjoy studying science and view science in a positive light, less than 17% of these children aspire to a career in science. The scholars state that learners at primary level show a natural enthusiasm for science and exploring the world around them but as they progress to high school, they lose interest in the science subjects and develop a negative attitude towards the subjects and ultimately perform poorly in them.

2.6.3 Attitude of teaches and learners towards Life Sciences and the shortage of learning materials

According to Mbajiorgu *et al.* (2014), the method of teaching and the attitude of a teacher influences the attitude of learners. These researchers found that teachers from schools in rural areas were demotivated in their teaching of Life Sciences because they lacked resources such as laboratories and could not demonstrate experiments. Their own negative attitudes passed on to learners, who developed negative attitudes towards the subject, which contributed to poor performance.

Moreover, Legotlo *et al.* (2002) also asserted that learners develop a negative attitude to science when there is a shortage of teachers and lack of textbooks for the subject. According to White and Harrison (2012, p. 2) “when referring to pupils’ attitudes, they include the notion of enjoyment expressed in its “positive form” as interest, love, happiness, liking and fun, or in its “negative form” as boredom and hate”.

Researchers such as Hussaini *et al*. (2015) discovered that the type of school affects learners’ attitudes. Learners who attend schools in an urban setting tend to have more positive attitudes than learners in rural settings because schools in rural areas have the greater shortage of learning materials. This situation demotivates learners. Therefore, learners see Life Sciences as a difficult subject which they cannot link to their lives, and they lose interest in doing well in it. Lebata *et al.* (2014) found that learners have negative attitudes towards Life Sciences because it includes calculations and analysis as well as the use of representations, they find difficult to grasp, such as graphs. These difficulties lead to learners performing poorly in the subject *(ibid).* In addition, some learners who have a poor foundation in science from primary school fail the subject at high school *(ibid).* White and Harrison (2012) in UK studies found that teachers and methods of teaching played a significant role in the influence of the learners’ attitudes towards science subjects and choosing a career in science.

2.6.4 Gendered attitudes towards studying Life Sciences

One of the major contributors to attitudes towards studying Life Sciences is gender. Girls show a great interest in studying Life Sciences at a young age, but this interest decreases as they grow older (Mandeep, 2015). Girls have an interest in studying

plants and animals, but when they get to university, they do not choose science courses (*ibid*). Boys, according to this researcher, show comparatively less interest in studying Life Sciences at high school. The scholar further argues that girls treat Life Sciences teachers as their role models and look to the characteristics of the teacher when deciding on a future career (*ibid*). Rikhotso (2015), in a study conducted in Sekhukhune District, South Africa, reveals that most of the girls enjoyed studying science, therefore, have positive attitudes towards science subjects. The scholar also found that about 87% of girls that showed an interest towards studying sciences made a claim that science is relevant to their science careers. Soltani and Nasr (2010), on the other hand, state that boys have a more positive attitude towards studying science than girls but that they prefer Physical Science and Chemistry as subjects, while girls prefer Life Sciences. Therefore, girls tend to perform better than boys in Life Sciences (Soltani & Nasr, 2010).

2.7 Theoretical framework for the study

In this research study, I examined factors which influence the performance of learners in Life Sciences in two selected high schools in rural settings in Mthatha district, Eastern Cape, South Africa. The research employed Bronfenbrenner's Ecological System Theory (EST), which was developed by Urie Bronfenbrenner (1917–2005). The reason for using EST is that the processes and interactions which influence learners' performance in Life Sciences and other subjects are varied, dynamic, non-linear and complex. This system marks a departure from oversimplifying measurements of educational outcomes (Johnson, 2008). Bronfenbrenner (1979) describes four concepts in the theory namely: process, person, context and time. These are explained in the following sections.

2.7.1 Concepts in Bronfenbrenner (EST)

2.7.1.1 Process

The concept 'process' is a proximal or near process that includes all kinds of interactions that a child uses to communicate during his/her time of development. The proximal process can be protective or preventive. This stage can be explained in the form of questions asked as the child grows. Examples include: 'Does the child get enough love from the parents as well as clear rules?' 'Does the child receive enough

food at home?' Questions should also focus on connections between the child and their immediate surroundings, such as family relationships, which play a part in the competencies and general wellbeing of a child (Krishnan, 2010).

2.7.1.2 Person

In this context, the term 'person' refers to family members, caregivers, and peers who are influenced by the characteristics of a child. For instance, if a child is physically disabled, it is highly possible that the child will not receive a positive response by some peers or caregivers. This, in turn, affects the child's emotional and spiritual development (Krishnan, 2010).

2.7.1.3 Context

'Context' refers to various venues such as the place where the child spends time, and where he or she develops and interacts. Interactions can be physical, social or economic. According to Bronfenbrenner (1979), the term 'context' consists of four different concentric systems: the microsystem, mesosystem, exosystem, and, macrosystem. Krishnan (2010) states that systems may influence the child's development directly or indirectly. Bronfenbrenner later added a fifth system called the chronosystem, which concerns the integration of the time dimension into the child's life (Krishnan, 2010).

2.7.1.4 Time

This aspect covers features such as chronological age, duration, and nature of periodicity in the child's life. Events in a child's life change over time and many influences are time related. Some examples of the changes wrought by time are parents getting older and suffering illness, parents' divorce, or civil war. All these aspects may occur as time progresses and be influenced by time. Such events can strongly influence the development of a child (Krishnan, 2010).

Bronfenbrenner's Ecological System Theory

Paquette and Ryan (2001) assert that the EST focuses on the child's development in the context of the components of the system, all of which shape the child in one way or the other. Paquette and Ryan add that Bronfenbrenner's theory affirms the roles that the various components of the total environment play in a child's development.

Krishnan (2010) concludes that EST focuses on children's development in different contexts of the environment, where interrelationships are continuous.

Bronfenbrenner (1994) asserts that in order to gain an overview of a child's development, one must look at the whole ecological system where the child's growth occurs. EST is made up of five subsystems that assist and guide a child's development. The subsystems are arranged from immediate to less immediate and include microsystem, mesosystem, exosystem, macrosystem and chronosystem. Bronfenbrenner stresses that a system can affect the development of a child either directly or indirectly, depending on the environment that surrounds the child. Changes in the system, such as physical changes or changes in the home, may lead to changes in the child's development. Figure 2.1 shows the important features of Bronfenbrenner's ecological system model:

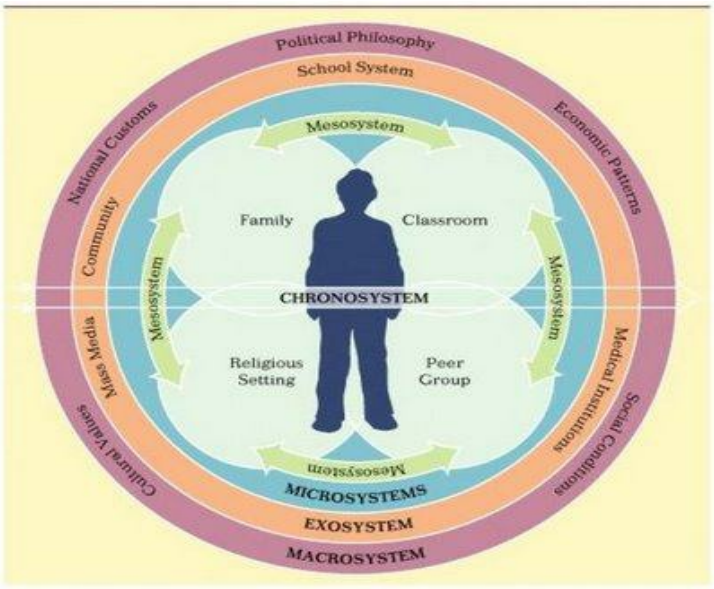

Figure 2.1: Bronfenbrenner's ecological system model
Source: Project Cornerstone, ABC year 3, lesson 5, (Bridges, 2017).

2.7.2 The microsystem

The microsystem involves the set of structures (including activities, roles, interpersonal relationships and material features within the spaces where these occur) with which a developing person has direct contact (Johnson, 2008). The innermost part of the circle is referred to as the microsystem, which includes all individuals and their experiences. Luthar (1997) argues that although all levels of the ecological model play a role in the development of a person, the microsystemic environment is most influential. The

influence may be either positive or negative. The system is characterised by relationships with parents, with other caregivers at home, with peers, and with the teachers at school where the developing person spends much of the day. According to Krishnan (2010), this layer has an instant, direct effect and control on the young person's development. Bi-directional influences exist between the developing person and the surrounding structures, including people such as peers, based on interpersonal interactions. In this study, learners' relationships and interactions with their teachers and parents will be examined to gain insight into how these factors influence their performance in the Life Sciences.

2.7.2 The mesosystem

The mesosystem is the second layer of influences, consisting of the interrelatedness between microsystems. It centres on the connection between two or more systems, such as the home and the school. Al-Matalka (2014) asserts that the involvement of parents in the schoolwork of a child, such as checking homework, motivating the child to study and giving a child love, help the child to perform well at school. This scholar infers that the participation of parents in children's education enhances a child's attitude towards learning. Johnson (2008) adds that if parents expect very high levels of academic and extracurricular success from their children, fear and anxiety may arise in their minds if their child underperforms. Conversely, this also affects the school both directly and indirectly. Teachers in the school might try to protect the child from parental pressure by not being candid with parents about the child's progress. The child might adopt negative attitudes towards academic work and sports, and this could manifest in the child becoming undisciplined *(ibid).* In this study, levels of parental support and relationships between parents and teachers were examined for the role they play in a learner's attitude towards Life Sciences.

2.7.3 The exosystem

The exosystem is the third layer in the circle, with the developing person not directly involved in this aspect. The system involves all things that affect the individual's development in an indirect way. For instance, people who surround the learner in a neighbourhood may not interact with the learner constantly, but the attitudes and interactions of these people still have a huge impact on the learner (Bronfenbrenner & Morris,1998). Parents may attend work related events for many days and be unable

to attend parents' meeting at schools, or parents may be retrenched from work. These occurrences reduce the interaction of the parents with teachers, which can adversely affect a learner's development. The influence exerted by this system on the developing person is uni-directional.

2.7.4 The macrosystem

This system is the outer layer and the largest one. It affects all the lower systems of the EST. According to Parrila, Ma, Fleming, and Rinaldi (2002), this layer is made up of beliefs and cultural values that are basic influences on the child's development. Johnson (2008) refers to this layer as the "social blueprint of a given culture" (2008, p. 3). This 'blueprint' comprises "values, belief systems, lifestyles, opportunities, customs and resources". Prevailing cultural values may influence the developing person positively or negatively. Bronfenbrenner and Morris (1998) maintain that all the lower layers are influenced by the macrosystem, which includes cultural values, changes in politics and economic fluctuations. All these aspects subtly influence the development of a child indirectly and uni-directionally. In this study, the values of parents and teachers, the lifestyles of parents and the economic circumstances of the parents and school were examined as influences on learners' performance in Life Sciences.

2.7.5 The chronosystem

The chronosystem comprises the time-based dimension as it relates to the child's development and influences how all the other layers of the ecological system work. Ryan (2001) asserts that the effects of this system can be either external or internal. For instance, if a child loses his/her parents, the child's development may be affected as time goes on. The development of a child and his/her behaviour will change with time as the child grows. The child may act differently to similar circumstances depending on when in his personal development the circumstance occurs *(ibid).* Within a school, curricula, staffing and resources change over the short, medium and long term and affect the developing individual in different ways (Johnson, 2008).

2.8 Links between theoretical framework and the study

Bronfenbrenner's theory of EST was chosen to guide this study because it is ideally suited to the focus of this study, which includes the factors that enable or constrain learners' performance in Life Sciences in schools in rural settings. These factors guide

the development of the child at school and at home. The theory covers all the systems that affect a child's development and adequately explain the interrelationships among the various components of a child's life. If one system is not functioning, the effect is felt through all the systems, and a disturbance in any level of the model can affect a child's academic performance. The model focuses attention not only on the child as an individual, and the child's internal world, but upon all aspects that impact the child, including external factors. It also emphasises the interrelationships between the various systems that work together co-dependently to shape lives. Aspects such as parental support for schoolwork, the influence of the DoBE, peers and the economy of the country all affect the child positively or negatively.

Bronfenbrenner's (1989) model is also apt for this study because the study examines the processes (for example, the teaching process), the persons (learners, teachers and parents) and the context of learning (secondary schools in rural South Africa) on an outcome (learners' performance in Life Sciences) (Johnson, 2008).

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Brink, Van der Walt, and Van Rensburg (2006, p. 2) state that “research in science refers to exploration, delivery and careful study of the unexplained phenomenon.” It is a systematic process of collecting and logically analysing data for given purposes. Researchers employ various methods for the purpose of gathering and analysing data, and for maintaining the reliability and validity of their studies (McMillan & Schumacher, 2010). According to Håkansson (2013), research methodology is a guideline to carry out the research and it includes organising, planning, designing and conducting research.

According to Henning, Van Rensburg, and Smit (2004, p. 36), methodology is a “coherent group of methods that complement one another and have the goodness of fit to deliver data and findings that reflect the research question and suit the purpose.” In addition, Brink *et al.* (2006) explain that a research methodology offers the theoretical underpinning for understanding which method, set of methods, or best practices can be applied to a specific case. This suggests that methodology is a particular procedure for accomplishing or approaching something. It is, therefore, the system of methods or plans to be used or employed when doing the research (Brink *et al.*, 2006).

A case study approach was adopted in this qualitative study which was located in the interpretive paradigm. This study was designed to bring to the foreground learners’ views about factors which affect their performance in Life Sciences in a rural setting. The following two critical questions were used to generate findings:

1. What are learners’ views about factors which contribute to their performance in Life Sciences within a rural setting?
    - 1.1 What enables learners in their performance in Life Sciences within a rural setting? Why is this the case?

1.2 What constrains learners in their performance in Life Sciences within a rural setting? Why is this the case?

2. How can learners access support to perform successfully in Life Sciences classrooms in a rural context?

The discussion in this chapter will include the context of the study, methodology, paradigm, research design, population and sampling. The reliability and the validity of the research instrument will also be outlined. This will be followed by the ethical considerations guiding the study.

3.2 Context of the study

This case study was undertaken in two high schools (School A and School B - these are pseudonyms used to ensure the anonymity of the schools). This research was carried out among Grade 12 learners in the Mthatha district in the Eastern Cape, South Africa. Both schools were located in rural settings. Learners from both schools were of African descent and were studying Life Sciences in Grade 12.

In South Africa, schools are categorised into quintiles, based on socio-economic status or advantage. There are five quintiles, with the most disadvantaged schools which serve the most economically deprived population being classified as quintile one, and the most advantaged schools which cater to wealthier class of people being classifed as quintile five.

Both schools in my study were catergorised as quintile three schools. Both schools were poorly resourced and had inadequate infrastructure. Many parents of learners who attended these schools were unemployed and depended on social grants to support their children. Parents could not afford to pay school fees. I had decided to select these schools because I was interested in understanding Grade 12 learners' views within this setting.

According to the Eastern Cape Department of Basic Education (2016), this province has 600 high schools with learners from Grade 8 to Grade 12. Mthatha district, which is within the Eastern Cape currently has 249 high schools some of which are located in urban settings and others in rural settings. Schools in the Eastern Cape, particularly those in rural communities, are attended mainly by Black learners who reside in these areas.

Mthatha district is located in King Sabata Dalindyebo Municipality which is situated within OR Tambo district in the Eastern Cape. It is the largest of the five municipalities in the district, accounting for a quarter of its geographical area. The majority of population of the Municipality resides in rural areas and most of them are not educated and are not formally employed. King Sabata Dalindyebo Municipality retains many buildings of neoclassical style that were popular during the colonial times. The study participants were Black African learners from this rural context of the Mthatha district. Figure 3.1 shows the area of Mthatha district in the Eastern Cape Province in South Africa where my study took place.

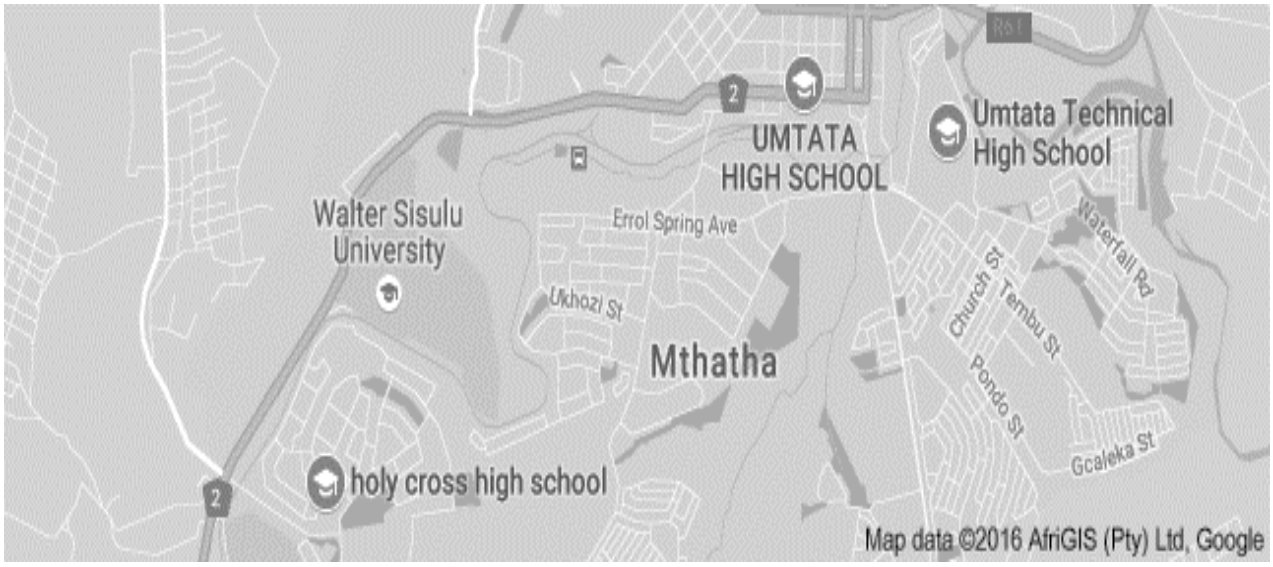

Figure 3.1: Map of Mthatha District in the Eastern Cape South Africa

The rural setting in Mthatha district is characterised by a high rate of poverty and illiteracy, especially among adults and other dwellers who reside in these communities. It is not uncommon for many learners to go to school without food. The lack of education among the adults drives unemployment and resultant poverty, which impacts learners. Many learners walk between one and three kilometres to school since their parents have no vehicle or fare to transport their children to school (Eastern Cape Department of Basic Education, 2011). The infrastructure is poor with gravel roads and when it rains, learners are unable to go to school, because roads become unusable. Within this context, the study was designed.

3.3 Overall research design

Figure 3.2 shows a schematic diagram of research methods used in this study and will be discussed as follows: Interpretive paradigm, qualitative approach, research design, and data collection.

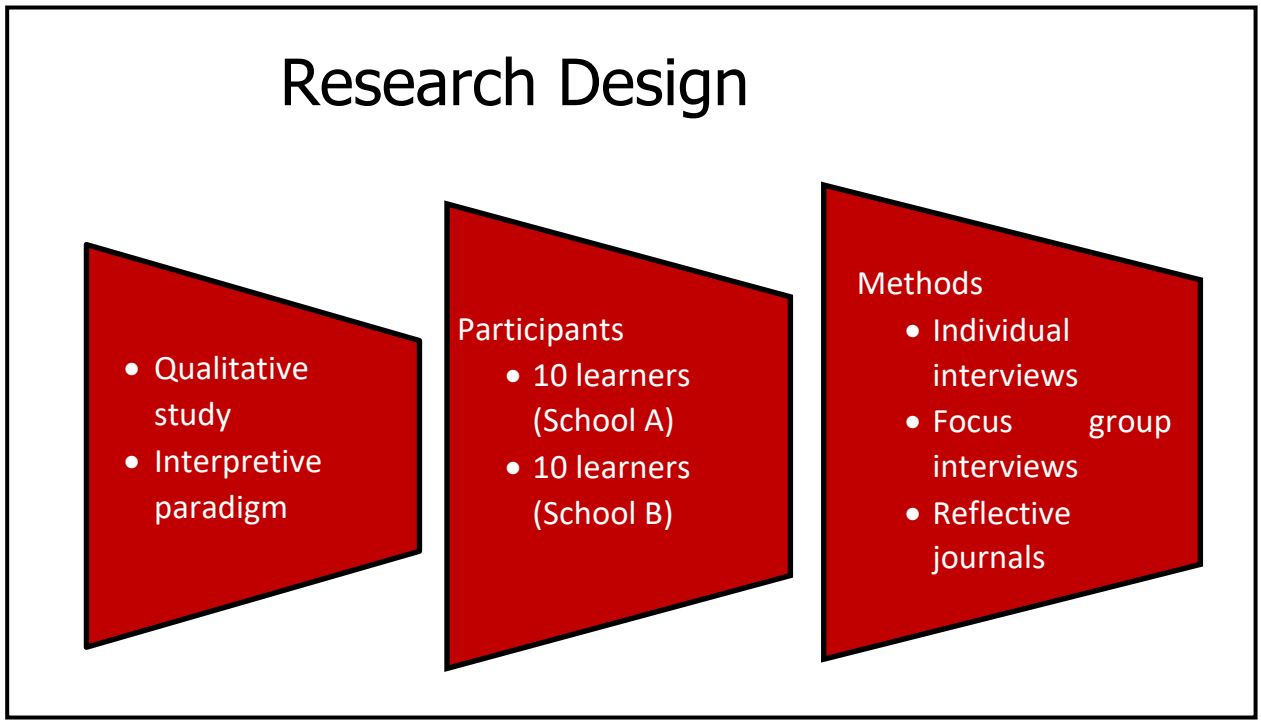

Figure 3.2: Schematic diagram of research design

3.4 Research Paradigm

According to Weaver and Olson (2006, p. 460), “paradigms are patterns of beliefs and practices that regulate inquiry with a discipline by providing a check lens, frames, and processes through which investigation is accomplished”. Creswell (2009, p. 6) adds that paradigm means “worldview” and is defined “as the way that people perceive the world”. This scholar states that the word paradigm holds four terms; “ethics, epistemology, ontology, and methodology”. In the view of Atieno (2009, p. 13), “paradigm can be used to mean the approach of the study or the design.”

