Cape Peninsula
University of Technology

TITLE OF THESIS

A phenomenological investigation into the lived experiences of Grade12 Physical Sciences Learners from selected schools in the Western Cape Province

by

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Thesis) submitted in fulfilment of the requirements for the degree

Master of Education :) Discipline: Physical Sciences Education

in the Faculty of Education

at the Cape Peninsula University of Technology

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Mowbray
Date submitted (16 August 2017)

DECLARATION

I, Mkhumbuzi Joe Mabodoko, declare that the contents of this dissertation/thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Signed **Date**

ABSTRACT

This study aims to narrate the lived experiences of Grade 12 Physical Sciences learners. According to UMALUSI reports on National Senior Certificate (NSC) of 2011 and 2013, there seems to be a steady decrease in the number of learners writing Physical Sciences from 2008 to 2013. One of the aims of this study is to investigate why there is a steady decline in the number of learners choosing the subject and what their classroom experiences are. A related aim is to describe how these learners' perceptions of their Physical Sciences educators affect their mental experiences in the subject. The study used phenomenology both as a research methodology as well as the underpinning theoretical framework. Twelve Grade 12 learners from 3 different schools in the Metro North Education District in Cape Town were chosen to participate in this research. The data were collected using two rounds of in-depth semi-structured interviews. The interviews were transcribed and explicated using Giorgi's phenomenological method. The findings show that although Physical Sciences educators are trying to support their learners, they are failing to meet the expectations of the learners. These findings provide new insights into understanding the world of the learner better and that the recommendations could have transformative implications for curriculum planners, curriculum advisors and pedagogical strategies in how the subject is presented to learners.

ACKNOWLEDGEMENTS

I wish to thank:

- I want to humbly acknowledge my Heavenly Father, His Son and my Saviour, Jesus Christ and the Holy Spirit for their grace, love, wisdom and strength grace to make this work possible
- To my supervisor, Dr O. Koopman, who believed in me and helped to shape my study. Thank you for teaching me the importance of being patient - as writing is a process that cannot be rushed. Dr O. Koopman you led by example and I will always remember your critical scrutiny of the thesis.
- The financial support from National Student Financial Aid Scheme (NSFAS) are much appreciated.
- To Sindi Lonah Mabodoko, my wife and best friend, who never once wavered in her support of my decision to return to school and who never complained about the amount of time I spent working once I was here. She managed to take great care of our children when I was busy with my studies.
- To my son Vuyo, and my daughter Nosipho, who were my inspiration in the completion of the manuscript.
- The principals of the schools, physical science educators and learners who took part in the study. Without them, the research was not going to be possible
- The Western Cape Department of Education for allowing me to conduct my research in their schools.

DEDICATION

Lonah, Vuyo and Nosipho Mabodoko

And

Annie and Nicholas Mabodoko (my late parents)

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GLOSSARY

Terms/Acronyms/Abbreviations	Definition/Explanation
NMSTE	**National Mathematics, Science and Technology Education**
DBE	**Department of Basic Education**
Dinaledi Schools	**Maths and Science Focus Schools**
FET	**Further Education and Training Band**
NCS	**National Curriculum Statement**
CAPS	**Curriculum and Assessment Policy Statements**
NMU	**Natural Meaning Units**
NBT	**National Benchmark Tests**
PCK	**Pedagogical Content Knowledge**
WCED	**Western Cape Education Department**

CHAPTER ONE
OVERVIEW OF THE STUDY

1.1 Introduction and background to the study

In a quest to improve the performance, participation and outputs in physical sciences and mathematics, the South African government launched the National Mathematics, Science and Technology Education (hereafter NMSTE) Strategy in 2001 (Department of Basic Education 2001). The main focus of the NMSTE was to improve the quality of teaching and learning in mathematics and science. The Department of Basic Education (hereafter DBE) was hoping that the strategy will help to increase the participation and improve the quality of learning and subsequently the performance of learners in mathematics and science in Grade 12 by improving the quality of teaching and learning (Department of Basic Education 2001). A direct consequence of the strategy was the establishment of Dinaledi Schools. The Dinaledi Schools Project was intended to give specific and targeted support to, firstly black learners from historically disadvantaged schools and, secondly girls of all races in mathematics and, thirdly Physical Sciences in selected schools(Department of Basic Education 2001). Given the drastic decrease in the number of learners enrolling in mathematics and Physical Sciences over 5 years (see Umalusi reports, 2011, 2012, 2014 and 2015), NMSTE strategy is falling short of its main objectives, which are the following:

i) to increase the number of learners enrolling for Physical Sciences in the Further Education and Training band (hereafter FET) band
ii) ensuring the quality delivery of the content to learners.