According to Surrepong (2010), an interpretive paradigm is sometimes called heuristic because by nature humans are able to communicate with one another and interpretive research prioritises communication. Willis and Jost (2007) argue that the interpretive paradigm is not a dominant model of research but is gaining considerable influence since it accommodates many perspectives and versions of truth. Cohen, Manion, and

Morrison (2007, p. 22) contend that the “interpretive paradigm focuses on the individual in order to understand the phenomenon that is being investigated from within the individual.” Gillis and Jackson (2002, p. 6) also support this conceptualisation.

Since the aim of my study is to investigate what Gillis and Jackson (2002, p. 6) refer to as “systemic life experiences” of Life Sciences learners in the selected schools, the interpretive paradigm was adopted as the most appropriate paradigm for actualising the purpose of the study.

3.5 Research Approach

Cohen, Manion, and Morrison (2013, p. 47) state that a “research methodology means the range of approaches used in educational and other research to gather data which are to be used as a basis for inference and interpretation”. These scholars add that the aim of research methodology is to help us understand in broad terms, not the products of scientific inquiry, but the processes involved. Generally, there are three types of research methods. These are the quantitative, qualitative and mixed methods.

The quantitative research method is a process that is systematic and objective in its way of using numerical data from only a selected sub-group of a universe to generalise the findings to the universe that is being studied (Pieterson & Maree, 2007). Maree (2007) further states that in quantitative research, an investigator relies on numerical data to test the relationships between the variables. This view is supported by McMillan and Schumacher (2010) who also state that quantitative research designs emphasise objectivity in measuring and describing phenomena.

The qualitative method has a different approach, providing information about the “human” side of an issue, in this case, the factors which contribute to the performance of Grade 12 Life Sciences learners, from their perspective. According to Mack, Woodsong, MacQueen, Guest, and Namey (2005, p. 1), “the strength of qualitative method lies in its ability to provide complex textual descriptions of how people experience a given research issue”. Often, contradictory behaviours, beliefs, opinions, emotions and relationships of individuals are explored qualitatively. Qualitative methods are also effective in identifying intangible factors, such as social norms, socio-economic status, gender roles, ethnicity, and religion, whose role in the research issue may not be readily apparent. Mack *et al.* (2005) further argue that the

components of the study must connect to each other and the identified method must dictate the combination of strategies to be applied in a specific manner to ensure consistency throughout the research process.

Qualitative research is designed to help researchers understand people and the social and cultural contexts within which they live. Qualitative research involves an interpretive and naturalistic approach to its subject matter. It also attempts to make sense of or interpret a phenomenon in terms of the meaning people bring to it (Lincoln & Denzin, 2003). Furthermore, qualitative researchers make knowledge claims usually based on constructivist or advocacy participatory perspectives. Strategies of inquiry often include narratives, phenomenologies, ethnographies, grounded theory studies or case studies. Open-ended, emerging data is collected with the intent of developing themes from the data (Galt, 2008).

Cohen *et al.* (2013) explain that qualitative methods are not more important than quantitative research methods, and the choice of methodology usually depends on the type of philosophical paradigm and other study design features. The scholars add that quantitative research covers a strong research form, originating in part from the positivist tradition. Qualitative research is not embedded in the positivist paradigm and can take several forms, including case studies and narrative inquiry.

The qualitative methodology was adopted for this study because it involves a small-scale study with a case study approach. From the description of the qualitative research method given above, a small-scale type of inquiry is one of the main characteristics of a qualitative research method. Moreover, researchers such as Cohen *et al.* (2013) assert that case study is a common design in qualitative research. Since the present study is a case study of the factors which influence performance of Grade 12 learners in Life Sciences in two selected schools, the study privileged qualitative methods.

Furthermore, I was interested in understanding the meaning learners have constructed, and how learners make sense of factors which influence their performance in Life Sciences in selected Mthatha rural high schools. The use of qualitative methodology helped me to unearth the phenomena in their natural setting. In order to make sense of and interpret the phenomena from a holistic perspective, the qualitative method is more apposite than the quantitative or mixed methods.

3.6 Research design

A qualitative case study design was used to conduct this research. Denscombe (2014) defines a case study as a design that systematically investigates, in depth, an instance of a particular phenomenon in order to generate knowledge. The “instance” that is being investigated is called the case. Isolating a case for study allows more intense examination of the case than would be the case if a broader investigation were carried out. Willig (2013, p. 72) states that “case study is not itself a research method, instead, it constitutes an approach to the study of singular entities which may involve the use of a wide range of diverse methods of data collection and analysis.” A case study can be seen as an “in-depth study of interactions of a single instance in an enclosed system” (Opie & Sikes, 2004, p. 111). The scholars also state that a “case study does not require a large number of people because a case study works better with fewer people. One person or a small group of people in a convenient place such as a classroom or study centre can be involved in a case study.” In my study, 20 learners were involved. Deep insight was obtained from them using reflective journals, individual interviews and focus group interviews. This was done in order to examine factors which they believed influenced their performance, more intensely.

Furthermore, Denscombe (2010, p. 52) highlights the importance of a case study approach by stating that a “case study focuses on one or few instances; this permits the researcher to deal with subtleties and complete complex social situations”. In other words, the researcher is not confined to one method but can use a variety of methods in the study in order to capture the complex reality under scrutiny. Similarly, Cohen *et al.* (2013, p. 182) state that the case study is a “real situation of real people in an environment familiar to the researcher.” In a case study, the researcher aims to describe “what is it like”, “thoughts” and “experiences” of a particular situation (Cohen *et al*. 2013, p. 182).

Yin (2003, p. 14) defines case study research as an “empirical inquiry that investigates a contemporary phenomenon within its real-life contexts in which multiple sources of evidence are used.” In the same manner, Lee, Mishna, and Brennenstuhl (2010) add that the case study is an evidence-based empirical approach that focuses on an intense investigation of a single system or a phenomenon in its real-life context. My study was designed to elicit and understand factors which learners believed influenced

their performance in Life Sciences. These were based on thoughts and experiences of learners drawn from their real life contexts about factors which affected their performance. Lee *et al.* (2010) state that the purpose of a case study is to provide an in-depth description, exploration or explanation of a particular system.

In my study, a case study approach was chosen because it allowed a deep exploration into factors which influenced the performance of Grade 12 Life Sciences learners in the selected Mthatha high schools. Bell (2014) explains that a case study approach is mainly suitable for individual researchers because it gives the chance for one aspect of a problem to be studied in-depth within a restricted timescale. Thus, for the present study, as an individual researcher, I used the case study design to present and interpret the detailed information about the factors which influenced the performance of Grade 12 Life Sciences learners in the Mthatha high schools.

3.7 Population and sampling

Due to time and resource constraints, the present study could not investigate the entire array of variables. Thus, I selected a sample that is representative of the population within this setting.

3.7.1 Population

According to Salkind (2013, p. 185) “population is a group of potential participants to whom you want to generalize the results of the study”. Babbie and Mouton (2005) state that population is the group about whom the researcher wants to draw conclusions. The population for this study comprised Grade 12 Life Sciences learners who were attending schools that are located in rural settings in the Mthatha District of the Eastern Cape Province.

3.7.2 Sampling

According to Salkind (2013, p. 95), “sampling is a subset of the population and generalisability is the name of the game; only when the results can be generalised from a sample to a population do the results of research have meaning beyond the limited setting in which they were originally obtained.”

Cohen *et al.* (2013) argue that good quality work for a researcher does not stand by only the relevant methodology and instrumentation but also needs a suitable sampling

strategy. These scholars say that researchers must also decide on the sampling strategy early in the overall planning of research. Schutt and Check (2012) assert that in qualitative research, decisions about sampling are determined by the necessity to thoroughly consider the participants involved, location and situation where the study will take place. Consequently, for this study, I decided to use purposive sampling as well as random sampling techniques to draw the participants. According to Mack *et al.* (2005), purposive sampling entails pre-selected criteria relevant to a particular research question, sampling sizes which may or may not be fixed prior to data collection depending on the resources and time available, as well as the study's objectives. Random sampling is different to purposive sampling in that in "random sampling every member of the population has a known (non-zero) probability of being included in the sample" (Alvi, 2016, p. 12). The preceding scholar adds that random selection is used, and this technique needs population to be very precisely defined.

Participants in my study were purposively selected based on the following criteria: they had to emerge from rural settings in the Mthatha District, be in Grade 12, and be studying Life Sciences. A large group of potential participants, based on these criteria, was available. I then employed a simple random sampling technique to obtain a small sample size of 10 participants per school.

Gay, Mills, and Airasian (2009, p. 113) add that qualitative sampling is the "process of selecting a small number of individuals for a study in such a way that individuals have a good key information to the researcher's understanding of a given phenomenon". The participants in my study had good information based on their lived experiences about factors which affect their performance in Life Sciences. In each of the schools A and B, 10 Black African learners, aged 18 to 19 years and who were in Grade 12 doing Life Sciences in a high school located in the rural area in Mthatha District, were selected.

I selected two schools that are located in a rural area since my research question was based on the performance of Grade 12 learners in a rural community. I worked in this area and had ready access to these schools, therefore they were conveniently sampled. Purposive sampling was involved in the first stage of sample selection. All Grade 12 learners from each rural school who study Life Sciences were invited to engage in my project. Learners in each school were then grouped into male and

female clusters, using a sampling technique. Creswell (2007) explains that this method of sampling includes a random selection of a number of clusters from which all participants are selected randomly. Next, the simple random sampling technique was used to select the representative proportion for each gender group. Depending on the number of respondents required for each gender group per class, the words “yes” and “no” were written on pieces of paper. The papers were then placed in a container and thoroughly shaken and all learners who consented to participate in the study were allowed to pick a piece of paper from the container. The first five male learners and first five female learners from each school who picked the “yes” papers from the container constituted the sample for that particular school. The simple random sampling method was used over other random sampling techniques because it gave every learner an equal opportunity to be chosen from the whole group.

3.8 Pilot study

According to Arain, Campbell, Cooper, and Lancaster (2010, p. 1), a pilot study is a small study for helping to design a further confirmatory study. Boudah (2010) explains that a pilot study helps a researcher learn about research questions, methods and procedure using few numbers of participants. I conducted a pilot study to check the clarity of the research questions on the instruments that I was going to use and also, to improve the validity and reliability of my study. It was anticipated that the instruments and methods could be validated to a greater degree by selecting participants for the pilot study from different schools within the same rural district as the school which were used as research sites.

I selected two Grade 12 boys and two Grade 12 girls from another school whose academic performances were similar to those who participated in the study. I interviewed them using both focus group and individual interview schedules. Based on these pilot interviews, I realised that the following changes needed to be made to the instruments. In the focus group, I noticed that one of the two piloted participants could not sit for more than 40 minutes due to reduced levels concentration. I then decreased the time from 45 minutes to 30 minutes in order to accommodate all participants. During the interview, I noticed that the piloted participants did not understand English adequately. I had to code-switch when interviewing them. I also

asked them to read the guide for the reflective journals. They thought that these guidelines were clear, and no changes were made.

Based on findings from the pilot study, I improved my research instruments. The following questions were asked during the pilot study: “Are you interested in doing Life Sciences at high school?” “And why?” A few learners seemed not to understand the question in the individual interview. Therefore, this question was changed to, “Would you consider yourselves as being curious about Life Sciences? Why do you say so?” “What kind of support do you require at home?” Also, other questions were not clear to the learners and were changed to: “What kind of support do you need from your schools to help master tasks that you dislike in Life Sciences?”

I then met with the 20 research participants. They told me that if I conducted the study during the first term, they would not be easily available because they would be in a new class and they would be adapting to being Grade 12. As a result, I decided to administer the reflective journals in the second term and third terms, over a period of six months.

3.9 Data collection procedure

The data was collected from Grade 12 Life Sciences learners in two Mthatha schools in a rural community. The methods of the data collection were focus group interviews, individual interviews, and reflective journals.

3.9.1 Focus group interviews

According to Liamputtong (2011, p. 31), a focus group interview “is not a group interview. It is a group of people gathered together to discuss a focused issue of concern”. Salkind (2013, p. 188) also states that a focus group is “a qualitative method that involves instructed group interviews in which the focus group leader actively encourages discussion among the participants on the topic of interest”. Moreover, Mack *et al*. (2005, p. 51) describe the focus group as a “qualitative data collection method in which one or two researchers and several participants meet as a group to discuss a given research topic”. Furthermore, Krueger and Casey (2002, p. 4) indicate that “The first few moments in focus group discussion are important. In a brief time, the moderator must create a thoughtful, permissive atmosphere, provide ground rules, and set the tone of the discussion. The recommended pattern for introducing the group

discussion includes (1) Welcome, (2) Overview of the topic (3) Ground rules and (4) First question."

Krueger and Casey (2014) argue that a focus group is not about putting participants together to discuss but is a plan to include a special type of group in terms of purpose, size, and composition and must also follow a procedure to select participants. The scholars add that the purpose of using a focus group is to understand how people feel or think about an idea or service. They are also used to put together opinions from different participants about certain issues or ideas. Ritchie, Lewis, Nicholls, and Ormston (2013, p. 171) point out that in a focus group interview "participants express their own views and experiences while interacting with other people. This gives the participants the opportunity to listen, reflect on what is said and in light of this further consider their own standpoint".

Based on these insights, I designed the focus group interviews. The focus group interviews for this study were not aimed at reaching consensus on the discussed issues but they served as a means of exploring learners' experiences as these relate to their performance in Life Sciences. Hence, the participants were encouraged to provide a range of responses which provided a greater understanding of the attitudes, behaviour, opinions or perceptions on the researched issues (Hennink 2007). The group of learners from each school was divided into two groups of five each, based on their academic performance in Life Sciences. This was done to obtain a variety of responses from learners in two groups whose performances were different. I was cognisant of the need to create a conducive environment for members to speak freely, to be warm and welcoming and to set guidelines which include mutual respect for one another's responses. The interviews lasted about 30 minutes.

3.9.2 Individual Interviews

According to Stuckey (2013, p. 56), an "interview is a way for researchers to understand the thought process that exists inside, an inner look at why people behave in the way they do". Denscombe (2010, p. 10) states that an interview is "an attractive proposition for project researchers." Rabionet (2011) adds that qualitative interviews are powerful tools together with the information and experiences about the people. Mack *et al.* (2005, p. 29) state that "an interview is a technique to elicit a vivid picture of the participant's perspective on the research topic." Furthermore, Schutt and Check

(2012, p. 174) define the individual interview as “one on one interview where the physical and social circumstances of the interview can be monitored, and respondents’ interpretations of questions can be probed and clarified.”

> Also, Stuckey (2013) explains that interview styles range widely but share a defining characteristic of using questions to understand the thoughts, feelings, beliefs and behaviour of people. He further states that “There are three types of one-on-one interviews, and these are structured, unstructured and semi-structured”. Unstructured interview protocols ask more open-ended questions and the order often depends on interviewees’ answers. Interviewees often react to the interviewer’s verbal and non-verbal responses to what the interviewee has said *(ibid).* In this study, a semi-structured interview schedule was used. This is due to the fact that a semi structured interview is usually preceded by observation, informal and unstructured interviewing in order to allow researchers to develop a keen interest in understanding the topic of interest necessary for developing relevant and meaningful semi structure questions. Pathak and Intratat (2012, p. 4) assert that “Semi-structured interviews provide a very flexible technique for small-scale research. They provide more useful data when the sample size is relatively small. It also allows thematic analysis of the qualitative data. Semi-structured interviews are used when the research would benefit from a fairly open framework. They are also used when more useful information can be obtained from focused, yet conversational two-way communication with the participants.”

Semi-structured interviews were designed for my study because they allowed me to adapt questions based on participants’ verbal and non-verbal responses. They also allowed for deeper probing into issues. Semi-structured interviews gave me the freedom to explore issues in particular ways, in order to answer the research questions of my study. They also gave participants a measure of freedom to respond to issues which mattered to them.

Prior arrangements were made for days and times scheduled for the interviews. Before the interviews began, consent forms (Appendix three) were given to the participants to sign to confirm their voluntary intention to participate. Two months were needed to

generate the interview data. The venues for the interviews were private spaces within the premises of the chosen schools.

3.9.3 Reflective journals

According to Mruck and Breuer (2003), participants are encouraged to say what they know about themselves, their presuppositions, choices, experiences and actions during the research process. The reflective journals can help learners learn to chart their development, identify barriers, patterns, and strategies, challenge their own beliefs and avoid repeating the same mistakes. Reflection can also lead towards greater confidence and assertiveness or to a change in attitude, perspective or priorities (Young, 2012). Moon (2010, p. 2) explains that

> "Journals, logs, diaries, portfolios are containers for writing that is recorded over a period of time. The writing may accompany a programme of learning work, fieldwork or placement experience or a research project. Journals allow a reticent student to establish an opinion about a topic before being asked to speak about it publicly. Journal writing turns students into active learners; it's difficult to fall asleep while writing! Journal writing also helps students to relax when they write and helps them to find their own voice and rhythm."

Reflective journals can also support understanding and the representation of that understanding; to develop critical thinking or the development of a questioning attitude (Moon, 2010).

Based on these insights, I asked each of the learners to maintain a reflective journal over a period of six months. I used reflective journals as a data generation tool to allow participants to record their own experiences in their own voices. They were asked to reflect on and record their thoughts about Life Sciences. The factors that constrain and enable learners' performance in Life Sciences were the issues on which they were asked to reflect, and this provoked critical thinking in them in line with their circumstances.

3.10 Data analysis

According to Leech and Onwuegbuzie (2007, p. 560), qualitative data analysis provides naturally occurring information that allows school psychology researchers to increase their understanding about certain phenomena. The data for this study were analysed using the qualitative content analysis approach. According to Schumacher and McMillan (2006), content analysis is a close scrutiny of text(s) to understand themes or perspectives. Data analysis is an attempt to identify the presence or absence of meaningful themes, common or divergent ideas, beliefs and practices. Data analysis in qualitative research is primarily an inductive process of organising data into categories and identifying a pattern among categories (Maree, 2007).

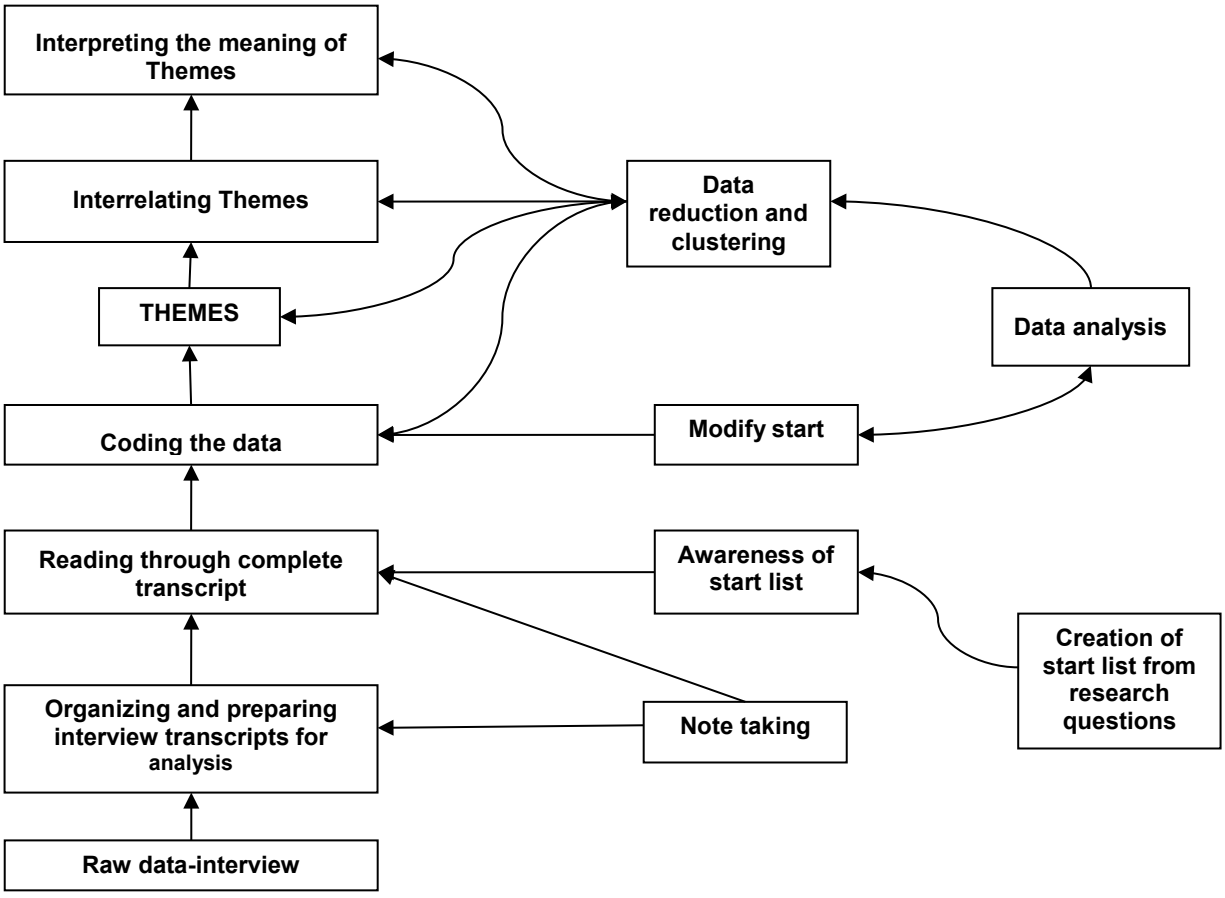

Figure 3.3: Diagrammatic qualitative interpretive categorisation
Source: Creswell's (2009, p. 185) seven step data analysis overview. Adapted from Stokes and Urquhart (2013)

Figure 3.3 shows Creswell's seven steps that a researcher can follow to analyse the data. Creswell (2009) submits that the researcher must merge the specific research

strategies. The scholar further suggests that the researcher must have a general data analysis framework with the qualitative interpretative categories. Moreover, Ireland, Tambyah, Neofa, and Harding (2009, p. 8) state that a “qualitative data analysis process commences with saturation exposure to the interview data and finishes with a set of descriptive categories which faithfully describe the conceptions of research participants”. The researcher labels each category of description as a description of a conception by the participants. Collected data are thematically analysed and raw data are set into meaningful segments and coded into categories. Related categories are usually grouped into patterns and emerging themes are scanned. Findings are also derived from emerging themes from the data (McMillan & Schumacher, 2010).

Content analysis was used to analyse the data for the present study. Krippendorff (2012, p. 1) defines content analysis as “a research technique for making replicable and valid inferences from data to their context”. Content analysis is the main element of content that procedures are not interpreted as a unit but are divided into segments; following the categories that are assigning to the text *(ibid).* In this study the data was collected from the participants using multiple methods and transcribed into a text form so that it could be verified by the participants, thereby allowing for analysis and replication if necessary.

Data was collected from focus group interviews, individual interviews and reflective journals. The focus group and individual interviews were audio-recorded so that the participants input could be captured word by word and the researcher could play it repeatedly. The focus group interviews were conducted first in School A and then School B. I started the transcription after the interview. I repeatedly listened to the recorded interviews in order to correctly capture words and expressions of the participants.

A week after the focus group interviews were completed, I conducted individual interviews. The interviews were recorded and later transcribed word by word then compared with the reflective journals collected from the participants. Interview transcripts and the reflective journals were read many times to understand the insights expressed in the text data and also, to understand the participants’ views in relation to the research questions of the study. The data was coded, and themes emerged for answering my research questions.

3.11 Rigour of the study

The quality of research can be measured by two constructs, namely, validity and reliability.

3.11.1 Validity (trustworthiness and credibility)

According to Leung (2015, p. 229), validity in qualitative research means “appropriate” tools, processes, and data. If a piece of research is invalid, then it is worthless. To ensure trustworthiness of this study, I established a rapport with the participants.

To enhance the trustworthiness of the study I ensured the elimination of the bias in the research procedures by using extensive field notes (White, 2005). To eliminate bias the data was verified and compared. Three research instruments were used to generate data and compare (focus group interviews, individual interviews and reflective journals) and to ensure the validity and reliability of my findings. The data was taken to participants to confirm accuracy. All the participants agreed that the transcripts were accurate. The research findings were read by my supervisor to enhance validity.

My study sought to find answers to the factors that enable and constrain Grade 12 Life Sciences learners’ performance in a rural setting. I systematically and thoroughly analysed the data that were collected from the participants. I use triangulation in order to ensure validity and reliability. I used various strategies and instruments to collect the data such as focus group interviews, individual interviews, and reflective journals. Themes and patterns emerged from various sources which ensured triangulation of data sets and increase validity.

3.11.2 Triangulation

According to Hussein (2015, p. 3), “triangulation is defined as the use of multiple methods mainly in qualitative and quantitative methods in studying the same phenomenon for the purpose of increasing study credibility.” Cohen, Manion, and Morrison (1994, p. 112) explain that “triangulation may be defined as the use of two or more methods of data collection in the study of some aspects of human behaviour. It may also compare different sources of evidence in order to determine accuracy of information”.

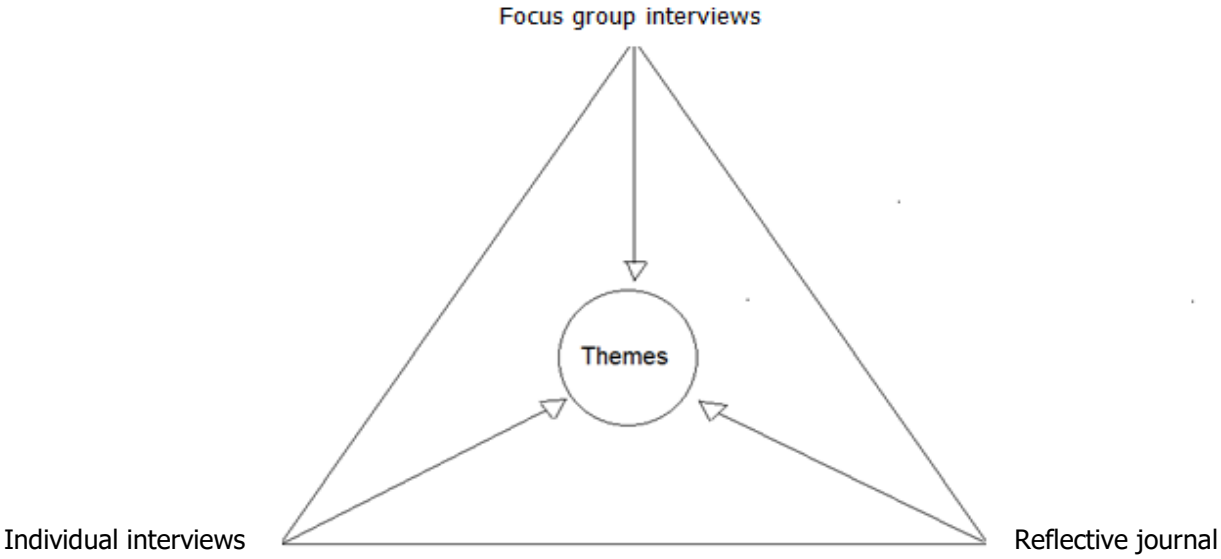

Figure 3.4: Diagrammatic representation of "triangulation"
Source: Adebayo (2014 p. 49) adapted from (Waters-Adams, 2006)

To ensure triangulation in my study, I used three different instruments to generate data and compare results. These were individual interviews, reflective journals and focus group interviews. These were used to ensure the validity and reliability of the data.

3.11.3 Reliability

Reliability is defined as "the exact reliability of the processes and results" (Leung, 2015, p. 230). Cohen *et al.* (2013, p. 117) describe it as an "essential synonym for consistency and reliability over time, over instruments and over groups of respondents."

I conducted a pilot study to make sure that I used unambiguous questions in the entire research instrument and the same respondents were repeatedly asked the questions through different instruments in the gathering of data. Thick descriptions of the research process enabled me to ensure reliability of the study.

3.11.4 Confirmability in qualitative research

Shenton (2004) states that the concept of confirmability is the qualitative investigator's comparable concern to objectivity where steps are taken to ensure as far as possible that findings are the result of the experiences and ideas of the informants, rather than

the characteristics and preferences of the researcher. I consulted my supervisor and another researcher to serve as peer reviewers to confirm whether or not the findings are supported by the data.

3.11.5 Trustworthiness

According to White (2005), trustworthiness of qualitative research can be achieved through the establishment of how confident the researcher is with the truth of the findings based on the research design, informants, context, and through the degree to which the findings can be applied to other contexts and settings or with other groups. In other words, it is the ability to generalise from the findings to a larger population. To enhance the trustworthiness of the study, I ensured that all identifiable biases in the research procedures were eliminated thereby establishing confidence with regard to the truth of the findings based on the research design.

3.11.6 Credibility in qualitative research

The credibility of findings ensures that the research is carried out according to the canons of good practice. It is also referred to as “member checks” in which participants are given their interview transcripts and the research reports so that they can agree/disagree with the researcher’s findings. Another strategy to enhance the credibility of findings is giving the findings of the study to other people who may have interest in the research to scrutinise (Maree, 2007).

I gave the instruments to my supervisor to examine and thereafter I conducted a pilot study where piloted participants were invited to comment on the items in the instruments. Moreover, the study participants were also invited to read the transcripts of their interviews to ensure that their responses were captured accurately.

3.12 Ethical considerations

According to Babbie (2013, p. 65), “ethics is typically associated with morality and both deal with matters of right and wrong.” Saunders, Lewis, and Thornhill (2011, p. 226) define ethics as “the standards of behaviour that guide your conduct in relation to the rights of those who become the subject of your work or are affected by it”. For this study, I obtained permission from the principals to conduct this study in their schools. According to Brink *et al.* (2006), conducting research requires ethical manners. Hence,

I assured the participants about the confidentiality of the information that they offered by stating that responses would not be attributed to individual participants during the process of disseminating the research findings. Also, pseudonyms were used to protect the identities of participants and the schools.

Participants were allowed to exercise the right to be part of the research or not, and the right to withdraw from the research without negative consequences. Informed consent from the participants prior to their participation in the study was sought (Appendix three). On informed consent Babbie (2013) explains that informed consent involves both accurately informing the subjects or respondents as to the nature of the research and obtaining their verbal or written consent to participate. I took the following steps into consideration to ensure maintenance of ethical standards when conducting the research.

3.12.1 Voluntary participation

All participants of this research participated voluntarily and could withdraw based on their own volition.

3.12.2 Anonymity and confidentiality

Babbie (2013) explains that the researcher can guarantee anonymity by not using the real names of participants. McMillan and Schumacher (2010) state that in order to maintain anonymity, the researcher must not name the places and the names of the participants participating in the study. The researcher must make every effort to ensure the autonomy of the research participants and to protect them from any kind of exploitation (White, 2005).

Anonymity requires a commitment to ensure the autonomy of the research participants, and where autonomy may be diminished, to protect people from exploitation of their vulnerability (Mack *et al*., 2005) In this study, pseudonyms were used to anonymise participants.

3.12.3 Respect for participants

Due respect and integrity for the participants were not compromised. Respect for participants was ensured by assuring them verbally and in writing that their participation was voluntary and that they were free to withdraw from the study without

negative consequences. Also, data was generated at the time and venues which were selected by the participants and I regarded the participants as powerful role players in the project. I gave due respect and autonomy to the participants' contribution. I ensured that participants' dignity was respected; participants were not simply used as a means to achieve the objectives of this study (Mack, *et al*., 2005).

3.12.4 Permission to conduct study

I applied for and received ethical clearance from the Ethics Committee of my university (Appendix one1). I also wrote the letters to the principals of Schools A and B requesting permission to conduct the research study, which I obtained in writing (Appendix two).

3.12.5 Informed consent

According to Drew, Hardman, and Hosp (2007, p. 57), "consent involves the procedure by which an individual may choose to participate in the study." All the participants were 18 years old. There was no need to write to their parents for consent. I made it clear to them that their participation was voluntary, and the study would not affect their school hours. I assured them that they could withdraw from the study at any time without negative consequences.

3.12.6 Data use and disposal

With my supervisor's consent and the practices of the department, the data were and will continue to be kept in a secure place in the department and will remain there for a minimum of five years. After the 5th year, the data will be disposed of by shredding using a shredding machine and by deletion of digitally recorded information. Participants were informed about the handling of data.

3.13 Limitations of the study

This study was limited to a small population and its findings cannot be applied to other settings. However, the methods, instruments, and theories which inform this study can be transferred to contexts which are similar to the one in this study.

3.14 Conclusion

This chapter described the research methodology used in the study which was guided by the interpretive paradigm and the case study approach. The design, sampling, and data generation techniques were discussed in detail. I also provided an account of triangulation, data analysis, confirmability and rigour of the research study. Lastly, ethical considerations and limitations of the study were discussed. The next chapter will focus on data analysis.

CHAPTER 4: PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction

Baptiste (2001, p. 4) defines data analysis as the process of "classifying data, making connections between and among categories of data and conveying the message/write-up." This chapter presents the phases of analysis and the themes arising from the analysis which are organised under each research question or sub-question. Literature which deepened understanding of findings was used to provide a more rigorous analysis. I was informed by Baptiste's (2001) and Creswell's (2009) guidelines in order to analyse data. According to Baptiste (2001), the data can be analysed using four phases as follows:

1. First phase. Baptiste (2001, p. 4) explains that "in order to conduct a Qualitative Data Analysis (QDA), analysts capture, record, interpret, and convey information". Researchers decide on the goals of the analysis and then explain the analysis. I read the transcripts that emerged from the multiple sources of data collection to familiarise myself with the data and looked for main themes and classification from the data. This also corresponds with step three of Creswell's (2009) seven step model (Figure 3.3).

2. Second phase. Baptiste (2001) states that a second phase includes tagging data, where a researcher will select from an amorphous body of material bits and pieces that satisfy a research study. I studied the data and thoroughly examined the detailed descriptions of the participants' words and responses. This corresponds with step four of Creswell's (2009) seven step model (Figure 3.3).

3. Third phase. Baptiste (2001) explains that some of Quality Data Analysis that he has come across end with a mere glossary such as themes, categories and their definitions. In this third phase of the data analysis process, I categorised, and coded the data before grouping them into themes. This corresponds with step five of Creswell's (2009) seven step model (Figure 3.3).

4. Fourth phase. This phase is where a researcher makes connections, constructing stories and theories (Baptiste 2001). In the final phase, I interpreted and organised the data in order to draw up the conclusion. This corresponds with steps six and seven in Creswell's (2009) seven step model (Figure 3.3).

Excerpts from the transcribed data generated from the participants and their analyses are presented below:

Three methods of data collection were used, namely, focus group interviews (FGIs), individual interviews (IIs) and reflective journals (RJs). The analyses of these data were used to answer the following two research questions:

1. What are learners' views about factors which contribute to their performance in Life Sciences within a rural setting?
    1.1 What enables learners in their performance in Life Sciences within a rural setting? Why is this the case?
    1.2 What constrains learners in their performance in Life Sciences within a rural setting? Why is this the case?
2. How can learners access support to perform successfully in Life Sciences classrooms in a rural context?

The themes that emerged from the data through analysis provided a deep description of the views of the participants. This discussion considered the research questions in this study and direct quotations from the participants' responses are presented in confirmation of the emerging themes and are supported by reference to the relevant literature.

The following abbreviations are used to distinguish among data from the different sources:
Individual interview –II
Focus group interview – FGI
Reflective Journal – RJ
Participant – P
School – A
School – B
Example of codes:
II-P1A: Individual interviewee who was the first participant in School A

FGI-P1 A: Focus group interviewee 1 in School A
RJ-P1B: Reflective journal for participant 1 in School B

4.2 Research Question one: What are learners' views about factors which contribute to their performance in Life Sciences within a rural setting?

4.2.1 What enables learners' performance in Life Sciences within a rural setting? Why is the case?

The following themes emerged from the data with respect to this research question:

- **Theme One:** Learners' ambition influences their performance
- **Theme Two:** Relatedness of Life Sciences to everyday life
- **Theme Three:** Preference for certain assessment strategies

4.2.1.1 Theme One

- Learners' ambition influences their performance

Learners who performed well provided several reasons for choosing to study Life Sciences. The following interview responses were solicited:

> *Oh ... At first, I wanted to be a doctor but then I sat down and had a rethink, so I decided to do Law ... but Life Sciences will help me to understand other things and to know why I'm sick ... yeah. (II- P1A)*

Participant 1 in School A believed that through the study of Life Sciences, she would be able to pursue a career in medicine. Even when her career plan changed, she valued the study of Life Sciences for its potential to develop her capacity for understanding and managing her personal health.

> *Sir … I really need it because my brother is a nurse and I want to be an animal doctor at home … my father sells sheep and cows and the money helps us at home, so I also want to help my father with his animals and my brother told me that for me to be an animal doctor, I need Life Sciences, Mathematics, and Physics. (II-P6 B)*

Individual interviewee 6 in School B disclosed that he was doing Life Sciences because he wanted to be an animal doctor (veterinary surgeon) so that he could cater for the health of his parents' livestock since his parents were practising small-scale farming.

For me, I am studying Sir, because I want to pass it with level 5 and above, but Life Sciences is not an easy subject and it is very long, but I really need it since what I am planning to do in the university, I will need Life Sciences. I am planning to work with the police as a pathologist, because of crimes that take place in our areas and killers sometimes do not get arrested because of lack of evidence. (FG-P5A)

Focus group interviewee 5 in School A agreed that Life Sciences has a long syllabus but learners study it because the courses they intend to do at the universities require the study of Life Sciences at school level. One learner also showed an interest in studying forensic pathology because the rate of crime was high in his community. He wanted to make a positive difference by becoming qualified to address crime in his community and this motivated him to study Life Sciences.

The ideas of Mukhwana (2013) concur with those of these participants, that learners can perform well in their studies because they want to pursue certain careers in the future. Many learners in my study had interests in Life Sciences because of their future careers. Also, these interests drove them towards achieving their goals in life and as a result, they excelled (scored higher marks) in their chosen subject areas. Mbajiorgu *et al.* (2014) concur that learners choose to study Life Sciences because it gives them more chances to study their future careers. Zimmerman and Schunk (2008) corroborate the participants' views that learners who have an interest in certain careers are more likely to be satisfied with the subjects and they score high marks in examinations. Uitto, Juuti, Lavonen, and Meisalo (2006) agree that experiences that the learners gain at home, such as engaging in farming activities, influences learners to enjoy Life Sciences and makes them decide to pursue science-related careers in the future. Mahdi (2014) argues that learners' beliefs are linked to the choice of subjects that are related to their careers. Also, learners choose science subjects in high school based on their beliefs that this work is related to their future career choices (Mahdi, 2014).

4.2.1.2 Theme Two

- Relatedness of Life Sciences to everyday life

Learners highlighted many reasons for choosing Life Sciences in high school.

Sir ... it's because Life Sciences in most cases are practical and things that are taught, I equally experience them outside the home and even in school. (II- P2A)

Further probing revealed that this learner was referring to practical work when she used the word "practical".

For individual interviewee 2 in School A there was a definite interrelatedness between Life Sciences and everyday knowledge, which is why she pursued the study of this subject.

Mukhwana (2013) asserts that practical work enables learners to comprehend what they have been taught in the class and link it to reality which makes the subject come alive. The scholar undertook a study whose results also speculate that about 81.5% of learners and 84% of teachers agree with the fact that doing practical work makes sciences more real. This resonates with the view of interviewee 2 in School A that "Life Sciences in most cases is practical". In addition, performing practical work in schools also promotes the interest of learners to study Life Sciences because learners enjoy studying what they can see and what they can relate to everyday situations.

Furthermore, Kibirige, Rebecca, and Mavhunga (2014) agree that students' involvement in practical work helps improve their interest and performance in science. Tekkaya, Ozkan and Sungur (2001) argue that the Life Sciences curriculum can be meaningful to learners because they can relate what is taught in class with the outside environment. Uitto *et al.* (2006) also ascertain that learners are motivated to study Life Sciences because, in some schools, educational tours to farms, gardens and food industries enable learners to relate the theory learned in the classrooms to the environment in which they live.

Some learners performed well in Life Sciences because concepts taught in other subjects, for example, Agricultural Sciences were common to Life Science. This enabled a deepening of their conceptual understanding as was attested to by the participant who said the following:

Sir ... sometimes things we do in Life Sciences we also learn in Agricultural Sciences, it makes things easy to understand it now. (FG-P3A)

Focus group interviewee 3 in School A valued Life Sciences because some concepts were common to both Life Sciences and Agricultural Sciences and this enhanced her

capacity to understand these concepts. Zimmerman and Schunk (2008) found that learners sometimes develop an interest in a subject if the subject shows integration with other subjects (as illustrated in the excerpt above).

I explored learners' enjoyment of the study of Life Sciences by asking the question: **Which aspect of Life Sciences do you like most? How do you perform?**

> *Oh ... the aspects I like Sir ... are DNA, blood and all those kinds of things including inheritance on how this person became so and so. (II-P6B)*
>
> *Mmm ... It's Cell Division in meiosis Sir. Meiosis is interesting and ever since I was in Grade 10 we were told that we will learn about meiosis in Grade 12 so I was happy because I want to study meiosis. (FG- P7B)*
>
> *I performed well in DNA code of life, meiosis, and genetics. (RJ- P4A)*
>
> *I enjoy studying human reproduction because I am a girl and human reproduction, we also taught menstruation when I am menstruating, I really know what is happening and I can know when I am pregnant. (RJ-P7B)*

Several participants enjoyed the study of Life Sciences and this contributed to their decision to study this subject. Some learners' performances were enhanced because they enjoyed studying specific topics, including types of nucleic acids (DNA and RNA), blood types, genetic inheritance, human reproduction, meiosis, and the human nervous system.

> *You know Sir ... there are some people here in the village that we call "Inkawu", but our teacher has told us that all people that have no pigment melanin are referred as albino and he even said albino is an example of genetic disorder where a person is lacking pigment melanin and it is good to know that these people are like us. (FG- P3A)*

Some topics can also be linked to a social life outside the school. For example, when people in the community have genetic disorders, learners' interest in studying the section on genetics in Life Sciences can be enhanced.

Another participant said enjoyment of the topic stemmed from its relevance, as is revealed in this excerpt:

Sir, I think it is Human Reproduction because it is the best aspect that I like most in Life Sciences. It elaborates more about human beings, the inner part, and the outer part, how a person is being structured all that sort of information. (FG- P6B)

Focus group interviewee 6 in School B displayed a personal interest in the concepts related to Human Reproduction because she could link these concepts to her personal physiology and anatomy. This kind of relevance enhances learners' understanding of concepts, and in my study, I discovered that it also promotes their interest in learning of Life Sciences.

These findings resonate with the finding of De Villiers (2011) who conducted a study in South Africa titled "Student teachers' views: what is an interesting Life Sciences curriculum?" De Villiers (2011) found that genetic inheritance, genetic disorders, DNA, meiosis, and human reproduction were the most interesting in Grade 12 Life Sciences syllabus, and the scholar also found that learners enjoy these topics because they find it useful in their daily lives. Çimer (2012) adds that topics that are taught at school must relate to learners' everyday lives so that learners easily recognise what is being taught.

4.2.1.3 Theme Three

- Preference for certain assessment strategies

Learners who preferred certain assessment tasks gave the following responses:

Oh ... I like controlled tests sir, because it is where I see how much I understand and how much I know to proceed to another grade or level. (II- P3A)

Individual interviewee 3 from School A valued controlled tests as a vital indicator of his understanding of and progress within the subject.

Aaa ... I like projects, Sir, because it makes me to investigate. (II- P4A)

Individual interviews 4 from school A found the investigative aspect of project work to be a good form of assessment because it is inquiry driven.

Sadler (2010) explains that some learners prefer investigative tasks such as projects in science (Life Sciences) because these activities require learners to actively engage in research about different topics. The scholar infers that when an educator brings

science investigation to learners, the task usually enables the learners to be more focused on the process and they show interest in doing it. Learners may show high involvement in the investigative approach during practical tasks. Sadler (2010) adds that feedback from assessment tasks by a teacher to the learners leads to a better performance of the learners. Also, teachers must plan the feedback to the learners and feedback must be bi-directional. It should enable the learner to learn from constructive criticism and the teacher to adapt teaching strategies which are effective *(ibid).* Brazeal, Brown, and Couch (2016) share a similar view, that activities that take place in class such as tests promote learners' understanding and enable the teacher to determine whether (specific) aims have been achieved. These authors' views resonated with that of II P3A.