The researcher is of the opinion that the NMSTE is failing to ensure quality delivery because research has found that many educators have poor content knowledge (Koopman 2016; Selvaratnam 2011) and the fact that some educators are still using traditional pedagogies and learners view Physical Sciences as a difficult subject (Koopman 2016). If the learners view the subject as difficult, then fewer of them are going to enrol for it.

1.1.1 Declining enrolments for Physical Sciences

The table below (labelled Table1.1) illustrates the rapid decrease in the number of learners enrolling for Grade 12 Physical Sciences in the FET band from 2008 to 2014. There was a drastic increase in the numbers of learners writing Physical Sciences final examination in Grade 12 between 2001 and 2008. This upward trend suddenly changed as there is sudden shift downwards in the numbers between 2009 and 2015.At first

glance, it will appear as if there was an increase in the enrolment for 2015, but that is not the case, because the percentage of Grade 12 learners that are writing Physical Sciences decreases. In 2015, generally, recorded the highest enrolment for Grade 12 learners in the history of education in South Africa (Department of Basic Education 2015).

Table 1.1: Number of learners enrolling for Physical Sciences in Grade 12 and those writing the examination

Year	Total Grade 12 examination takers	Grade 12 Physical Sciences examination takers	Percentage of examination takers writing Physical Sciences
2001		180 000	
2008	533 561	217300	40,7
2009	552 073	220882	40,0
2010	537 543	205364	38,2
2011	496 090	180585	36,4
2012	511 152	179194	35,1
2013	562 112	184383	32,8
2014	532 860	167 997	31,5
2015	644 536	193 188	30,0
2016	610 178	204 695	33,5

There was a significant increase in the number of Physical Sciences learners, but there was a decrease in the percentage of learners doing Physical Sciences. The increase in the number of learners in Grade 12 can be explained by the introduction of the policy on progressed learners (Department of Basic Education 2015). The policy on progressed learners allowed borderline Grade 11 learners to be promoted to Grade 12. The effect of the policy on progressed learners provides the evidence that over the years there were many learners who were remaining in the lower grades, some of them eventually dropped out of the subject. The leaking pipeline analogy shown below in Fig 1.1 can be used to explain what was contributing to the declining numbers of learners. Due to the fact that the Department of Basic Education has started implementing the policy on progressed learners, the numbers writing Physical Sciences have started increasing gradually.