The second part of the first research question is:

4.2.2 What constrains learners in their performance in Life Sciences within a rural setting? Why is this the case?

The themes that emerged from the data with respect to this question are as follows:

- **Theme One** – Lack of parental support
- **Theme Two** – Inadequate time for teaching and learning Life Sciences
- **Theme Three** – Teacher factors (knowledge of teaching)
- **Theme Four** – Overcrowded curriculum
- **Theme Five** – Lack of enjoyment of the study of Life Sciences by the learners.

4.2.2.1 Theme One

- Lack of parental support

Many learners believed that they struggled with producing good results in Life Sciences because their parents did not support them since their parents were poor and not educated. This was confirmed by the data that emerged from the focus group interviews and individual interviews, as is evident in the following excerpts about parental support:

> *Ee ... No Sir, (parents provide no support) because they are not educated and do not know what Life Sciences is. (II-P1 A)*

> *No, because they did not go to school and learn Life Sciences. (RJ-P9B)*

In this study, respondents expressed their views that the poor parental support at home was due to parents' lack of knowledge in Life Sciences and their poor economic status. This can be among the problems that learners in rural settings experience. In addition, parents who were not educated found it difficult to understand the school work that was taught in school. Focus group interviewee 3 from school A also highlighted that parents find it difficult to provide the necessary learner-support materials at home because of their low socio-economic status.

Mbajiorgu *et al.* (2014) conducted a study in Mpumalanga, South Africa, on factors that impact the teaching and learning of Agricultural Sciences in the Further Education and Training (FET) phase and found that parents whose children attended schools in the rural setting did not give academic support to their children. The authors add that this situation widens the gap in terms of the performance of learners in the rural schools compared to learners in urban schools. Martin (2003) states that some parents assume that it is not their responsibility to help learners at home with school work. This is because they (the parents) are not educated and consequently these parents show little or no interest in the studies of their children. This situation de-motivates learners to study at home *(ibid).*

Desforges and Abouchaar (2003) share similar views with the preceding authors that those parents with low socio-economic status find it difficult to support their children's education because they cannot buy books and other learning materials. This view is supported by Hillman and Jenkner (2004) who assert that in countries with economic instability (for example developing countries), parents find it difficult to supply their children with school materials due to their low income. A literature survey confirms that findings from other studies support my finding that the lack of parental support contributes to the learners' poor performance in Life Sciences.

4.2.2.2 Theme Two

- Inadequate time for teaching and learning Life Sciences

Another factor that contributed to learners' underperformance in Life Sciences was inadequate time for teaching and learning Life Sciences. The following responses emerged from participants in the focus interviews and the individual interviews to the question about whether adequate time is allocated for teaching:

No, because that one hour (one hour for a period per day in four days of the week) is not enough hence Life Sciences needs more time to be explained, do practical work and all that kind of stuff, so it is not enough. (II-P3A)

Not at all Sir, for instance, if I can mention Genetic Inheritance, this is the part that is difficult. So, it needs enough time in order for us to understand what is taught. (FG-P4A)

The DoBE (2011) outlines the time allocated for Mathematics, Physical Sciences, and Life Sciences. Table 4.1 is adapted from the Curriculum and Policy Statement (CAPS) document indicating the time distribution.

Table 4.1: Time allocation in subjects per week

SUBJECT	TIME ALLOCATION Per week (time hours)
Mathematics	4,5
Physical Sciences	4,5
Life Sciences	4

Source: Department of Education (CAPS for Life Sciences 2011)

Lebata *et al.* (2014) state that the Life Sciences CAPS curriculum has a high volume of work and teachers experience difficulty in completing the syllabus within the stipulated time. Life Sciences teachers have to make an extra sacrifice in order to finish the syllabus by organising extra classes on Saturdays because if they do not finish the syllabus, learners will fail the subject *(ibid).* Tibell and Rundgren (2010) assert that the cognitive demands for Life Sciences are difficult, thus, more time is required for effective teaching and learning. This resonates with the view of focus group interviewee four from School A. Dadabhay (2011) agrees that as the school week continues, many teaching hours are spent through unproductive work such as copying notes from the board because of lack of learning material such as textbooks. This situation may consume much time that is not considered by policy makers. These authors reinforce the views of the participants that time allocated for Life Sciences at Grade 12 level is inadequate and impacts negatively on their work and performance.

4.2.2.3 Theme Three

- Teacher factors (teacher knowledge)

The following responses were obtained when the participants were asked about their teachers' competence.

No, she is not qualified because sometimes in class she does not explain well to us, as a result, we end up failing the subject and we do not do practical work in school. (II-P8B)

According to some participants, their Life Sciences teachers constantly referred to the textbooks during the teaching and learning process in the classroom. Some teachers were unqualified and had little experience in the subject. This was highlighted by participants in the following excerpts:

Mmm ... No sir (Life Sciences teachers are not qualified): some of teachers look into the textbook always even when we ask them questions. (FG-P5A)

Our Life Sciences teacher lacks confidence; maybe he does not understand Life Sciences well. (FG-P7B)

I think she is not (qualified) because she taught me, but when I am writing tests I am failing. Maybe she is lacking experience. (RJ-P10)

In this research, qualifications and experience of teachers in the teaching profession could possibly have had an impact on the performance of the learners. Participant FG P5A indicated that teachers do not have qualifications to teach Life Sciences and implied that teachers' subject knowledge was inadequate because, in the Life Sciences class, they constantly referred to textbooks. Participants also highlighted that their teachers had no confidence when they presented lessons in the class.

Dada (2016) conducted a study which revealed that learners who are taught by more experienced teachers (6-15 years of teaching experience) score relatively higher marks than those taught by inexperienced teachers (one to five years of teaching experience). This shows that teachers' experience in teaching has an impact on the performance of the learners. The preceding author contends that teachers who attend effective professional development workshops can contribute to the performance of the learner.

Well-qualified teachers in South Africa possess the Bachelor of Education (B.Ed.), Masters in Education (MEd) and Doctor of Philosophy (PhD) degree as compared to those unqualified teachers who have certificates in education instead of degrees *(ibid).* Moats (2014, p. 75) contends that "teachers may adopt unproductive teaching strategies not only because science-based instruction is neglected in many teacher

training programs, but also because the requisite insights are difficult to understand, and the content is difficult for many to grasp, even with some experience".

The view of Moats indicates that poor teacher training leads to poor discipline content knowledge which some teachers display.

Appleton (2003) concurs that the teacher must have knowledge of the subject matter that s/he is going to present to the learners. The author adds that, although in Australia they have a shortage of educational resources, this is not the only factor that leads to poor performance among the learners. Many teachers do not have enough scientific knowledge and as result, they do not have confidence to teach science in schools *(ibid).* Lebata and Mudau (2014) concludes that in some South African schools Life Sciences is taught by teachers who do not have teaching qualifications, and this leads to the learners' poor performance in the subject. The author also argues that learners achieve low marks in Life Sciences as a result of their teachers' lack of knowledge of teaching techniques and subject content matter.

This is also attested to by international scholars. According to Essay (2018), there are many teachers in the rural communities in the United Kingdom who have no experience in teaching Life Sciences and have not been able to master the pedagogy involved in delivering the subject to learners. This is due to the fact that the Department of Education places the new teachers in rural schools because the experienced teachers move to urban areas for better job opportunities *(ibid).* Harris and Sass (2011) support the foregoing assertion by implying that experienced high school teachers teach effectively in the classroom and consequently, learners perform well in science.

4.2.2.4 Theme Four

- Overcrowded curriculum

Another factor that impacted negatively on learners' performances in Life Sciences was studying too many subjects in one day at school. The following responses were obtained from the focus group interview when the participants were asked about how much they had to study in a single school day and how this impacted on Life Sciences.

Oh ... I don't think there's enough time spent on teaching Life Sciences because we have seven subjects and including Life Sciences. So, in these seven subjects, we have two subjects that we focus too much on which are Physical Sciences and Mathematics. (FG-P2A)

Eh, sir, I don't think we have enough time because here in school we have morning classes and extra classes but among those extra classes and morning classes, we do not attend Life Sciences we only attend Physical Science and Mathematics. (FG-P7B)

According to these participants, many subjects are done by the learners in one day and this situation results in the overcrowding of the curriculum and poor performance of learners in Life Sciences. More hours in school are allocated for the study of Physical Sciences and Mathematics and less time for Life Sciences, according to the participants.

Mukhwana (2013) concurs that the number of subjects and tasks that are offered in the school has an impact on the performance of a learner. The preceding author advocates that about 64% of learners and teachers agree that the higher the number of tasks in class and subjects in the school which are done by the learner, the poorer the performance of the learner will be. This may result in having many subjects requiring extra time to cover the syllabus, particularly those subjects that need more time to analyse and interpret information *(ibid).*

In the Curriculum Assessment Policy Statement (CAPS), a minimum of seven subjects with the teaching time of 27 hours, five days per week, excluding break time, assembly and extramural activities should be offered to learners in the Further Education and Training phase. It is possible that the time allocated according to the terms of the policy is inadequate to facilitate understanding of complex concepts in Life Sciences.

The United Nations Education Scientific and Cultural Organisation (UNESCO) (2013) also states that the overcrowding of the school curriculum results in low student achievement and delays the development of vital competencies of learners. The school tends to prioritise certain subjects to cover the syllabus *(ibid)* and in this study, Mathematics and Physical Sciences in schools are preferred.

The Australian Primary Principals Association APPA (2014) maintains that the curriculum in schools can be overcrowded by the number of subjects in each

curriculum that are done by learners and the number of documents and the amount of time that is allowed for teaching and learning the content. Sometimes if administrative elements are excessive this leads to a decrease in teaching time which can lead to underperformance of learners *(ibid).*

4.2.2.5 Theme Five

- Learners lack enjoyment of Life Sciences

Some learners did not enjoy studying Life Sciences, according to the data generated from this study. They could not meet the cognitive demands of the subject, as was attested to by the following participants when this question was asked: **Would you consider yourself as being curious about Life Sciences? Why do you say so?**

> *I am not curious because, some of the topics I do not enjoy at all like Mutation, Down's syndrome, Genetic engineering, stem cells and nervous system. (RJ-P2 A)*
>
> *Sir! I will be honest, I am not used or familiar with Life Sciences because Life Sciences is the whole textbook and we have to read it and understand it before we go into the exam room. We have to read every function and every day we have to analyse everything, every structure, for example, you'll be told to draw a structure of animal cell may be. Then you're not able to remember all the labels so I think that's why we don't like Life Sciences at all. (FGI- P10 B)*

Several participants were of the view that the cognitive demands in Life Sciences were in excess of their capacity to cope, as was attested to by participant FGI P10B, who said: "we have to analyse everything". Analysis, within Life Sciences, is a higher order thinking skill, and some participants were unable to engage in this skill successfully. In addition, some focus group interviewees found the volume of the Life Sciences curriculum to be too intensive. For instance, Participant 10 in School B also added that "Life Sciences is the whole textbook and we have to read, and you are not able to remember". The views expressed by the participants were supported by the works of other researchers that an overcrowded syllabus and a large number of topics that are cognitively challenging may dull learners' capacity to enjoy learning Life Sciences.

Adu-Gyamfi (2013) argues that science demands more time from the learners because they are given many class activities and they spend more time trying to understand the complex terms that are used in sciences. Çimer (2012) asserts that

Life Sciences (Biology) has many topics and that makes the subject voluminous and some concepts are abstract and difficult for learners to understand. As a result, learners do not enjoy it in class. Çimer (2012) agrees that learners find some topics such as genetics and meiosis difficult to comprehend and this makes learners develop negative attitudes towards studying the subject. Similarly, Tekkaya *et al.* (2001) suggest that learners may experience difficulties in some topics such as hormonal control, genetics and inheritance, mitosis and meiosis, the nervous system and Mendel's crosses. In my study, learners did indicate that some of the topics mentioned by these authors were too challenging. However, other learners had enjoyed studying these concepts (section 4.2.1.2).

4.3 Research question two: How can learners access support to perform successfully in Life Sciences classrooms in rural contexts?

Learners were asked about their views regarding ways in which support can be leveraged to enable them to perform well in Life Sciences. The themes that emerged from the data with respect to this question were as follows:

- **Theme One** Learner support from the school and teacher
- **Theme Two** Learner support from parents
- **Theme Tree** Learner support from the Department of Education
- **Theme Four** Learner support from peers at school
- **Theme Five** Medium of instruction in Life Sciences

4.3.1 Theme One

- Learner support from the school and teacher

With reference to this research question, I enquired about the kind of support learners can obtain from the teachers and school to assist them to excel in Life Sciences. The following responses were obtained:

> *I think extra classes can help and provision of computers so as to make Life Science interesting more and fun. (FG- P5A)*
>
> *First of all, sir, I would like my teacher to have enough knowledge about Life Sciences, stop looking at the text book when we ask questions and shout at us sometimes and second, to come in class on time and every day. (FG- P6 B)*

To have Life Sciences classes on Saturday for revision of what we have done during the week use different question papers. (RJ- P5 B)

The school must ask other qualified teachers in Life Sciences from other schools, for more explanations and assistance in difficult areas that I do not understand. (RJ- P2 A)

Participants in this study believed that teachers could support them in the following ways: offering extra classes, developing deeper content knowledge, networking with other more capable teachers who can serve as guest teachers and using technology to teach. Furthermore, the availability of computers, laboratories, qualified and competent teachers, the regular school attendance by the teachers, and decreased dependence on the textbooks while teaching by the teachers, emerged from the data. I also found that the support learners need from the school to help them master the tasks in Life Sciences includes more revision with different question papers and more time to be allocated for revision.

According to Mbajiorgu *et al.* (2014), learners need more time to study science, and in order to improve their performance, they must be offered more teaching time and time for revision. Also, these authors advocate that the school must organise extra classes on Saturdays and evening studies. Popham (2000) concurs that assessing learners frequently is important since it provides more understanding of the subject concepts and they can also monitor their progress through these exercises. Mukhwana (2013) asserts that learners who are given extra lessons find more time to interact with the teacher and are able to ask questions and discuss some difficult parts of the subject. He continues to say that extra classes enable the high performance of learners in Life Sciences.

In a study focusing on the perceptions of stakeholders on causes of poor performance in Grade 12 in the North West Province of South Africa, Legotlo *et al.* (2002) found that many teachers lack professionalism and they are not punctual (about time of arrival at school) and sometimes they may be absent from work. This reduces the time for teaching. This view was echoed by Focus Group Interviewee 6 in School B who wanted teachers to be present and punctual by saying they should “come (to) class every day and on time”. My study revealed that participants would have full support if teachers were prepared, punctual and present.

The reflective journal entry which underscored the need for “qualified teachers” is supported by several studies. Clotfelter, Ladd, and Vigdor (2010) observed that those learners that were taught by qualified teachers from universities or colleges that specialised, performed well in the subject and scored high marks. According to Zuzovsky (2009), science is a gradually changing subject and new laws and discoveries are made all the time, therefore it is important for a teacher to study further or advance in the learning of science. This underscores the importance of teachers having high disciplinary knowledge as was suggested by the participants in my study. In this study, it is possible that some Life Sciences teachers were unqualified because some learners requested assistance from qualified teachers from outside their school.

Ainley and Ainley (2011) assert that the employment of unqualified teachers decreases the standard of performance in science, while the learners who are taught by qualified teachers understand science to a greater extent and perform well. Learners agreed that the introduction of technology, such as computers in their schools would change their lives. Huppert, Lomask, and Lazarowitz (2002) assert that learners who use computers in their schools may cover more work within a shorter period of time. This resonates with the view of participant FG P6B.

Çimer (2012) submits that if the schools can provide visual teaching, study materials, computers and DVDs, learning would be greatly improved. The teaching of Biology (Life Sciences) will then be more effective. The use of visual materials in Life Sciences (which, for the purpose of my study, can be accessed via computers, for example YouTube videos) can assist learners to understand Life Sciences concepts and knowledge and enable learners to recall and apply what they had learned more easily in the examination.

4.3.2 Theme Two

- Learner support from their parents

Learners indicated that they would prefer more support from their parents, as is evident in the following excerpts.

> *From my parent, I would like them to buy me textbooks and study guides so that I can get more information. (FG- P3 A)*

Our parents must give us enough time to study and do homework by reducing work at home, like me not cooking and going to the river (to collect water). (FG- P6 B)

My parents must help me at home if they know something and must limit home chores such as not looking after cows and getting the water from the river. (RJ-P1 A)

Learners indicated that they would prefer receiving the following kinds of support from their parents: Buying of textbooks, study guides and other materials, giving them enough time to study at home, motivation, and encouragement from family members, and to limit home chores.

The views expressed by the participants are similar to those of Rafiq *et al.* (2013) who stated that parents should be actively involved if they want their children to achieve high grades in the sciences. On parental engagement, they found that parents with high expectations get involved to a greater extent in the education of their children in many ways, depending on the type of parent and his/her background. Some parents help their children in reading at home to increase literacy, encourage them to do school work alone (enable learning independently) and check their tasks which were performed at school (monitor their work). Furthermore, parents could also buy study material and organise an expert tutor for particular subjects. This gives a child inspiration to perform better at school and be motivated to learn *(ibid).*

Al-Matalka (2014) argues that parents' level of education plays a significant role in the support of children. Parents who are well-educated are more involved in the education of their children at home *(ibid).* According to Chen and Gregory (2009), parental support for children and the involvement of parents in the education of their children are different from one another. Some parents may be directly involved by participating in the homework of their children thereby motivating the learners from home. Children can be motivated extrinsically by buying gifts for them if they attain good marks which can lead to better performance in the subject *(ibid).* Albert *et al.* (2014) found that children from families with educated parents, who have stable employment, perform well in education because their parents are concerned about the education of their children and their academic progress in school. In my study, learners believed that motivation to succeed from their parents, by releasing them from domestic chores, would contribute positively to their performance.

Chinyoka and Naidu (2014) established that in homes in rural settings, some learners do not have parents, and consequently have to take the responsibility of caring for their younger siblings while still attending school. This child does not find enough time to do his/her school work at home because of home chores that he/she is required to do in the morning and afternoon *(ibid).* Although none of the study participants alluded to this, it is worth noting here, in order to understand the African rural contexts. Concerning learners who reside in rural settings, Chiyoko *et al.* (2014) found that learners are also required to do a vast amount of work at home, including cooking, washing dishes and taking care of cows and goats before they can study. They add that children get exhausted from the work that they do at home and as a result, do not find time to do school work at home.

Chimombo *et al*. (2000) also emphasise that children from rural areas do many house chores, and the domestic chore is classified according to their gender (boys and girls). Girls are given more work than boys at home in rural areas and this leads to fewer girls being able to attend school. Some of them fail their grades and decide to drop out of school. Girls in their homes are expected to prepare the meals, wash dishes, clean the house and they even walk long distances to fetch the water. This results in them being too exhausted to do school work at home. Boys take care of the animals at home and this leads to absenteeism and the authors maintain that in these ways, home chores deprive children of time to study *(ibid).*

4.3.3 Theme Three

- Learner support from Department of Basic Education (DoBE)

Participants cited several ways in which the DoBE could be supportive to them to enhance their achievement in Life Sciences, as is evident in the following responses.

> *I would say if the government can provide us with more teachers, just because there are few Life Sciences teachers in our school, so each teacher has 4 classes to teach Life Sciences and (the DoBE) must also reduce the topics that are taught in Grade 12. They are many, we sometimes do not understand as result we memorise the subject in order to pass. (FG- P3A)*

> *Sir, if government can provide resources to rural areas such as school library, electricity, computers so that we can be familiar with what is happening in Life Sciences*

and other subjects because some of the learners don't even have electricity, so we use generators to photocopy something because we are sharing textbooks. (FG- P9 B)

Learners in my study believed that the DoBE (government) could support them by providing suitable human and material resources and re-examining policies which prescribe the topics which are included in Life Sciences. They indicated that more teachers should be employed since there is a shortage of Life Sciences teachers. Furthermore, more resources and textbooks for Life Sciences should be made available in all schools including electricity supply, computers and laboratories.

According to Gardiner (2008), in order to improve the teaching and learning in schools in rural South African settings, there must be an improvement in the supply of water and sanitation, electricity, and infrastructure such as a study library and sports fields. Mbajiorgu *et al.* (2014) concur with the participants' views that the DoBE should provide more learning materials such as stationery, wall charts, DVDs and library resources in schools in rural settings. Çimer (2012) supports the notion expressed by participants in my study that Life Sciences has too many topics that lead to the learners having to memorise them, because they cannot deal with the cognitive demands of the subjects.

In addition, under-resourced schools in rural settings are not unique to Africa. The National Academies of Sciences, Engineering, and Medicine (2015) in a study conducted in the United States, found that some teachers agree that there are other countries who have a shortage of resources in their schools in rural settings and they also have no libraries in their schools. Sinimbo (2013) states that schools located in rural settings in the Kavango Region of Namibia, often face a similar challenge of lack of equipment and learner resource material; there are no school libraries, no electricity and there is a shortage of qualified science teachers. This impacts learners negatively and leads to their underperformance in Life Sciences.

In South Africa, some schools that are located in rural settings do not have libraries and those that have them do not have the required resources e.g. books, DVDs, and computers (Paton-Ash & Wilmot, 2015). As a result, these libraries are not effective in the teaching and learning process and do not give quality support to the learners in rural settings *(ibid).*

4.3.4 Theme Four

- Learner support from their peers at school

Various forms of support from peers were required by participants in this study, and the following responses related to peer support were solicited:

> *Sir … for me the help I need from my friends or peers, I would like us to remain after school and catch up on what was done during the day with my classmates so that I will ask questions where I did not understand because sometimes, I am scared to ask in the class when a teacher teaches me. (II-P8B)*
>
> *To come together forming study groups after school because we talk easily to each other and, share learning material like question papers to study before the examination starts. (RJ- P6 B)*
>
> *We must meet and do group work since it easy to express yourself to your friends rather than in class and learn together helping one another where we have difficulties but avoid plagiarism and copying. (RJ- P8 B)*

Participants believed that the following forms of support could be leveraged from their peers: forming study groups to discuss topics that were taught in class (co-operative learning) and sharing learning materials such as question papers from previous exams before the examination (collaboration). Lord (2001) concludes that learners who use study groups perform well because in a study group everyone is free to talk and ask questions. The author adds that study groups enable learners to be more actively involved in learning. The scholar contends that the formation of study groups promotes active discussion which leads to the positive attitudes towards learning of the subject.

According to Landers (2013), putting learners in groups is the best method of learning because all learners can participate actively by taking part in the discussion of the topic with no one person being singled out to answer the question(s) during class activities. Murphy, Wilkinson, Soter, Hennessey, and Alexander (2009) contend that group work is more reliable and beneficial to the learners in class because it promotes the involvement of learners and creates more opportunities for critical thinking by giving learners the chance to express themselves about the topic that is taught in class. Also, group work enhances the understanding of learners and builds their grammar and reasoning capabilities about the subject *(ibid).* Although the group work

to which participants alluded was envisioned to occur outside of school time, I contend that group work in class can also be beneficial.

Dioso-Henson (2012) argues that tutoring of learners by one another is one of the best strategies available and has the benefit of learners having to prepare to teach one another. When learners teach themselves, if one makes mistakes, the other learners can easily identify the mistake and correct the learner. This has been found to be a most effective way of learning and it promotes co-operative learning and improves learners' academic performance *(ibid).*

4.3.5 Theme Five

- Medium of instruction in Life Sciences

Participants indicated that in order to support the learners to pass Life Sciences, English as a medium of instruction must be used at all times to teach the subject. This was expressed by the following participants.

> *I can say English is the best to make me pass the subject sir because even when I'm writing I will use English, for example, the scientific terms in exams cannot be written in Xhosa but when our teacher explains to us he uses IsiXhosa somewhere somehow. (II- P4 A)*

> *Sir … English because textbooks that we are using in school for Life Sciences are written in English even the question papers they came using this English… if (the teacher) can use isiXhosa it could be difficult to pass the subjects but sometimes we need to hear some other things in IsiXhosa so that we will have an idea about it. (FG-P1 A)*

The participants revealed that the teacher can sometimes use isiXhosa (code switch) to explain unusual terms. However, since all examination papers are written in English, and the textbooks are printed in English, participants expressed the desire that English be primarily the medium of instruction.

The findings of Mtsi and Maphosa (2016) reveal that learners in rural areas find it difficult to understand the scientific terminology that is taught using English since English is not their mother tongue. This leads to teachers using both English and the learners' first language in class to enable learners understand the content and the

terms that are used in the topic. Ferreira (2011) concurs that teachers must be able to connect the Life Sciences content and English terms with isiXhosa when they emphasise certain topics in class. Code-switching helps the learners from rural settings to understand the content of the topic in class, but teachers must emphasise the use of English when the learners are communicating in class to make them familiar with the English language *(ibid).* Mji and Makgato (2006) assert that learners are facing a challenge when taught in a foreign language (English) in schools because it makes it difficult for learners to understand the content and complex terms of science. These authors add that second language English learners need special classes for the English languages to close the gap between the science subjects and language difficulties.

4.4 Conclusion

Several themes emerged from the data. Three themes emerged from research sub-question 1.1 which was: “What enables learners in their performance in Life Sciences within a rural setting? Why is this the case?”

Participants mentioned several factors that enabled them to perform well in Life Sciences. These included having ambition for their future careers that required the study of Life Sciences. This made them study more intensively to get the required marks in order to be admitted at university level. Personal ambition is located on the microsystem of the EST. According to the participants, Life Sciences is related to what they do at home and this connection between Life Sciences and home motivated the participants to also study at school. Their preference for an assessment task in the form of practical work and control tests motivated them to learn and perform well in Life Sciences.

Five themes emerged in terms of research sub-question 1.2 which was: “What constrains learners in their performance in Life Sciences within a rural setting? Why is this the case?”

Participants acknowledged that their parents did not support them at home because their parents were not educated and were poor. There was also a lack of learning materials such as textbooks and study guides which learners would have valued had their parents been able to purchase these. According to Bronfenbrenner (1994),

interaction between family and classroom occurs with the mesosystem layer in EST. This interaction was missing between the learners' school work and parental support from home. The families of several participants in my study did not support learners in their school work. Other data that emerged from the participants was lack of adequate teaching time for Life Sciences because the DoBE allocated more teaching time to Mathematics and Physical Sciences. Within the South African context, control of education is largely centralised which means that the amount of teaching time allocated to each subject and the sequence and pacing of topics is dictated by the DoBE. According to Bronfenbrenner's (1974) EST, centralised control can be understood as being embedded in a macrosystem. Centralised control (from the macrosystem) can affect learners because it is in one direction (DoBE to learner) with no involvement of learners and teachers in the planning of the curriculum.

Finally, participants proposed different ways in which they could access support to perform well in the Life Sciences classroom. This informed the second research question which was: "How can learners access support to perform successfully in Life Sciences classrooms in rural contexts?"

Participants expressed many views about what they needed to support better performance in Life Sciences. Some of the learning materials and facilities required by the participants were: adequate Life Sciences textbooks, good school infrastructure, a fully-equipped laboratory, reliable electricity supply and computers in their schools. It also emerged from the data that there was a need for more qualified Life Sciences teachers in the schools and they indicated that the DoBE should provide these. Greater use of the English language as the medium of instruction instead of the mother tongue was seen as necessary since the examinations for Life Sciences are written in the English language. Regular peer work so that participants can learn from one another was also pointed out as a valuable strategy to support the participants.

In the next chapter I offer a more detailed analysis of the findings in terms of Bronfenbrenner's EST (1994), and also provide a synthesis of the findings, recommendations and concluding remarks.

CHAPTER 5: SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

This chapter provides a summary of the findings and offers recommendations and concluding remarks for this qualitative study. The study aimed to explore factors which influence the performance of Life Sciences learners in two selected Mthatha high schools in a rural setting. Voices of learners were sought to answer two research questions. These are presented below, together with the main findings for each question.

5.2 Summary of key research findings

The findings were interpreted using Bronfenbrenner's EST which was employed as a theoretical construct in this study. It is useful to describe key elements of Bronfenbrenner's EST at this point, although it might be deemed to be repetitive.

The microsystem of the home involves the relationship between parents and learners. According to Berk (2006), the microsystem is the area where relationships and interactions centre around a child's immediate family, school, neighbourhood and child-care environment. Bronfenbrenner's EST, cited by Berk (2006), states that the microsystem is the first social system to which a child is exposed. Here, parents and immediate surroundings affect the child's development, either positively or negatively. In this study, parents' support of their children's learning was highlighted.

The mesosystem, in terms of the learner, is the bi-directional influence between two microsystems, for example, parents (at home) and the teachers (at school). Parents' expectations from the teachers in terms of facilitating superior learner performance can influence the learner. If parents expect the teachers to take total responsibility for the learners' performance, teachers may view parents as being unreasonable and as having unrealistic expectations of the learner. Teachers may then elect not to consult

parents when learners underperform. Teachers may do this to protect the child from parents whose expectations are unrealistically high.

The exosystem includes policies and decisions at the school level (for example, those made by the SGB) which influence the learner, but not bi-directionally. This can include the number of teachers appointed and paid by the governing bodies, and fund raising for resources by the governing body.

At the national level, national policy decisions which influence the learner unidirectionally are located in the macrosystem. This can include curriculum policies, the pass mark for a subject, number of subjects which are compulsory, and number of hours allocated to the teaching of each subject. In this study, the number of topics in the curriculum and time allocated for teaching Life Sciences were elements of the macrosystem and need to be revisited to improve learner performance in Life Sciences.

The macrosystem includes cultural patterns which shape roles and behaviour of individuals and the state of the country's economy. In this study the strained economy resulted in many parents of the participants being unemployed, and unable to support their children in their learning of Life Sciences adequately.

The key findings are derived from the main research questions. The first of these was:

5.2.1 Learner's views about factors which contribute to their performance in Life Sciences within a rural setting

The first research sub-question was: What enables learners in their performance in Life Sciences within a rural setting? Why is this the case?

Several responses can be interpreted using the theoretical framework of Bronfenbrenner's EST. Firstly, learners' personal ambition to do well, the ability to relate Life Sciences to everyday life, and certain strategies were favoured and considered helpful.

A finding was that those who desired to study medicine or related subjects performed better than those who had no sense of their future careers. When Life Sciences was seen as a practical subject, learners were able to make connections between the syllabus content and the real world. Some participants who had no clear aspiration to

study medicine expressed that they could see the subject as being useful in a variety of areas such as why some people get sick and what can be done to help them. Learners' personal ambition was also a factor which enabled their success in Life Sciences. This can be seen as a factor which is located in the mesosystem, which includes interactions among several elements in the learners' environment, such as the influence of parents, peers, community members, media, role models, school system, and the ways in which these shape learners' career ambitions.

Many participants enjoyed Life Sciences because their parents were small holder farmers, and they thought that their knowledge of Life Sciences might assist in their homes. Some even said they wished to become veterinarians after school. Others mentioned the high crime rate and said that Life Sciences might even assist with forensic pathology, should they decide to study it. The cultural teaching of being helpful in a family and community could have informed these learners' career decisions. Berk (2006), citing Bronfenbrenner, points out that the macrosystem shapes a child's cultural values and customs. The above aspects are all part of the macrosystem and, clearly, play a part in shaping how learners in rural areas view Life Sciences.

Moreover, the results showed that Life Sciences has a certain relatedness to many other subjects, particularly Agricultural Sciences. The common concepts between Agricultural Sciences and Life Sciences enhanced learner enjoyment and appreciation for the Life Sciences. It would appear that a sense of connectedness is vital for progress in the subject. A school is a microsystem offering different subjects which are embedded with common concepts. Learners' concurrent engagement with these concepts deepens their understanding.

A sense of clear progression from one concept to the next in Life Sciences contributes to learners' success and feeds into their decision to take the subject in high school. Some topics in Life Sciences are linked conceptually, for example cell division, meiosis, genetics, and the DNA-code of life. Such clustering of concepts enables a sense of a seamless progression from one topic to the other. Although participants in this study did not allude directly to conceptual progression which deepened their understanding, it can be assumed that they enjoy certain topics to a greater extent when compared to other topics because these were conceptually related to the conceptual links between cell division, nucleic acids and genetics. This is a factor

which lies in the teacher-learner relationship at the level of the microsystem, where the teacher understands the gradual development of complexity of concepts across the grades for Life Sciences and is able to link these effectively to enable the creation of a more holistic learning experience. When and where these factors are favourably enhanced, there is a tendency for these factors to enable learners to perform excellently in Life Science in the rural setting.

Also, learners develop personal interests in certain topics, such as human reproduction since they are able to link its concepts to everyday life and their own experiences. This has implications for the teacher-learner relationship in the microsystem, where the teacher endeavours to relate Life Sciences to daily life when interacting with learners in the Life Sciences classroom.

Regarding preferred strategies, it was found that learners prefer the kinds of assessment strategies that they perceive as enhancing their performance in Life Sciences. These include assessment of homework, control tests, and projects. Learners enjoyed the opportunity to personally investigate scientific phenomena, and it helped them to prepare for exams. This engagement of the learners with school science is located in the microsystem. The relationship here is bi-directional and it is the most influential level of Ecological System Theory. The teacher, school, home, parents and other caregivers play a very crucial role here. If there are follow-ups of teachers' work after school hours and learners receive the necessary motivation from the people that surround them, it is likely that they would invest greater effort into their work and this could yield improved performance.

Peers were an aspect of the micro-environment that had a positive effect on learners' performance. Participants felt that the formation of study groups with peers would enhance their performance in Life Sciences.

The second research sub-question was: "What constrains learners' in their performance in Life Sciences?"

The findings reveal several factors which served as barriers to learners' progress in Life Sciences. These included lack of parental support, inadequate time for teaching and learning Life Sciences, inadequate knowledge on the part of teachers, an overcrowded curriculum and lack of learner enjoyment in the study of Life Sciences.

Lack of parental support was a barrier for two key reasons: Firstly, many parents were uneducated and could not assist their children to deepen their understanding of Life Sciences. Parents themselves were not schooled in Life Sciences or any other school subject. This could signal a disruption of the interaction between the parents at home, and the work that learners are expected to study at school. The interrelatedness between systems with their role players lies in the mesosystem of Bronfenbrenner's EST. If the interaction among role players from these systems e.g. teacher (school system) and parents (home system) is poor, learners' performance becomes adversely affected. This was found to be the case in this study.

Secondly, the lack of education impacted upon parents' earning potential and rendered them unable to support their children financially; learners were unable to purchase basic resources which might have furthered their understanding of Life Sciences. This factor is categorised under the fourth level of Bronfenbrenner's EST, the macrosystem, which encompasses the cultural environment in which the learner lives. This includes the economy, cultural values, and political system. Here, the economic status of the parents will negatively affect the child's performance in Life Sciences. The influence of the economy on unemployment of parents impacted the learners in a unidirectional and negative way in this study.

Inadequate time for teaching and learning of Life Sciences impacted negatively on learners' ability to construct knowledge of Life Sciences. The DoBE allocates four hours per week for a vast, voluminous, cognitively demanding Life Sciences syllabus, which is considered by learners and teachers alike as inadequate time. This creates a barrier to learning and performing well in Life Sciences, according to participants in this study. This factor is categorised under the 'macrosystem' because the curriculum and syllabus system and the time allocated for the study of Life Sciences are centrally controlled. Learners have no influence over these policy decisions. In this study, these policy decisions constrained learners and led to their underperformance in Life Sciences.

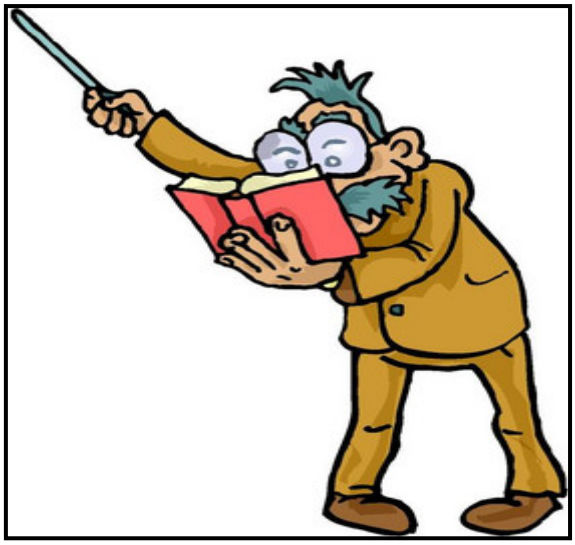

Figure 5.1: A graphic representation of teaching methodology in Life Sciences classroom
Source: Cartoon adopted from a graphic of cartoon (Degree Tutoring, 2017)

The cartoon in Figure 5.1 may be considered a graphic representation of the next problem associated with learning barriers for Life Sciences: the unqualified teacher, who refers almost constantly to the textbook when attempting to teach Life Sciences. Data from the participants indicated that unqualified teachers, inexperienced teachers and teachers who lacked personal confidence and who then displayed an over-reliance on textbooks, constituted a significant barrier to learners' progress in Life Sciences. Teachers who constantly referred to textbooks, were seemingly unfamiliar with what they were reading. Teacher factors, such as teacher discipline specific knowledge and teacher pedagogic knowledge, impacted the learner at two levels. The first is at the level of the microsystem, where a lack of teacher discipline knowledge influenced learners' performance negatively. Teachers were probably aware of this knowledge deficit and this led to their over-reliance on textbooks and a decrease in their confidence. The second is at the level of the exosystem. Several learners believed that their teachers were under or unqualified to teach Life Sciences. The allocation of teaching subjects to teachers depends on school policies and affects learners in a uni-directional way. When all these factors are not properly handled in a teaching-learning process they will then be constraints to the learners' performance in Life Sciences because learners themselves have begun to form opinions about the inadequacy of the teachers or their methodological approaches.

In addition, many learners expressed that there were too many subjects in their curriculum and that the Life Sciences curriculum itself was too full. Moreover, their

schools did not prioritise the teaching and learning of Life Sciences. Participants said that their schools favoured Physical Sciences and Mathematics, and channelled all resources, including any extra time, to those subjects. The school as part of the 'microsystem' prioritised other subjects such as Physical Sciences, and Mathematics. This contributed negatively to the performance of learners in the Life Sciences in schools.

Learners also believed that they needed to remember a copious volume of information, including many new terms that they seldom heard pronounced correctly. Understanding diagrams involving detailed labels of processes requiring a level of English mastery and of knowledge that they simply lacked.

This, coupled with the above factors, led to their underperformance in Life Sciences and their lack of enjoyment of it. Some aspects, in particular, were seemingly beyond their ability – notably the section on genetics. Sections such as these acted as stumbling blocks and inhibited their progress in the subject as a whole.

The multiple factors which impeded learner performance in Life Sciences are summarised in Figure 5.2.

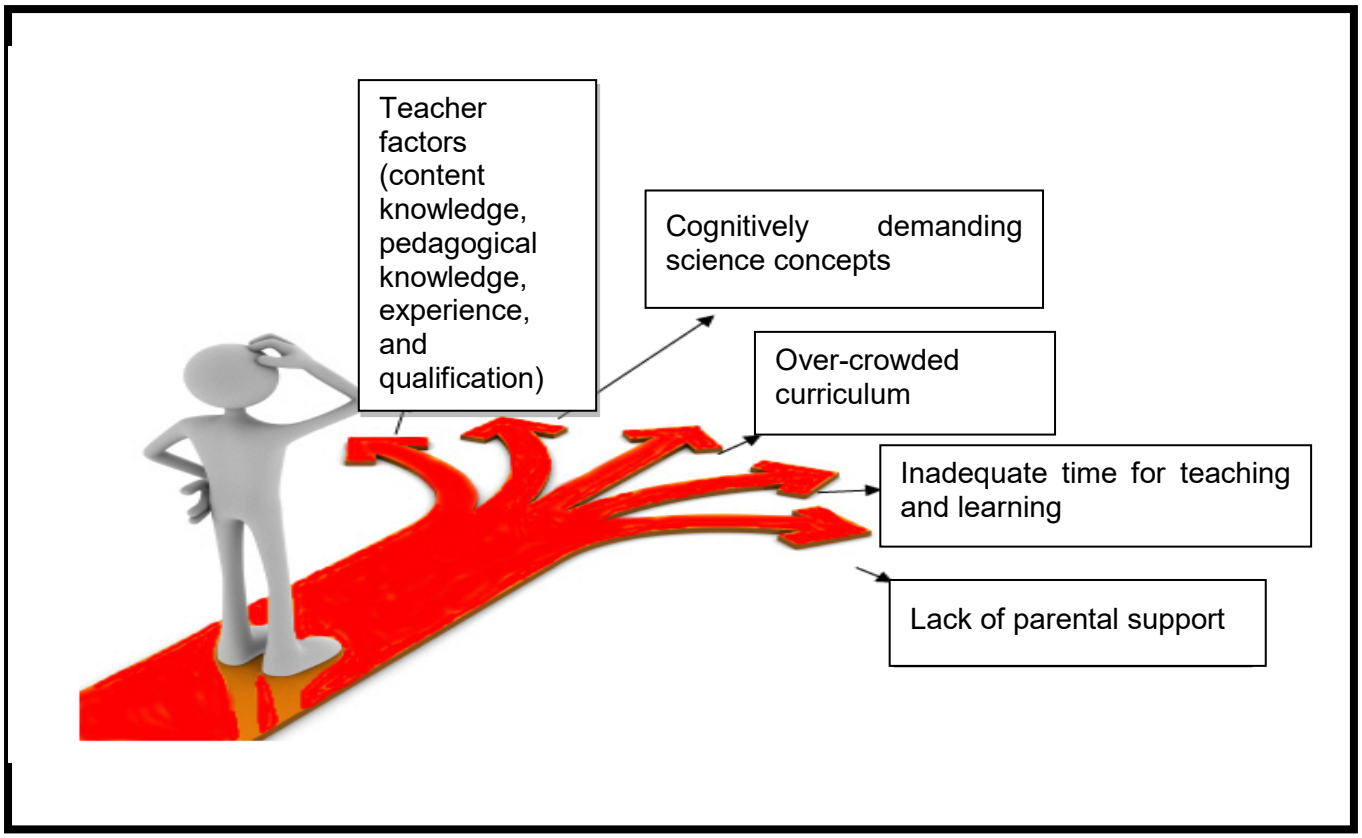

Figure 5.2: Constraining factors for learners in Life Sciences in rural contexts
Source: Cartoon adapted from a graphic of cartoon (Degree Tutoring (2017)

The second research question was:

5.2.2 Learners' views about accessing support to perform successfully in Life Sciences classrooms in rural contexts

The data generated for this research question showed that learners need support from schools and teachers, from parents, from the DoBE, and peers. They also derive support from the medium of instruction, where it is well chosen. Many learners' parents were uneducated, unemployed and poor. They could not buy resources for their children to enhance the children's achievement in Life Sciences. This circumstance of the parents may be located in the exosystem, since it affects the learner, but the learner has no control over it.

From the point of view of the school and teachers, learners in Life Sciences in rural settings need extra classes, extra textbooks, computer labs, science laboratories and qualified and competent teachers, who know their subject and are not reliant on textbooks for every topic throughout the lesson. Learners suggested that teachers should network to a greater extent so that the inexperienced can gain by mixing with

and learning from the experienced teachers. Within the South African context school governing bodies may influence the appointment of teachers. However national policy dictates the provision of textbooks and what constitutes a recognised teacher qualification. What the SBG governs is located in the exosystem, while national policies are in the macrosystem. Both these systems comprise factors which influence learners in a unidirectional way. In this study participants revealed that they would feel supported in their study of Life Sciences if the authorities who drive the aforementioned issues could consider their needs.

Schools can also enhance the learning of Life Sciences and enable better results by aiming to develop a genuine interest in and love for Life Sciences in learners. If teachers adopt suitable pedagogical strategies and if resources are made available this could facilitate deeper understanding of Life Sciences. Teachers need to spend time with learners doing revision through the use of previous question papers when preparing learners for examinations. This greater interaction between teacher and learners is located in the microsystem (school).

In addition, participants in my study felt that Life Sciences must be allocated more time by the DoBE. Time allocation was important given the complexity of the Life Sciences syllabus. In this study, the inadequate time allocated for the teaching of Life Sciences, as reported by the participants, shows how the exosystem influences the learner in a uni-directional way. The allocation of the number of hours per week to the teaching and learning of Life Sciences is dictated by national curriculum policy, and in this study, points to an unfavourable allocation of time to this subject.