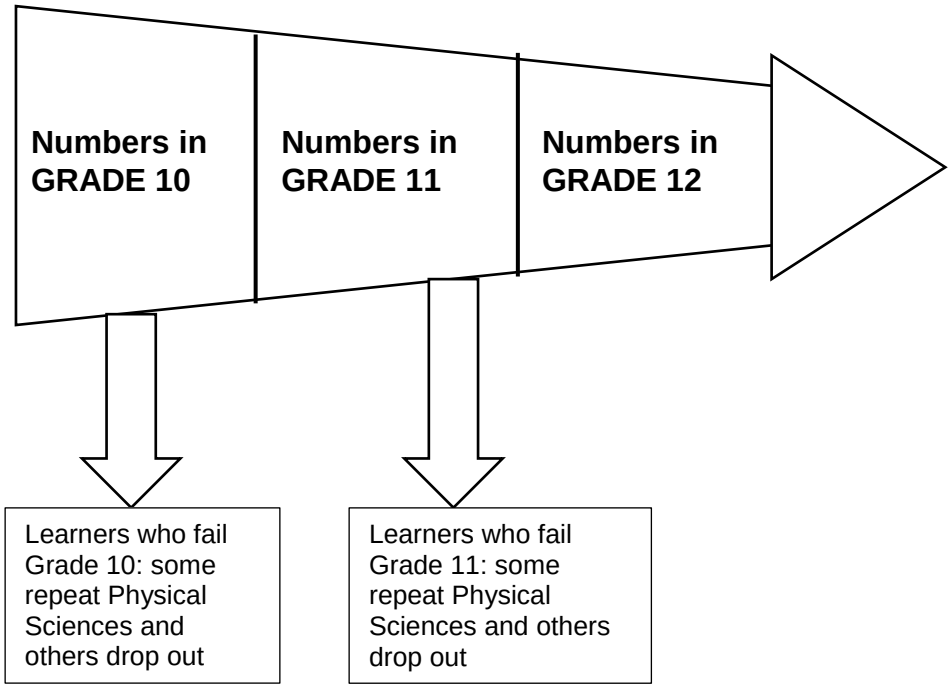
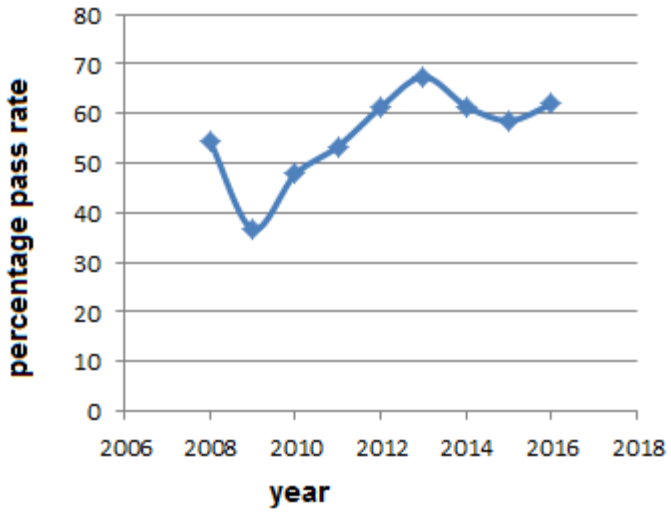


Figure 1.1: Leaking pipeline model showing why enrolment numbers in Grade 12

The researcher will now take a look at why there was a sudden decrease in enrolments from 2008. The sudden decrease as illustrated by the Table 1.1, since the inception of new National Curriculum Statement (NCS hereafter) for Physical Sciences in 2006. The NCS was introduced in 2006 in Grade 10 and the first Grade 12 examination was written in 2008. The big drop in enrolment figures for Physical Sciences after 2009 can be attributed to huge drop in the pass rate for Physical Sciences (see Graph 1.2). The pass rate for Physical Sciences in the NSC era reached its record lowest in 2009. After this record low pass rate, the enrolment figures started declining rapidly.

Figure 1.2: Graph showing pass rate for Physical Sciences in the NSC era



Another reason for this steady decline in the numbers can be attributed to the quality of teaching that the learners are exposed to. According to Koopman (2013), many Physical Sciences educators in the FET band were struggling with the implementation of NCS, and the educators felt that they needed more training to the effective in the implementation of the NCS. Similar findings can also be found in Kriek and Basson's (2009) study that found that many educators were not qualified to teach Physical Sciences as they were not competent in teaching the physics section of the subject. Researchers such as Ogunniyi (1988), Aikenhead and Jegede (1999), Jegede (1993) and many others found that the reason for this decline in numbers is that the content is far removed from the daily realities of learners, resulting in many learners not wanting to do science. This decrease in numbers is not only unique to South Africa as others abroad such as Hurt (2002) and Price and Mcneil (2013) share similar sentiments and argues that the subject is taught too dogmatic, lacking in dynamism.

1.1.2 Why Physical Sciences is a high priority subject

Physical science is a high priority subject in South Africa because it has the potential to be of great value to the economic development of the country. For example, the future supply of qualified science learners for careers in engineering, medicine, and so forth might be at risk and therefore it is important to investigate at grassroots level why learners are not attracted to Physical Sciences as a school subject. In trying to answer this question, this study will investigate the lived experiences of grade12 Physical Sciences learners from selected schools in poor urban settlements in the Western Cape. The researcher has chosen schools located in the poor urban locations because many studies have found that the failure rate in Physical Sciences has remained high in these schools (Cameron 2009; Stears & Gopal 2010; Bloch 2008). The study will draw from the theoretical work of Husserl, Heidegger and various other phenomenologists as this study falls within the scope of a phenomenological framework.