Learners also need assistance and support from the parents at home and in school. The kind of support they need is as follows: parents need to buy all the necessary study materials, such as texts books and study guides; they should reduce home chores for learners, allowing them time to do schoolwork; even if they are unable to grasp the concepts in Life Sciences and they should encourage and help by informal testing (if they are literate) and by being willing to listen and discuss concepts. This is something parents can do to encourage them. This positive interaction between parents and their children is located in the microsystem. Participants highlighted their need for support by saying that parents ought to visit the school and discuss learner progress with Life Sciences teachers from time to time, as this would motivate them

and indicate support by signalling the importance of positive interactions at the level of the mesosystem. Participants also said that they needed private tutors to assist them with Life Sciences. This is something that could be organised with volunteers, either by families or by schools. Here a positive interaction between the family, school and community at the level of the mesosystem could prove to be useful in supporting learners to achieve success in school in general and Life Sciences in particular.

This support which learners sought from their parents also overlaps with the macrosystem because many parents of learners in rural areas are unemployed or earn low salaries, and this low socio-economic status impacts negatively on the learning resources which parents can provide. In addition, the economy of the country, which influences employment of people, is located in the macrosystem. Therefore, parents' socio-economic status has implications for learner performance at several levels of Bronfenbrenner's EST. Herein lies the complexity of understanding the many factors which influence learner performance.

Further suggestions by learners were that the DoBE should provide more Life Sciences teachers who are both qualified and experienced in the subject in rural settings. Participants believed that the learning material, such as textbooks should be supplied in the correct numbers, and the DoBE should include Life Sciences in the timetable for extra classes. All schools in rural areas must be supplied with electricity, computer laboratories, and science laboratories.

It was also found that learners valued peer support and input. They believed that more after school study groups should be formed to recap what was done in class during the day, allowing group members to move at a pace that suits them, and enabling reinforcement of new concepts. They indicated that some learners were afraid to ask questions of teachers. Learners who had formed study groups indicated that they found groups invaluable in helping them to understand concepts.

Lastly, learners expressed the desire to be taught in English in every class, because all question papers and textbook are written in English. They were not averse to code-switching but felt the indigenous language should not to be the primary medium of teaching. The use of English as a medium of instruction was found to have a positive effect. These are factors over which learners have no control; they are issues decided on by the DoBE and handed down to schools to implement, regardless of whether they

suit the school or not. This finding relates to Bronfenbrenner's exosystem, as cited by Paquette and lebRyan (2001), who states that the child does not directly encounter the exosystem, and yet is impacted strongly by it.

5.3 Intersecting findings with Bronfenbrenner's EST

Results were analysed using Bronfenbrenner's EST framework. The scientific study of the inter-relationship between the development of an individual and the changes which occur in the individual's immediate environment is presented as four layers in Bronfenbrenner's EST.

This analysis is not meant to categorise factors into specific levels of Bronfenbrenner's EST. Instead, it reveals that factors which influence learners' performance in Life Sciences are inter-linked and emerge from elements which can be located at different levels. This analysis could have provided a different understanding if the context was different. Therefore, the complexity of the factors which influence learner performance needs to be underscored and understood. The insights from the findings are summarised in Figure 5.3:

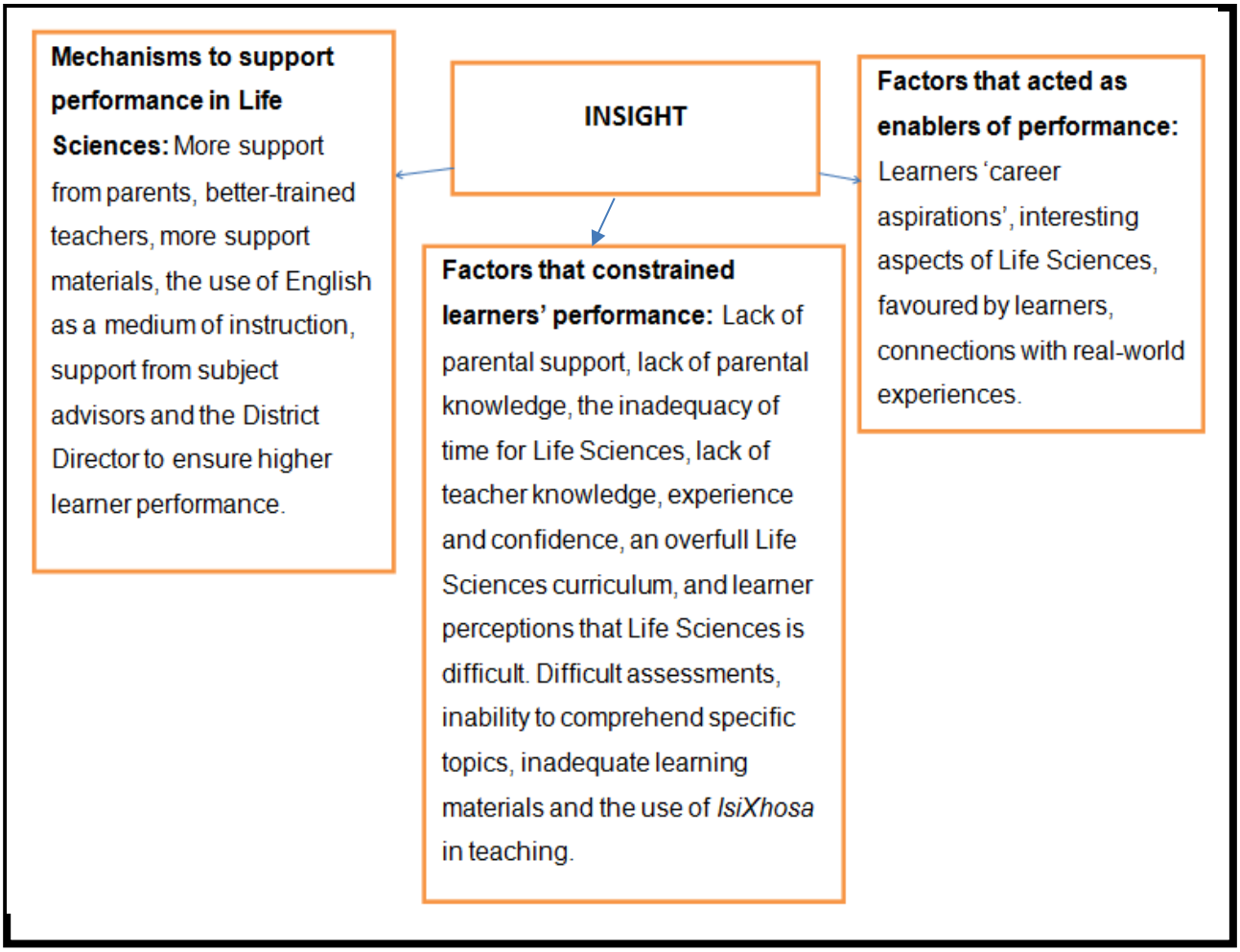

Figure 5.3: Factors which influence learners' performance in Life Sciences in rural settings

5.4 Implications and recommendations

This study has yielded several insights about learners' performance in Life Sciences in rural settings, and recommendations are made in lieu of these. It is recommended that SGBs and teacher cohorts work together to ensure that learners in all schools are supplied with adequate learning materials, which include textbooks, laboratories, and computers. The time for teaching and learning Life Sciences could be increased, adding more time for revision and for practical experiments and demonstrations. This can be achieved by adding extra classes and Saturday classes.

The DoBE can also play a crucial role. It is recommended that the curriculum for Life Sciences in Grade 12 be reduced to allow greater depth of learning. Moreover, the time allocation for Mathematics, Physical Sciences, and Life Sciences ought to be equal. Qualified, competent and experienced teachers must be appointed in rural settings.

It is also recommended that schools, SGBs and the DoBE call workshops for parents at the beginning of each school year to sensitise parents about the importance of supporting and motivating their children at home. Parents should be encouraged to visit schools every term to monitor the progress of the child. Schools and parents should help learners to form study groups, support them and motivate them, both in and away from school premises.

A final recommendation is that the medium of instruction in Life Sciences should be English. Teachers may code-switch where necessary, such as where there is a need to emphasise particular concepts, but teachers should not rely solely on the mother tongue language for instruction.

5.5 Areas for further research

Further studies can be conducted to investigate parents' perspectives about their experiences of their children who study Life Sciences. Parents' attitudes should be probed for whether they see value in the subject, and whether or not they are aware of the various ways that they can support and enhance their children's learning. The study could be expanded to include other provinces, enabling a comparison of learners' experiences of Life Sciences in rural settings across South Africa.

5.6 Limitations

The study was limited to two selected high schools in rural settings close to Mthatha. Thus, the data generated cannot be generalised to other high schools in the country. Further research into the factors which influence the performance of Grade 12 learners of Life Sciences in a rural setting is suggested. The study relied on the views of participants, whose backgrounds and experiences were diverse, and the findings cannot be generalised to the general teaching and learning of Life Sciences.

5.7 Conclusion

This chapter summarised the findings that emerged from the study. It also made recommendations regarding the factors which influence the performance of Grade 12 Life Sciences learners in rural settings in selected Mthatha high schools, and regarding what stakeholders can do to improve the teaching, learning, and performance of learners in the subject. The issue of learners' poor performances and attitudes towards

the sciences has received attention locally and globally. It has become clear that high-quality materials, in sufficient numbers, proper Life Science equipment, including laboratories, and qualified teachers are vital if schools are to make a difference to how future generations contribute to the Life Sciences. The well-being of individuals, societies, countries and the world at large depends on education that goes further than the bare minimum. It also depends on making visible the challenges experienced by communities such as those in rural settings in terms of science education, with a view to addressing these challenges.

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APPENDICES

1. Ethical clearance from the University of KwaZulu-Natal

2. Letters to principals of School A and B (informed consent)

3. Inform consent letter for learners

4. Focus group interview schedule

5. Individual interview schedule

6. Reflective journal schedule

7. Focus group interview transcripts

8. Individual interview transcripts

9. Reflective journal transcript

10. Professional editing certificate

11. Pages which show summary of similarity from different sources

APPENDIX 1: Ethical clearance from the University of KwaZulu-Natal

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

10 March 2016

Mr Thamsanqa Sihele 215039784
School of Education
Edgewood Campus

Dear Mr Sihele

Protocol reference number: HSS/1852/015M
Project Title: Exploring factors which influence the performance of Life Sciences learners in Two Mthatha rural high schools

Full Approval – Expedited Application

In response to your application received 15 December 2015, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....

Dr Shenuka Singh (Chair)
Humanities & Social Scinces Research Ethics Committee

/pm

Cc Supervisor: Dr Ronicka Mudaly
Cc Academic Leader Research: Dr SB Khoza
Cc School Administrator: Ms T Tyzer

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** singhs@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za

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APPENDIX 2: Letters to principals of School A and B (informed consent)

Appendix B

Informed consent: for the Principal

St John's Collage

Private bag X 5010

Mthatha

5099

November 2015

To:

The Principal

Eastern Cape Department of Basic Education

Dear Sir/ Madam

INFORMED CONSENT

I currently a Masters student at the University of KwaZulu Natal and am engaged in a project titled **"EXPLORING FACTORS WHICH INFLUENCE THE PERFORMANCE OF LIFE SCIENCES LEARNERS IN SELECTED MTHATHA RURAL HIGH SCHOOLS."** I want to hear and understand the views of learners about factors which contribute to their performance in Life Sciences.

I would like to generate data from your learners using three different methods. The first will be individual interviews that will take approximately twenty minutes; the second will be focus group interviews that will take about one hour. The learners will also given a reflective journal, which they will keep for a

period of six months to record their experiences of support, or the lack of it, and how this influences their performance in Life Sciences.

I assure you that the strictest confidentiality and anonymity will be maintained. No school or individual shall be named in this study, and pseudonyms or codes will be used to refer to them. School programmes shall not be disrupted by this study, and activities will take place out of lesson time in a venue such as school library. The interviews will be audio recorded.

Thank you, in advance for you time and co-operation.

If you would like any further information or if you are unclear about anything, please feel free to contact me or my supervisor.

Researcher:
Mr T. Sihele
Cell 078 449 5325
E-mail sihelet1@gmail.com
Student number 215039784

Supervisor
Dr R Mudaly
Phone: 031 260 3643
E-mail: mudalyr@ukzn.ac.za
Research office:
Ms Mariette Snyman
HSSREC research office,
Tel: 031 260 8350
E- mail snymanm@ukzn.ac.za

Informed consent: for the Principal

St John's Collage

Private bag X 5010

Mthatha

5099

November 2015

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Eastern Cape Department of Basic Education

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DECLARATION by Principal

I MOJNSI N.A. (full name/s)the Principal, hereby confirm that I grant permission to Mr T.Sihele to conduct his research in my school (name of school) KULANATHI S.S.S.

The research project is titled **"EXPLORING FACTORS WHICH INFLUENCE THE PERFORMANCE OF LIFE SCIENCES LEARNERS IN SELECTED MTHATHA RURAL HIGH SCHOOLS."** I understand that grade 12 learners will participate.

Additional consent

I hereby consent to the audio recording of all discussions, interviewers and dialogues.

YES/NO

SIGNATURE OF THE PRINCIPAL ..... DATE 04/11/2015

School stamp

DEPARTMENT OF EDUCATION
KULANATHI S.S.S
BOX 53037 - MTHATHA
04 NOV 2015
Principal :
TEL: 047 538 83

Informed consent: for the Principal

St John's Collage

Private bag X 5010

Mthatha

5099

November 2015

To:

The Principal

Eastern Cape Department of Basic Education

Dear Sir/ Madam

INFORMED CONSENT

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Thank you, in advance for you time and co-operation.

If you would like any further information or if you are unclear about anything, please feel free to contact me or my supervisor.

Researcher:
Mr T. Sihele
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Research office:
Ms Mariette Snyman
HSSREC research office,
Tel: 031 260 8350
E- mail snymanm@ukzn.ac.za

DECLARATION by Principal

I SAMKELO N. DAWEDI (full name/s)the Principal, hereby confirm that I grant permission to Mr T.Sihele to conduct his research in my school (name of school) ZAMUKULUNGISA S.S.S.

The research project is titled "**EXPLORING FACTORS WHICH INFLUENCE THE PERFORMANCE OF LIFE SCIENCES LEARNERS IN SELECTED MTHATHA RURAL HIGH SCHOOLS.**" I understand that grade 12 learners will participate.

Additional consent

I hereby consent to the audio recording of all discussions, interviewers and dialogues.

YES/~~NO~~

SIGNATURE OF THE PRINCIPAL

DATE 04/11/2015

School stamp

ZAMUKULUNGISA S. S. S.
P. O. Box 1883 - Mthatha 5099
2015 -11- 04
DEPARTMENT OF EDUCATION E.C.

APPENDIX 3: Inform consent letter for learners

Appendix A

Informed consent: for Learners

St John's College

Private bag X 5010

Mthatha

5099

November 2015

Dear Learner

I am Masters Student at the University of KwaZulu- Natal and am undertaking a research project titled **"EXPLORING FACTORS WHICH INFLUENCE THE PERFORMANCE OF LIFE SCIENCES LEARNERS IN SELECTED MTHATHA RURAL HIGH SCHOOL."**

I wish to understand learners' views about the support they need in their schools, and how this could improve their performance. I invite you to participate in this research, by offering your candid views about learner's performance.

You are requested to participate in three research activities, which will not overlap with your classes. The first is an individual interview which should be of approximately 20 minutes duration, and can be held at a time and place which you deem convenient.

The second is a focus group interview which should be about one hour long and will be held in private place like the school library. The last activity will require you to write about your thoughts and experiences about factors which influence your performance and that of other learners. You will be given a reflective journal to record this information over a period of six months.

Please take a note of the following:

- Your participation in the study is voluntary and you may withdraw from the project at any time without negative consequences.
- There will be no financial or other material benefit that you may receive as part on your participation in this research project.
- Try to answer all the questions.
- All information will be treated with the greatest confidentiality. Reponses will be attributed to a group and not an individual.
- Your real name will not be used, but codes such as A, B, C or X, Y, Z will be used.
- Any information that you provide will not be used against you, and will be used for purposes of this research only.
- You will not, under any circumstances, be forced to reveal what you don't want to reveal.
- No video or video recording will be made, but the interviewers will be audio recorded.

My contact number is 0784495325 and my supervisor, Dr R Mudaly, may be contacted at 031 260 3643. Alternatively, the Research Office may be contacted if necessary, and the details are:

Ms Mariette Snyman.

HSSREC Research Office

Tel: 031 260 8350

Email: snymanm@ukzn.ac.za

DECLARATION by the learner

I A. TIKAYO ..... (full name/s of participant) hereby confirm that I understand the contents of this document and the nature of this project. I consent to participating in the individual interviews, focus group interviews and reflective journal activities of this research project titled **"EXPLORING FACTORS WHICH INFLUENCE THE PERFORMANCE OF LIFE SCIENCES LEARNERS IN SELECTED MTHATHA RURAL HIGH SCHOOLS."**

Additional consent

I understand that I am at liberty to withdraw from the project at any time, should I so desire, and there will be no negative effects based on this decision.

YES/NO

I hereby consent to the audio recording of all discussions, interviews and dialogues

YES/NO

SIGNATURE OF PARTICIPANT ..... **DATE** September 2015 November 2015

APPENDIX 4: Focus group interview schedule

FOCUS GROUP INTERVIEW SCHEDULE FOR THE LEARNERS TEMPLATE

The content of this focus group interview schedule is highly confidential. The researcher will ensure that your identity will not be disclosed under any circumstance to any unauthorised person.
The pattern for introducing the focus group interviews or discussion will include: (1) Welcome, (2) Overview of the topic (3) Ground rules and (4) the questions.

The researcher will thank all the participants for making themselves available and will conduct the interview after gatekeeper permission; consent and or assent are granted.

1.1 Do you think enough time has been spent in teaching Life Sciences in the schools? Please elaborate.

1.2 Do you think your Life Sciences teachers are qualified and also experienced in the subject? Why do you say so?

2.1 Why did you choose to study Life Sciences?

2.2.1 Which aspects of Life Sciences do you like most?

2.2.2 Which aspects of Life Sciences do you like least? Please tell me why this is the case.

2.2.3 Would you consider yourselves as being curious about Life Sciences? Why do you say so?

2.3.1 Which assessment tasks do you like the most? Why is this the case?

2.3.2 Which assessment tasks do you like the least? Why is this the case?

2.4 What types of classroom tasks do you enjoy most in the Life Sciences and why do you think you enjoy them most?

2.5.1 Which tasks do you not enjoy in Life Sciences?

2.5.2 Why do you not enjoy these tasks?

2.5.3 How does this influence your performance?

2.6.1 What kind of support do you need from your schools to help master these tasks that you do not like most in Life Sciences?

2.6.2 What kind of support do you need from your teachers to help master these tasks that you do not like most in Life Sciences?

2.6.3 What kind of support do you need from your peers to help master these tasks that you do not like most in Life Sciences?

2.6.4 What kind of support do you need from your parents/guardians to help master these tasks that you do not like most in Life Sciences?

3.1 Do your parents support your learning of Life Sciences? Please explain why this is the case.

3.2.1 If your parents do not support your learning, how does it affect your performance in Life Sciences?

3.2.2 If your parents do support your learning, how does it affect your performance in Life Sciences?

3.2.3 What types of support would you like to receive from your parents?

4.1 Do all learners have learning materials in Life Sciences in your schools? Please elaborate.

4.2 Is there a shortage of resources in your schools? If so, how does a shortage of learning materials affect your performance in Life Sciences?

4.3 Please give three examples of how a lack of resources affected the learning of particular Grade 12 topics.

4.4 What kinds of learning materials do you need most in Life Sciences?

4.5 Describe how the provision of such learning material/resource would help with learning a particular topic. Give 3 such descriptions.

4.6 In which sections/ topics have you learners performed well in Life Sciences? Why do you think this was the case?

5.1 Which medium of instruction is mostly used in class when teaching and learning Life Sciences?

5.2 Which medium of instruction does contribute a lot to your good performance in Life Sciences?

5.3 What are your views about the effects of IsiXhosa as a medium of instruction on your performance in the Life Sciences?

6.1 Do you learners like to study Life Sciences? Please explain.

6.2 What reasons or conditions could make you or other Grade 12 learners like yourself develop negative attitudes towards Life Sciences? How can these challenges be addressed?

7.1 Suppose that you had three minutes to talk to the Subject Advisor or the District Director on the factors which influence the performance of Life Sciences learners in selected Mthatha rural high schools, the topic of today's discussion. What would you say?

THANK YOU

APPENDIX 5: Individual interview schedule

INDIVIDUAL INTERVIEW SCHEDULE FOR THE LEARNERS

The content of this interview schedule is highly confidential. The researcher will ensure that your identity will not be disclosed under any circumstance to any unauthorized person. The researcher will thank the participant for making him/herself available and will conduct the interview after gatekeeper permission; consent and or assent are granted.

Biographic information of participants:

1. Race ……...
2. Gender ……
3. Age range ……...

1.1 Please tell me which language you use at home?

1.2 Please tell me what your guardians or parents do for a living?

1.3 Do your parents have knowledge of sciences careers?

2.1 Let us talk about school. Do you think enough time has been spent in teaching you Life Sciences? Please elaborate.

2.2 Do you think your Life Sciences teacher is qualified and also experienced in the subject? Why do you say so?

3.1 Why did you choose to study Life Sciences?

3.2.1 Which aspects of Life Sciences do you like most?

3.2.2 Which aspects of Life Sciences do you like least? Please tell me why this is the case.

3.2.3 Would you consider yourself as being curious about Life Sciences? Why do you say so?

3.3.1 Which assessment tasks do you like the most? Why is this the case?

3.3.2 Which assessment tasks do you like the least? Why is this the case?

3.4 What types of classroom tasks do you enjoy most in the Life Sciences and why do you think you enjoy them most?

3.5.1 Which tasks do you not enjoy in Life Sciences?

3.5.2 Why do you not enjoy these tasks?

3.5.3 How does this influence your performance?

3.6.1 What kind of support do you need from the school to help master these tasks that you do not like most in Life Sciences?

3.6.2 What kind of support do you need from the teacher to help master these tasks that you do not like most in Life Sciences?

3.6.3 What kind of support do you need from peers to help master these tasks that you do not like most in Life Sciences?

3.6.4 What kind of support do you need from your parents/guardians to help master these tasks that you do not like most in Life Sciences?

4.1 Do your parents support your learning of Life Sciences? Please explain why thisis the case.

4.2.1 If your parents do not support your learning, how does it affect your performance in Life Sciences?

4.2.2 If your parents do support your learning, how does it affect your performance in Life Sciences?

4.2.3 What types of support would you like to receive from your parents?

5.1 Do all learners have learning materials in Life Sciences in this school? Please elaborate.

5.2 Is there a shortage of resources in your school? If so, how does a shortage of learning materials affect your performance in Life Sciences?

5.3 Please give three examples of how a lack of resources affected the learning of particular Grade 12 topics.

5.4 What kinds of learning materials do you need most in Life Sciences?

5.5 Describe how the provision of such learning material/resource would help with learning a particular topic. Give 3 such descriptions.

5.6 In which sections/ topics have you performed well in Life Sciences? Why do you think this was the case?

6.1 Which medium of instruction is mostly used in class when teaching and learning Life Sciences?

6.2 Which medium of instruction does contribute a lot to your good performance in Life Sciences?

6.3 What are your views about the effects of IsiXhosa as a medium of instruction on your performance in the Life Sciences?

7.1 Do you like to study Life Sciences? Please explain.

7.2 What reasons or conditions could make you or other Grade 12 learners like yourself develop negative attitudes towards Life Sciences? How can these challenges be addressed?

APPENDIX 6: Reflective journal schedule

REFLECTIVE JOURNAL FOR THE LEARNERS: TEMPLATE

The content of this reflective journal is highly confidential. The researcher will ensure that your identity will not be disclosed. The researcher will facilitate your reflective thinking by including prompting questions as well as focuses of reflection. This will prevent you from getting frustrated as a result of not knowing where to begin.

This reflective journal is about your views and experiences related to different teaching and learning activities in Life Sciences, you might want to write something about each of these activities with the help of the following questions:

1. Do I really like to study Life Sciences?

2. Which topics in Life Sciences do I like most?

3. Which aspects of Life Sciences do I like least?

4. Do I like the teaching style of the Life Science teacher?

5. Do I understand what is been taught in class?

6. Do I think about his/her experience and qualification in Life Sciences?

7. Which topics have I performed well in, in Life Sciences?

8. Why do I think I performed well in this topic?

9. Which assessment tasks do I like the most?

10. Which assessment tasks do I like the least?

12. What types of classroom tasks do I enjoy most in the Life Sciences and why do I think I enjoy them most?

13. Which tasks do I not enjoy in Life Sciences?

14. Why do I not enjoy these tasks?

15. How does this influence my performance in Life Sciences?

16. What kind of support do I need from the school to help me master these tasks that I do not like most in Life Sciences?

17. What kind of support do I need from the teacher to help master these tasks that I do not like most in Life Sciences?

18. What kind of support do I need from peers to help master these tasks that I do not like most in Life Sciences?

19. What kind of support do I need from my parents/guardians to help master these tasks that I do not like most in Life Sciences?

20. What kind of learning materials do I need most in Life Sciences?

21. Which medium of instruction do I like most to be used in the teaching and learning of Life Sciences?

22. Which medium of instruction does contribute a lot to my good performance in Life Sciences?

23. What reasons or conditions could make me develop negative attitudes towards Life Sciences?

Focus on 4 or 5 lessons.
Complete the following table:

Date
Lesson topic
Main teaching strategy used (e.g. lecture method/ class discussion/ group work/ teacher demonstration/practical work)
What I enjoyed most about the lesson
What I did not like about the lesson
What kind of support I would like from teachers in this lesson
What kind of support I would like from the school or Department of Education in this lesson
What kind of support I would like from parents/guardians/community in this lesson

Focus on 3 different types of assessment (e.g. class test/ practical/ project/ term test)

Date

Topics tested

Type of assessment

What I enjoyed most about the lesson

My performance (% obtained)

Am I satisfied with my mark?

Why?

What kind of support would I like from the school or Department of Education that will result in an improved performance?

What kind of support would I like from parents/guardians/community?

that will result in an improved performance?

What kind of support would I like from my teacher?

that will result in an improved performance?

APPENDIX 7: Focus group interview transcript

TRANCSRIPTS OF FOCUS GROUP INTERVIEW SCHOOL A

1.1 Do you think enough time has been spent in teaching Life Sciences in the schools? Please elaborate.

Participant 1: *I think it is not enough because in our classes our teachers do not take time to explain since not all of us have the same level of understanding.*

Participant 4: *Not at all. For instance, if I can machine genetically Inheritance, this is the part that is difficult. So, it needs enough time in order for us to understand what is taught in class.*

1.2 Do you think your Life Sciences teachers are qualified and also experienced in the subject? Why do you say so?

Participant 5: *You see sir; some of the teachers look into the text book always even when we ask them questions.*

Participant 7: *Our life sciences teacher lacks confidence; maybe he does not understand life sciences well.*

2.1 Which aspects of Life Sciences do you like most?

Participant 6: *Sir, I think it is Human Reproduction because it is the best aspect that I like most in Life Sciences. It elaborates more about human beings, the inner part and the outer part, how a person is being structured all that sort of information.*

Participant 1: *Me too, sir I enjoy human reproduction, since it deals with menstrual and I am girl, this topic makes me to understand when I am menstruating and will be easy to know when I pregnant.*

Participant 3: *You know Sir..., there are some people here in the village that we call "Inkawu" but our teacher has told us that all people that have no pigment melanin*

are referred as Albino and he even said albino is an example of genetic disorder where a person is lacking pigment melanin and it is good to know that these people are like us. (FG- P5A)

2.2 Which aspects of Life Sciences do you like least? Please tell me why this is the case.

Participant 2: *The aspects of Life Sciences that I don't like the most is the Genetics because Genetics are so confusing and they're a bit hard so it's hard for me to understand.*

Participant 8: *I think these aspects will be Monohybrid and Hybrid I cannot differentiate between them, but I try to understand them.*

2.3 Would you consider yourselves as being curious about Life Sciences? Why do you say so?

Participant 9: *I will be honest because am not used or familiar with Life Sciences. Life Sciences is the whole textbook and we have to read it and understand it before we go into the exam room. We have to read every function and every day we have to analyse everything every structure for example, you'll be told to draw a structure of animal cell may be. Then you're not able to remember all the labels so I think that's why we don't like Life Sciences at all.*

Participant 5: *for me I am curious Sir, but Life Sciences is not an easy subject and is very long, but I really need it since what I am planning to do in the university, I will need Life Sciences. I am planning to work with police as pathologist*

3.1 Which assessment tasks do you like the most? Why is this?

Participant 4: *Eee…Mhh… I like controlled test because it controls me to be prepared for examinations.*

Participant 6: *I like class work, if I did a mistake let's say I didn't get a mark correctly I know that my teacher will rectify it for me. So, I get helped where I didn't do well.*

3.2 Which assessment tasks do you like the least? Why is this the case?

Participant 3: *I hope we like all the task giving to us in class*

Participant 8: *I do not like home work because it is a waste of time***.**

4.1 What kind of support do you need from your teachers and from the school to help master these tasks that you do not like most in Life Sciences?

Participant5: *I think extra classes can help and provision of computers so as to make Life Science interesting more and funny.*

Participant 7: *Ee... First of all, I would like my teacher to come in class every day, secondly, I would like my teacher to first introduce the topic not to refer on the book just read the book and say ok am fine now. I would like her to come with introduction and then ask us questions and then refer to the textbook.*

4.2 What kind of support do you need from your peers to help master these tasks that you do not like most in Life Sciences?

Participant 3: *I would like to us to be cooperative in class and to help those who do not understand in class.*

Participant 8: *When the teacher is not around, I will like those who know how to answer the questions to stand up and explain them to us.*

5.1 Do your parents support your learning of Life Sciences? Please explain why this is the case:

Participant 1: *No support. They do not support us, and they do not care if I pass or not*

Participant 3: *Not at all because I do not have books and other materials that they should have bought for me.*

Participant 2: Yes, I get the support because my mom would say go and study Life Sciences because you've failed it in last test.

3.1 What types of support would you like to receive from your parents?
Participant 3: *From my parent I would like them to buy me textbooks and study guides so that I can get more information.*

Participant 6: *Our parents must give us enough time to study and do homework.*

3.2. If your parents do not support your learning, how does it affect your performance in Life Sciences?
Participant 8: *I fail Life Sciences always.*

Participant 9: *For me I do not have interest in the subject.*

4.1 Do all learners have learning materials in Life Sciences in your schools? Please elaborate.

Participant 2: *No sir, we share the text books in our school*

Participant 4: *They are few and so three learners for one text book.*

4.2 Is there a shortage of resources in your schools? If so, how does a shortage of learning materials affect your performance in Life Sciences?
Participant 5: *Yes, we have no materials in life sciences and so we find it difficult to do homework.*

Participant 10: *There is no laboratory in this school and no books that is why we fail in the life science subject.*

4.3 What kind of learning materials do you need most in Life Sciences?

Participant 7: *I think in our school we need lots of text books and passed exams questions.*

Participant 8: *We need a life sciences laboratory with all the tools inside.*

5.1 In which sections/ topics have you learners performed well in Life Sciences? Why do you think this was the case?

Participant 1: *Human Reproduction is the aspect we do well because it is all about human structured.*

Participant2: *I pass Meiosis because I like the topic and it is all about the cells in human beings.*

5.2 Which medium of instruction is mostly used in class when teaching and learning Life Sciences?

Participant 10: *The medium we use in our school is IsiXhosa*

Participant 6: *We use Xhosa throughout in class when learning life sciences.*

.

5.3 What are your views about the effects of IsiXhosa as a medium of instruction on your performance in the Life Sciences?

Participant 8 (learner): *IsiXhosa rather helps us to understand the subject.*

Participant 9: *The effect is that the question papers are written in English and so we do not understand what they want us to write.*

6.1 Do you learners like to study Life Sciences? Please explain.

Participant 2: *For me I sometimes do not like life sciences because there are not books.*

Participant 4: *We like the subject but there are topics that so difficult and so we turn not to like it at all.*

6.2 What reasons or conditions could make you or other Grade 12 learners like yourself develop negative attitudes towards Life Sciences?

Participant 5: *The way our teacher teaches us doesn't give us interest I mean her style of teaching and referring to a textbook when teaching.*

Participant 6: *The other thing that makes me develop negative attitude towards Life Sciences is the use of language on Life Sciences, I don't think those words used in Life Sciences are English words because they are so difficult to pronounce.*

7.1 Suppose that you had three minutes to talk to the Subject Advisor or the District Director on the factors which influence the performance of Life Sciences learners in selected Mthatha rural high schools, the topic of today's discussion. What would you say?

Participant 3: *Ee...I would say if the government can provide us with more teachers just because there are few Life Sciences' teachers in our school, so each teacher has 4 classes to teach Life Sciences*

Participant 9: *If government can provide resources to rural areas such as electricity, computers so that those who are in rural areas can be familiar with what is happening in Life Sciences and other subjects because some of the learners don't even have electricity so use generators to photocopy something because they only have one textbook to use.*

TRANCSRIPTS OF FOCUS GROUP INTERVIEW SCHOOL B

1.1 Do you think enough time has been spent in teaching Life Sciences in the schools? Please elaborate.

Participant 5: *Oh...I don't think there's enough time spent on teaching Life Sciences because we have seven subjects and including Life Sciences. So in these seven subjects we have two subjects that we focus too much on which are Physics and Mathematics than in Life Sciences.*

Participant 8: *Eh sir, I don't think we have enough time because here in school we have morning classes and extra classes but among those extra classes and morning classes we do not attend Life Sciences we only attend Physics, Mathematics and Consumer Studies.*

1.2 Do you think your Life Sciences teachers are qualified and also experienced in the subject? Why do you say so?

Participant: *Mhh Sir..., I am not sure, but we pass Life Sciences*

Participant 10: *when she taught us, she is very fast and also, she just read us for what is in the book without explaining to us, with me she is not.*

2.1 Which aspects of Life Sciences do you like most?

Participant 5: *I enjoy meiosis, mutation and genetic disorders because they make understand people with genetic disorders that it's something that they are born with like albino I use to get scared when I see albino but now, I am not*.

Participant 1: *It's Cell Division in meiosis. Meiosis it is interesting and ever since I was in grade 10, we were told that we will learn about meiosis in grade 12 so I was happy because I want to study meiosis.*

2.2 Which aspects of Life Sciences do you like least? Please tell me why this is the case.

Participant 7: *Its mono hybrid cross, dihybrid cross and evolution*.

Participant 4: *Me too sir this Evolution and genetics have got many terms that I really do not understand also the topics are too long it's difficult to study and understand at once.*

2.3 Would you consider yourselves as being curious about Life Sciences? Why do you say so?

Participant 6: to *be honest I don't know whether I like Life Sciences.*
The way our teachers teach the subject it is not motivating, and I lose interest always.

Participant 4: *I am curious Sir, but the way our teacher do to us is not motivating at all she is moody and read from the textbook without explaining to us, I am agree with my colleague but with the course that I am willing to do at the university need Life Sciences and Mathematics so I am forced to do it and pass it.*

3.1 Which assessment tasks do you like the most? Why is this?

Participant 3: *I enjoy class work sir, because it makes me to know what if I understand what was taught in the class also have an idea about the question style they use to ask certain questions.*

Participant 1: *Me too sir class work is right because it prepares us the control test and I also enjoy control test because our teacher monitors us when we writer test.*

3.2 Which assessment tasks do you like the least? Why is this the case?

Participant 6: *Class work as my friend said it can help us to understand the topic well at the end of period.*

4.1 What kind of support do you need from your teachers and from the school to help master these tasks that you do not like most in Life Sciences?

Participant 3: *more revision sir before we right test and also extra classes.*

Participant 5: *she must love use and motivate us to do well in Life Sciences also come early in the class during her period.*

4.2 What kind of support do you need from your peers to help master these tasks that you do not like most in Life Sciences?

Participant 9: *Sir, Let's work together, you know sir some learners they do not want to work with us they just hide the information, even if they have question paper, they will not tell us. So, let's learn to share the information.*

Participant 2: *the learners that are bright sir must teach us when the teacher is not around also as learners lets behave when there is not teacher stop making noise and do school work.*

5.1 Do your parents support your learning of Life Sciences? Please explain why this is the case?

Participant 3: *I do not know, but when I ask money for school things, she gives me, but she is unable to help me with school homework since she has not educated and sometimes, she will ask me to fetch the water and cook while I want to study or do homework. She uses to say my home work is not going to bring food.*

Participant 6: *maybe she wants to support but we do not have enough money at home for me to buy study guide and books we depend on social grant. My parents both are not working.*

Participant 1: *Yes, my dad encourages me to pass the subject and to be a nurse.*

3.1 What types of support would you like to receive from your parents?

Participant 7: *yahoo, sir at least they must reduce the work that I am doing at home and also buy me more books and study guide for Life Sciences.*

Participant 4: *motivate me and give more support like asking about my performance at school, also buy for me textbooks and my friend said we need study guides that have questions and answers.*

3.2. If your parents do not support your learning, how does it affect your performance in Life Sciences?

Participant 5: *Sir is very difficult to pass Life Sciences if my dad is not helping me.*

3.2. If your parents do not support your learning, how does it affect your performance in Life Sciences?

Participant 9:*me too sir I find it difficult to perform well in Life Sciences, because there is no push at home as a result, I repeated grade 11 but now I will pass.*

Participant 2: *I feel mot motivated sir*

4.1 Do all learners have learning materials in Life Sciences in your schools? Please elaborate.

Participant 10: *Not at all for Life Sciences instead they give us calculators and they said if for Mathematics. You see sir the thing is Principal love Mathematics and Physics so everything he bought for physics leaners for us doing Maths Lit and Life Sciences we do not get material.*

Participant 9: *Sir as a result we share textbooks two per learner.*

4.2 Is there a shortage of resources in your schools? If so, how does a shortage of learning materials affect your performance in Life Sciences?

Participant 6: *Sir now that we share these books it make things difficult because we are not staying in one place, it is more difficult if we are given homework or we are going to write a test.*

4.3 What kind of learning materials do you need most in Life Sciences?

Participant 3: *We need more textbook for Life Sciences sir so that we will stop sharing, Life Sciences laboratories and computers.*

Participant 7: *Also, they must buy use study guides with questions and answers.*

5.1 In which sections/ topics have you learners performed well in Life Sciences? Why do you think this was the case?

Participant: *I think we tried to do well in DNA and meiosis sir, but I am not sure others what they think.*

Participant 3: *Also, the menstruation cycle I did well sir I understand it.*

5.2 Which medium of instruction is mostly used in class when teaching and learning Life Sciences?

Participant 1: *It is English.*

Participant 8: *English because question papers come in English it cannot come in Xhosa.*

5.3 What are your views about the effects of IsiXhosa as a medium of instruction on your performance in the Life Sciences?

Participant 9: *No sir because textbooks are still in English so for use to use IsiXhosa let the textbooks be written in Xhosa and question papers sir so that we will understand it.*

Participant 4: *I agree with my friend Xhosa in Life Sciences will not help us, but teacher can sometimes explain in Xhosa so that we understand well some terms.*

6.1 Do you learners like to study Life Sciences? Please explain.

Participant 6: *Sir I do not know but as for me yes, I like Life Sciences because I will need at the University, I want to be a Doctor.*

Participant 3: *Yes, Sir we like it, but principal do not like us as a results we do not have enough books than learners who do pure Mathematics.*

6.2 What reasons or conditions could make you or other Grade 12 learners like yourself develop negative attitudes towards Life Sciences?

Participant 8: *Shortage of books and the way our teacher teachers the subject sometimes, she is not interested to us she loves Mathematics learners, so we are not that much taken serious they are saying we do general not Science.*

Participant 10: *Because we get little attention from our teacher and principal and Life Sciences is too many it needs more time and more concentration.*

7.1 Suppose that you had three minutes to talk to the Subject Advisor or the District Director on the factors which influence the performance of Life Sciences learners in selected Mthatha rural high schools, the topic of today's discussion. What would you say?

Participant 5: *Life Science laboratory, textbook that are different also with more Life Sciences teachers, maybe if there are many, they will be able to give us more time.*

Participant 9: *Computer labs sir, sometimes we need to research but we cannot.*

APPENDIX 8: Individual interview transcripts

TRANSCRIPTS OF INDIVIDUAL INTERVIEW SCHOOL A

1.1 Race

Participant: *I am black.*

1.2 Gender

Participant: *Am a male student*

1.3 Age range

Participant: *Am 19 years old*

1.4 Please tell me which language you use at home?

Participant: *I use Xhosa.*

1.5 Please tell me what your guardians or parents do for a living?

Participant: *Oh... hence I'm living with my grandmother she is not working only dependent on social grant.*

1.6 Do your parents have knowledge about the sciences careers?

Participant: *Aa... No, they don't have any because sometimes they ask me what I am going to do with this Life Science.*

2.1 Let us talk about school. Do you think enough time has been spent in teaching your Life Sciences? Please elaborate.

Participant: *No because that one hour is not enough hence Life Sciences need more time to be explained and all that kind of staff, so it is not enough.*

2.2 Do you think your Life Sciences teacher is qualified and also experienced in the subject? Why do you say so?

Participant: *No, she is not because something in class are not explained to us, we fail in the subject and no practical.*

3.1 Why did you choose to study Life Sciences?

Participant: *Oh... At first, I wanted to be a doctor but then I sat down and rethink, so decided to do Law but Life Sciences will help me to understand other things and to know why I'm sick Yhaa.*

3.2 Which aspects of Life Sciences do you like most?

Participant: *The aspects are; DNA, blood and all those kinds of things including inheritance on how this person became so and so.*

3.3 Which aspects of Life Sciences do you like least? Please tell me why this is the case?

Participant: *Genetics and Inheritance is very tricky, it has got many topics like sex linked characteristic and you have to study the appropriate punnet squares, which diagram that you need to draw so all that can be tricky to your mind.*

3.4Would you consider yourself as being curious about Life Sciences? Why do you say so?

Participant: *Yes, sometimes in my class if I've been taught something then I will be seeing things for example to see that your eyes are not like mine then I will remember that this is what my teacher saying in the class, so in that way I'm curious.*

4.1 Which assessment tasks do you like the most? Why is this the case?

Participant: *I like controlled test because it is where I see how much I understand and how much I know to proceed to another grade or level.*

4.2 Which assessment tasks do you like the least? Why is this case?

Participant: *Home work because my teacher doesn't consider it more than controlled test. It's because it is full of plagiarism.*

5.1 Do your parents support your learning of Life Sciences? Please explain why this is the case?

Participant: *No, because they are not educated and do not know what life sciences is.*

5.2. If your parents do not support your learning, how does it affect your performance?

Participant: *There is no one at home and no time for me to do my homework.*

What kind of support would you need from your peers?

Participant: *I would like us to remain after school and catch up on what was done during the day with my classmates.*

6.1 Is there a shortage of resources in your school? If so, how does a shortage of learning materials affect your performance in Life Sciences?

Participant: *Yes, some share textbooks and study guides for example these people stay in different places so at night they will not have time to study at the same time because textbook will have to go with the other and the other one will go home without it.*

6.2 What kinds of learning materials do you need most in Life Sciences?

Participant: *We need books, laboratory with microscope for DNA studies, computers and charts.*

7.1 Which medium of instruction is mostly used in class when teaching and learning Life Sciences?

Participant: *Our teachers like us to learn the subject in Xhosa, especially when we do not understand something, he will explain in Xhosa.*

7.2 Which medium of instruction does contribute a lot to your good performance in Life Sciences?

Participant: *It is English because even when I'm writing I will use English so for example the science terms in exams cannot be written in Xhosa.*

7.3 What are your views about the effects of IsiXhosa as a medium of instruction on your performance in the Life Sciences?

Participant: *Yes, it is a good thing because in Life Sciences there are some big words that you cannot understand easy so when it is taught in your home language it will be easy for you to understand and some terminology.*

8.1 Do you like to study Life Sciences? Please explain.

Participant: *Ok I like it because for example from the environment I live in I see some of these things happening of which I've heard them through studying Life Sciences.*

8.2 What reasons or conditions could make you or other Grade 12 learners liken yourself develop negative attitudes towards Life Sciences?