1.2 Problem Statement and orientation of study

According to Giles (2011) all educational experiences are contextual as well as relational. These relational interactions between learners and educators need to be understood from a personal subjective standpoint from both parties' point of view. For example, Gee (2011) argues that a learner is an active meaning maker of the content delivered to him or her by the educator who acts as a guide to the learner in the teaching and learning process. So instead of being a passive recipient of the knowledge/information the learner is an active participant working together with the educator towards new learning possibilities (ibid), and from this perspective the curriculum can be described as a lived experience between the

educator and learner. Therefore in order to shed light on the question: why the enrolment numbers in Physical Sciences are declining, we need to investigate the lived experiences learners. Nixon, Martin, McKeown and Ranson(1996) found that, although the testimony by learners is not considered as 'more true' than that of educators, it helps to provide an important element that is often overlooked. These sentiments were echoed by Huang and Waxman (1997) who said that understanding how learners view and respond to their learning environments may provide more useful insights than the analysis of quality by outsiders. According to Huang and Waxman (1997), researchers must analyse learners'views and perspectives of teaching and learning environments since the learners' experiences in learning may be quite different from what is observed or the educator's intended pedagogy. This call by Huang and Waxman (1997) is supported by Howard's (2001) view that learners' perspectives on their learning environments reveal great challenges and pain that learners feel when schools are unresponsive to their needs. Howard says that learners' perceptions contain important lessons and that educators need to listen to them carefully.

1.2.1 Value of learners' lived experiences

While many approaches may be used to improve the enrolment rates, and the quality of learning in Physical Sciences, it is important to value what the learners themselves experience in Physical Science classrooms in order to make science more meaningful, appropriate and interesting to the learners (Fonseca & Conboy 2006). Furthermore, a better understanding of the learners' perceptions of their science educators helps to inform the stakeholders in science education about what should be done to improve the low enrolment rate in Physical Sciences and to improve the learners' understanding of the Physical Sciences content.

As a point of departure, to investigate the lived experiences of learners this study focuses on the South African classrooms in poor urban settlements known as Township schools. In South Africa, the high density urban settlements where most low income earners live are commonly called townships. In most townships there are large numbers of informal settlements. In many South African Township schools; where the Physical Sciences classroom lacks resources and in this type of situation, the educators become virtually the only source of information and explaining concepts. This situation allows the educator to have a major influence on the learners' understanding and experience of Physical Sciences. According to Ebenezer & Zoller (1993), it the is the teaching methods that have the greatest influence on how much the learners understand and enjoy science. It is the teaching method and educator encouragement that have the greatest influence on learners' attitudes towards sciences (Atwater, Wiggins and Gardner, 1995). The physical aspects of the classroom have

no effect on the learners' attitude towards sciences (Atwater et al. 1995). This can be interpreted to mean that the location of schools and resources in the school have little effect on the learners attitudes towards science. As I have highlighted earlier in the chapter that a number of other researchers have emphasised the importance of the Physical Science educator's role in helping to stimulate interest in science. The question that arises is: How do educators in poor urban settlements manage to stimulate interest in science? when according to Koopman (2013) many of these science educators are struggling with both the content knowledge and pedagogical knowledge of Physical Sciences. Besides the lack of content and pedagogical knowledge, according to Basson and Kriek (2009) many educators cited content overload as a constraint and that the content overload takes up too much time leaving inadequate time available to implement all requirements of the curriculum.