Participant: *Life Sciences goes in hand with Mathematics so when you are doing Life Sciences maybe you want to be a doctor or a nurse, but you will need to it with Mathematics and my problem I don't like Mathematics.*

8.3 How can these challenges be addressed?

Participant: *By making it a point that we study Life Sciences in the science laboratory.*

TRANSCRIPTS OF INDIVIDUAL INTERVIEW SCHOOL B

1.1 Race

Participant: *I am black.*

Participant: *Am black*

1.2 Gender

Participant: *Am a female*

1.3Age range

Participant: *I am 18*

Please tell me which language you use at home?

1.4Participant: *We use Xhosa all the time*

1.5 Please tell me what your guardians or parents do for a living?

Participant: *My father was a teacher but retired and my mother is notworking.*

2.1 Let us talk about school. Do you think enough time has been spent in teaching Life Sciences? Please elaborate.

Participant: *I can say it's enough because from what I've learned from previous grades I can relate to that as I grow up, I know that this is happening because I was told like this and this is happening because of the way I was taught, I can understand things how they work.*

2.2 Do you think your Life Sciences teacher is qualified and also experienced in the subject? Why do you say so?

Participant: *Oh... yes. Every time we have problem, she tries by all means to make it clearer to us.*

3.1 Why did you choose to study Life Sciences?

Participant: *Because Life Sciences in most cases is practical and things that are taught, I equally experienced them outside home and even in school.*

3.2 Which aspects of Life Sciences do you like most?

Participant: *DNA and Human reproduction.*

3.3 Which aspects of Life Sciences do you like least? Please tell me why this is the case?

Participant: *Genetics and inheritance because It is difficult to understand when the teachers teach us and a lot of terminology that I do not understand.*

3.4Would you consider yourself as being curious about Life Sciences? Why do you say so?

Participant: *When am reading say a magazine and there's something about science especially science careers I become interested to read it so that I can get more information.*

4.1 Which assessment tasks do you like the most? Why is this the case?

Participant: *I like project because it makes me investigate.*

4.2 Which assessment tasks do you like the least? Why is this case?

Participant: *It is controlled test and because when it comes to test that information is not mastered from head its copied information, so we fail the test.*

5.1 Do your parents support your learning of Life Sciences? Please explain why this is the case.

Participant: *Yes, I do get support like my father he is not always around so when he comes, he would call me and ask how am I doing in school so makes sure that he sees my files and check my class work books, unmarked work and marked work.*

5.2. If your parents do not support your learning, how does it affect your performance?

Participant: *Because my parents are not helping me, I will fail the subject and because I do not have the books.*

5.3 What kind of support would you need from your peers?

Participant: I would like us to remain after school and do what was doing by the teacher during the Life Sciences period so that we understand it more as group.

6.1 Is there a shortage of resources in your school? If so, how does a shortage of learning materials affect your performance in Life Sciences?

Participant: *We do not have books in this school and even the few are not enough for each one to take home and do homework.*

6.2 What kinds of learning materials do you need most in Life Sciences?

Participant: *I think in this school we need computers, we need charts to help us learn the endocrine system.*

7.1 Which medium of instruction is mostly used in class when teaching and learning Life Sciences?

Participant: *It is English that our teacher uses, sometimes Xhosa to explain what we do not understand.*

7.2 Which medium of instruction does contribute a lot to your good performance in Life Sciences?

Participant: *The medium that makes us pass well is the English language.*

7.3 What are your views about the effects of IsiXhosa as a medium of instruction on your performance in the Life Sciences?

Participant: *It is not going to be fine as questions are written in English.*

8.1 Do you like to study Life Sciences? Please explain.

Participant: *What I can say is that the subject is real but is difficult to learn and there are difficult words too in it.*

8.2 What reasons or conditions could make you or other Grade 12 learners like yourself develop negative attitudes towards Life Sciences?

Participant: *By making it a point that we study Life Sciences in the science laboratory.*

8.3 How can these challenges be addressed?

Participant: *I think the school must give each one of us a text books and more computers supplied.*

APPENDIX 9: Reflective journal transcript

TRANSCRIPTS OF REFLECTIVE JOURNALS OF SCHOOL A

1.1 Do I really like to study Life Sciences?

Participant: *Yes, because it gives me more knowledge about humans and plants.*

1.2 Which topics in Life Sciences do I like most?

Participant: *I like cell division and human reproduction*

1.3 Which aspects of Life Sciences do I like least?

Participant: *I do not like genetics & inheritance*

1.4 Do I like teaching style of the Life Science teacher?

Participant: *No because most of time she refers on textbook and not give us more information.*

1.5 Do I understand what is been taught in class?

Participant: *Yes, I do understand.*

1.6 Do I think about his/her experience and qualification in Life Sciences?

Participant: Yes. She is qualified and well experienced.

1.7 Which topics have I performed well in, in Life Sciences?

Participant: *Not even one last term, but human nervous system this term.*

1.8 Why do I think I performed well in this topic? It is a bit interesting.

Participant: *I think because our teachers taught us well and I got high marks too.*

1.9 Which assessment tasks do I like most?

Participant: *Investigation.*

1.10 What types of classroom tasks do I enjoy most in Life Sciences and why do I think I enjoy them most?

Participant: *Test because it tests what I have in my mind during a particular topic.*

1.11 Which assessment tasks do I like least?

Participant: *Class work because my mind need to rest after a teaching.*

1.12How does this influence my performance in Life Sciences?

Participant: *It influences my performance badly because I do get lower percentages.*

1.13 What kind of support do I need from the school to help me master these tasks that I do not like most in Life Sciences?

Participant: *To extend extra class and provide resources.*

1.14 What kind of support do I need from the teacher to help master these tasks that I do not like most in Life Sciences?

Participant: *Is to have Science teacher on Saturday and provide enough material for us.*

1.15 What kind of support do I need from peers to help master these tasks that I not like most in Life Sciences?

Participant: *Is to provide material like question papers for study before exam start.*

1.16 What kind of support do I need from my parents/guardians to help master these tasks that I do not like most in Life Sciences?

Participant: *My parents should help me when studying if there is something, she/he understands.*

1.17 What kind of learning materials do I need most in Life Sciences?

Participant: Computers, enough material, laboratories, science labs, study teacher for Life Sciences.

2.1.1 REFLECTIVE JOURNAL OF THE DIFFERENT TOPICS

2.1.1.2 Main teaching strategy used (e.g. Lecture method/ class discussion/ group work/ teacher demonstration/ practical work)

The learner reflected that on the topics of dihybrid cross and mutation the teaching strategies that were used are: class discussion, teacher taught punnet square using lecture method and demonstrations.

2.1.1.2 What I enjoyed most about the lesson

The areas the learner reflected on how he or she enjoyed the topics of dihybrid cross and mutation were: the crossing, determine the genotype and the effects of mutation.

2.1.1.3 What I did not like about the lesson

There were no areas that the learner reflected on whether or not he or she enjoyed the topics of dihybrid cross.

2.1.1.4 What kind of support would I like from teachers in this lesson?

The kind of support from the teachers the learner reflected on how it would help in learning dihybrid cross and mutation were: more exercises and different questions, giving them textbooks that simplify the lesson and showing him or her how mutation takes place in the laboratory.

2.1.1.5 What kind of support would I like from the school or Department of Education in this lesson?

The kind of support from the school or Department of Education the learner reflected on how it would help in learning dihybrid cross and mutation were: give us more teachers for subject, allow us to come to school on holidays for revision and supply our school with laboratories and overhead projectors.

2.1.1.6 What kind of support would I like from parents/guardians/community in this lesson?

The kind of support from the parents/guardians/community the learner reflected on how it would help in learning dihybrid cross and mutation were: the family allowing him or her more time to study, giving him or her less chores, motivating him or her,

understanding his or her weaknesses and strengths and giving him or her more time to study.

2.1.2 REFLECTING ON DIFFERENT TYPES OF ASSESSMENT BY LEARNER

2.1.2.1 Type of assessment

The kind of assessment the learner reflected on that usually conducted on dihybrid cross and genetic test and genetics were practical and class test.

2.1.2.2 What I enjoyed most about the lesson

The areas the learner reflected on about his or her enjoyment concerning the answering questions on dihybrid crossing, genetic test and genetics were the crossing, the learning of dihybrid and mono hybrid.

2.1.2.3 My performance obtained (% obtained)

The learner reflection on his or her performances on the various assessments were dihybrid crossing (70%), genetic test (80%) and genetics (60%)

2.1.2.4 Am I satisfied with my mark? Why?

The learner reflected that he or she was satisfied with the performances on dihybrid crossing (70%) and genetic test (80%) but was not satisfied with the mark on genetics (60%).

With my performance, is my teacher qualified and experienced to teach me

2.1.2.5 What kind of support would I like from the school or Department of Education that will result in an improved performance?

The kind of support the learner reflected on that he or she needs from the school or Department of Education that will result in an improved performance were: advanced textbooks that have questions and having more qualified teachers in the schools to teach Life Sciences.

2.1.2.6 What kind of support would I like from parents/guardians/community that will result in an improved performance?

The kind of support the learner reflected on that he or she needs from the parents/guardians/community that will result in an improved performance was: motivation and give the learner more time to study.

2.1.2.7 What kind of support would I like from my teacher that will result in an improved performance?

The kind of support the learner reflected on that he or she needs from the teacher that will result in an improved performance was more explanation of the questions and how to answer them.

2.2 REFLECTIVE JOURNAL OF THE LEARNERS ON DIFFERENT TOPICS

2.2.2.1 Main teaching strategy used (e.g. Lecture method/ class discussion/ group work/ teacher demonstration/ practical work)

The learner's reflection on the teaching strategies used in teaching topics like mutation, Down syndrome, human reproduction, genetic engineering, stem cell and nervous system were: teacher demonstration and class discussions.

2.2.2.2 What I enjoyed most about the lesson

The learner reflection on how he or she enjoyed the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system were: knowing what mutation is, knowing the causes of Down syndrome and to be more careful and to knowing about medulla. Also, to understand how albino occurs in human and understand that person with albino is normal.

2.2.2.3 What I did not like about the lesson

The learner reflection on how he or she did not enjoy the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system was about the eye.

2.2.2.4 What kind of support would I like from teachers in this lesson?

The learner reflection on the kind of support from teachers on the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system included: more explanation, given individual attention and practical.

2.2.2.5 What kind of support would I like from the school or Department of Education in this lesson?

The learner reflection on the kind of support from the school or Department of Education on the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system included: build laboratory for us and take us to sciences excursions.

2.2.2.6 What kind of support would I like from parents/guardians/community in this lesson?

The learner reflection on the kind of support from parents/guardians/community on the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system included: more time at home, building community library and encouraging me to study at home.

TRANSCRIPTS OF REFLECTIVE JOURNAL SCHOOL B

1.1 Do I really like to study Life Sciences?

Participant: *Yes, I like to study Life Sciences.*

1.2 Which topics in Life Sciences do I like most?

Participant: *Human nervous system and Human endocrine system.*

1.3 Which aspects of Life Sciences do I like least?

Participant: *DNA- and the code of life*

1.4 Do I like teaching style of the Life Science teacher?

Participant: *Yes, I like it because it discusses with us during Life Sciences period, but I do not like when we ask question she first go to the book and answer sometimes shout at us telling us we ask simply things.*

1.5 Do I understand what is been taught in class?

Participant: *Yes, but not all the time.*

1.6 Do I think about his/her experience and qualification in Life Sciences?

Participant: *I am not sure.*

1.7 Which topics have I performed well in, in Life Sciences?

Participant: *Not even one, but meiosis was better.*

1.8 Why do I think I performed well in this topic? It is a bit interesting.

Participant: *Because I understand it and it is easy to read.*

1.9 Which assessment tasks do I like most?

Participant: *Homework because it gives some time to study.*

1.10 What types of classroom tasks do I enjoy most in Life Sciences and why do I think I enjoy them most?

Participant: *Group work because we first teach each other and discuss after.*

1.11 Which assessment tasks do I like least?

Participant: *Controlled test, it contains various topics and it requires too much reading.*

1.12 How does this influence my performance in Life Sciences?

Participant: *Very bad. I don't focus as results I get low mark.*

1.13 What kind of support do I need from the school to help me master these tasks that I do not like most in Life Sciences?

Participant: *To ask other teachers for more explanations and assistance in difficult areas that I do not understand.*

1.14 What kind of support do I need from the teacher to help master these tasks that I do not like most in Life Sciences?

Participant: *To help me understand and try to make Life Sciences interesting.*

1.15 What kind of support do I need from peers to help master these tasks that I not like most in Life Sciences?

Participant: *We must meet and do work and learn together but avoid plagiarism and copying.*

1.16 What kind of support do I need from my parents/guardians to help master these tasks that I do not like most in Life Sciences?

Participant: *Is to give me time to study at home and reduce home chores.*

1.17 What kind of learning materials do I need most in Life Sciences?

Participant: *Computers, textbooks, and science labs.*

1.18 Which medium of instruction do I like most to be used in the teaching and learning of Life Sciences?

Participant: *The medium I like is the English language.*

2.2 REFLECTIVE JOURNAL OF THE PARTICIPANT NUMBER 2 ON DIFFERENT TOPICS

2.2.2.1 Main teaching strategy used (e.g. Lecture method/ class discussion/ group work/ teacher demonstration/ practical work)

The learner's reflection on the teaching strategies used in teaching topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system were: teacher demonstration and class discussions.

2.2.2.2 What I enjoyed most about the lesson

The learner reflection on how he or she enjoyed the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system were: knowing what mutation is, knowing the causes of Down syndrome and to be more careful and to knowing about medulla.

2.2.2.3 What I did not like about the lesson

The learner reflection on how he or she did not enjoy the topics like, genetic engineering, stem cell and nervous system was about the eye.

2.2.2.4 What kind of support would I like from teachers in this lesson?

The learner reflection on the kind of support from teachers on the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system included: more explanation, given individual attention and practical.

2.2.2.5 What kind of support would I like from the school or Department of Education in this lesson?

The learner reflection on the kind of support from the school or Department of Education on the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous system included these topics must be given more revision and more time to teach.

2.2.2.6 What kind of support would I like from parents/guardians/community in this lesson?

The learner reflection on the kind of support from parents/guardians/community on the topics like mutation, Down syndrome, genetic engineering, stem cell and nervous

system included: more time at home, building community library and encouraging me to study at home.

2.3.2 REFLECTING ON DIFFERENT TYPES OF ASSESSMENT BY PARTICIPANT NUMBER 3

2.3.2.1 Type of assessment

The kind of assessment the learner reflected on that usually conducted on genetics and human nervous system was a class test.

2.3.2.2 What I enjoyed most about the lesson

The kind of enjoyment the learner reflected on doing work on genetics and human nervous system was work on structures.

2.3.2.3 My performance obtained (% obtained)

The learner reflection on the marks on genetics was 23% and on human nervous system was 35%.

2.3.2.4 Am I satisfied with my mark? Why?

The learner reflection on the marks on genetics (23%) and on human nervous system (35%) was that he or she was not happy and was disappointed.

2.3.2.5 What kind of support would I like from the school or Department of Education that will result in an improved performance?

The kind of support the learner reflected on that he or she needs from the school or Department of Education that will result in an improved performance on genetics and human nervous system was: quality textbooks and more life sciences teachers to teach them.

2.3.2.6 What kind of support would I like from parents/guardians/community that will result in an improved performance?

The kind of support the learner reflected on that he or she needs from parents and the community will result in an improved performance on genetics and human nervous system were: time to study and motivation to pass Life Sciences.

2.3.2.7 What kind of support would I like from my teacher that will result in an improved performance?

The kind of support the learner reflected on that he or she needs from the teacher that will result in an improved performance on genetics and human nervous system was: more time in class to assist in answering questions, more strategies to answer questions and giving learner encouragement in class.

2.4.1 REFLECTIVE JOURNAL OF THE PARTICIPANT NUMBER 4ON DIFFERENT TOPICS

2.4.1.1 Main teaching strategy used (e.g. Lecture method/ class discussion/ group work/ teacher demonstration/ practical work)

The learner reflected that on the topics of DNA code of life, genetics (endocrine) and human reproduction the only teaching strategy that was used was class discussion and telling method.

2.4.1.2 What I enjoyed most about the lesson

The learner reflection on what he or she enjoyed about the topics on DNA code of life, genetics (endocrine) and human reproduction was the learning of the background and the human production system.

2.4.1.3 What did I not like about the lesson?

The learner reflection on what he or she did not enjoy about the topics on DNA code of life, genetics (endocrine) and human reproduction was the learning of the menstruation cycle since is more about girl.

2.4.1.4 What kind of support would I like from teachers in this lesson?

The kind of support from the teachers the learner reflected on that would help in learning the DNA code of life, genetics (endocrine) and human reproduction was: teacher demonstration of the structure of DNA practically, covering all the teaching strategies and giving more explanations when teaching.

2.4.1.5 What kind of support would I like from the school or Department of Education in this lesson?

The kind of support from the school and the department the learner reflected on that would help in learning the DNA code of life, genetics (endocrine) and human reproduction was: the school and the department must give the school and learners a laboratory and resources for DNA coding practical and more textbooks.

2.4.1.6 What kind of support would I like from parents/guardians/community in this lesson?

The kind of support from the parents and the community the learner reflected on that would help in learning the DNA code of life, genetics (endocrine) and human reproduction was: they must give enough time to study, to reduce the home chores and to show the learner background so that he or she can see the genes of the family members.

APPENDIX 10: Professional editing certificate

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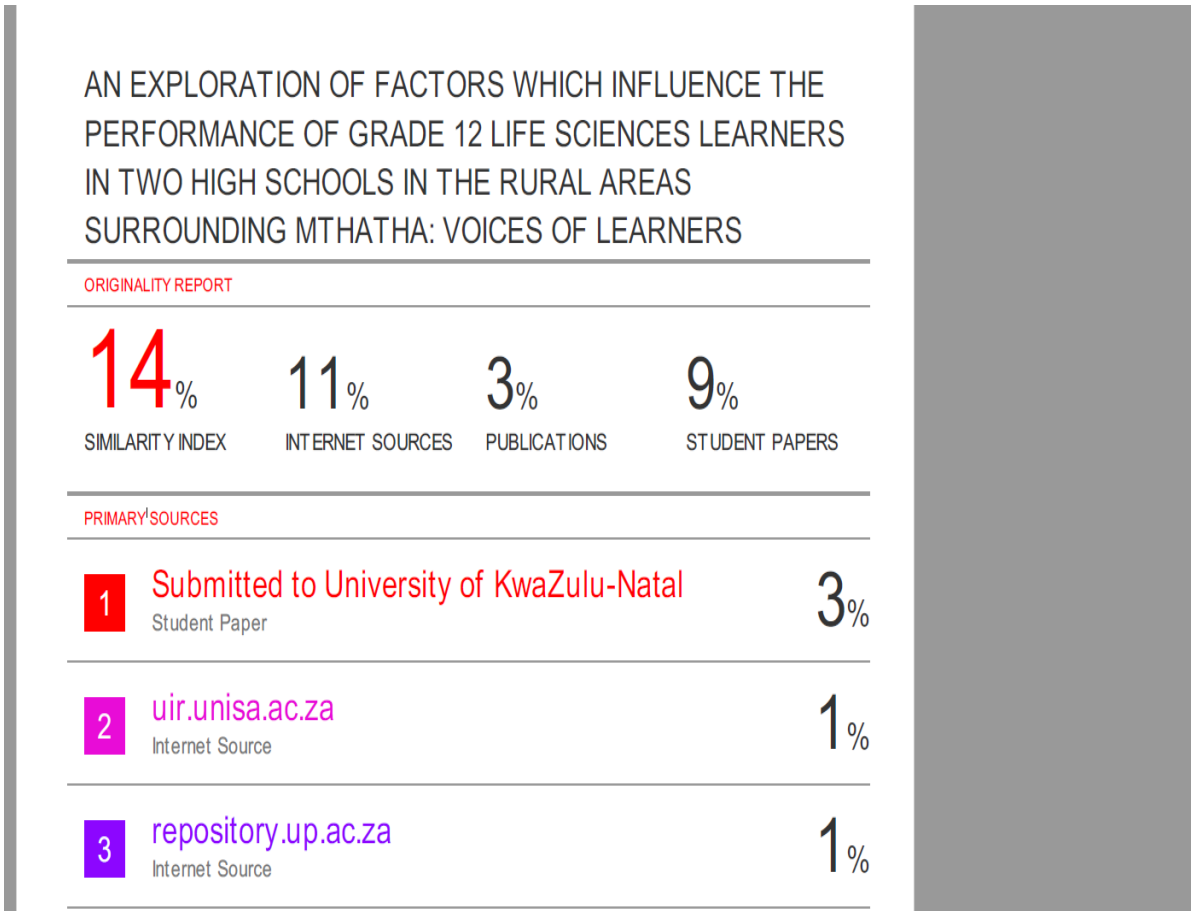
EDITING CERTIFICATE

Re: **Thamsanqa Sihele**
Master's dissertation: **AN EXPLORATION OF FACTORS WHICH INFLUENCE THE PERFORMANCE OF GRADE 12 LIFE SCIENCES LEARNERS IN TWO HIGH SCHOOLS IN THE RURAL AREAS SURROUNDING MTHATHA: VOICES OF LEARNERS**

I confirm that I have edited this dissertation and the references for clarity, language and layout. I returned the document to the author with track changes so correct implementation of the changes and clarifications requested in the text and references is the responsibility of the author. I am a freelance editor specialising in proofreading and editing academic documents. My original tertiary degree which I obtained at the University of Cape Town was a B.A. with English as a major and I went on to complete an H.D.E. (P.G.) Sec. with English as my teaching subject. I obtained a distinction for my M.Tech. dissertation in the Department of Homeopathy at Technikon Natal in 1999 (now the Durban University of Technology). During my 13 years as a part-time lecturer in the Department of Homoeopathy at the Durban University of Technology I supervised numerous Master's degree dissertations.

Dr Richard Steele
27 April 2019
per email

APPENDIX 11: Pages which show summary of similarity from different sources



AN EXPLORATION OF FACTORS WHICH INFLUENCE THE PERFORMANCE OF GRADE 12 LIFE SCIENCES LEARNERS IN TWO HIGH SCHOOLS IN THE RURAL AREAS SURROUNDING MTHATHA: VOICES OF LEARNERS

ORIGINALITY REPORT

14%	11%	3%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University of KwaZulu-Natal Student Paper	3%
2	uir.unisa.ac.za Internet Source	1%
3	repository.up.ac.za Internet Source	1%