Both the National Curriculum Statement (NCS) and the Curriculum and Assessment Policy Statements (CAPS) for Physical Sciences place emphasis on the development of reasoning abilities and critical thinking of learners. The successful implementation of both the NCS and CAPS curriculum, therefore, requires educators who are competent in teaching learners critical thinking skills effectively (Selvaratnam 2011). Selvaratnam conducted a study on whether the matric Physical Sciences educators are competent in basic problem-solving strategies. In the study Selvaratnam (2011) used a total of 73 Grade 12 Physical Sciences educators selected from 50 Dinaledi schools in the North West and KwaZulu-Natal provinces in South Africa were tested in five intellectual strategies, namely, 1) if they can clearly represent problems, 2) if they can identify goals and focus on them, 3) if they can identify and use relevant principles, 4) if they can use equations for deductions and 5) if they follow a step-by-step solution (Selvaratnam 2011). It was found that the educators' performance in all the tested intellectual strategies tested was poor (Selvaratnam 2011). About 60% of educators tested failed to answer the questions correctly (Selvaratnam 2011). The Physical Sciences curriculum placed emphasis on the objective of development of critical thinking, scientific reasoning and strategies of learners. Since this study by Selvaratnam shows lack of competence of educators in these intellectual strategies, it means that the objective of attaining critical thinking, scientific reasoning and strategies of learners is handicapped by the lack of competence by educators. This begs the question: Are the learners in these classes being handicapped by the poor content knowledge and pedagogical inadequacies of these educators? For this reason, the main focus of the study is:

1) To investigate how selected learners in the Physical Sciences classrooms experience the subject
2) How does the learner's relationship with their Physical Sciences educators affect the learner's lived experiences?

It is hoped that this study will draw new insights on how learners experience Physical Sciences in poor urban settlements of modern South Africa.

1.3 Research questions

The main research question is:

What are the lived experiences of selected Grade 12 Physical Science learners in the Western Cape regarding the subject?

To do so, the study aims to critically investigate:

1) What role do the learners' backgrounds, future career choices and self-conceptions have in their science learning experiences?

2) What are the learners' views of their Physical Sciences educators and the classroom climate?

3) To what extent are the learners expectations met in the Physical Sciences classroom?

1.4 Purpose of the study

The purpose of this phenomenological study is to report on the lived experiences of Grade 12 Physical Sciences learners in schools in a poor urban settlement in contemporary South Africa. It will fulfil this purpose by gathering stories from learners and from these stories obtain understandings about the experiences of the learners from which deeper meaning will be derived which is often taken for granted. It is hoped that the study will provide deeper insight into the consciousness of Grade 12 Physical Sciences learners. The study is important, in that the findings could potentially identify the shortcomings of educators and various other challenges. All of the participants are Grade 12 Physical Sciences learners; therefore, it is expected of them to have a lot of stories to tell about their experiences of learning Physical Sciences.

1.5 Motivation for the study

This study is motivated by my personal experiences as a Physical Sciences educator. The declining numbers of learners that are writing the final Grade 12 Physical Sciences are a cause for concern. To investigate the underlying reasons of these declining numbers, I decided to focus on the lived experiences of Grade 12 Physical Sciences learners. The question that often echoed in my mind was, "how do learners feel about Physical science as a school subject? How do they experience the learning of the content? In other words I was

interested in their consciousness and how they project the content delivered to them by their educators. For example, what are their views about their educators? Drawing from my own experiences as a Physical Sciences educator, I daily see how learners struggle with the content and the fear of failing that overwhelm them. According to van Manen (1984), my judgements ironically are clouded by my subjective involvement as the one teaching them Physical Sciences. Although I attempt to help the learners in my classes, and teaching them how to solve problems logically they continue to struggle. Strategies such as extra classes fail to be the answer to their challenges. So I often ask myself: Am I doing enough to help my learners? What is their perception of my teaching and content knowledge? The main motivation behind the study is, therefore, to give the learners a voice about how they want to be taught. It is important that the voices of the learners doing Physical Sciences are heard as they represent valid experiences of school science. Kampmann (2000) recognizes that children are players in their own life and not just objects to be socialised.

1.6 Significance of the study

The following are potential benefits of the study:

- Through the voices of the learners, we will get deeper understanding of perceptions held by learners;
- The study will give disadvantaged learners a voice to tell their stories; while on the other hand, it will give educators the opportunity to understand Physical Sciences classrooms from learners' perspectives. This will also afford educators the chance to understand the views that the learners bring into classrooms, so that they can understand the needs of the learners;
- The study might make educators aware that, they not only affect the learner's engagement with the content, but also have a responsibility to support the learners.
- This research will shed light and insight into what goes on in the mind of learners as they are taught Physical Sciences

1.7 Literature review

In this section the study introduces on the current and previous literature on the work of various scholars who investigated the lived experiences of learners, and the extent to which educators contribute to the holistic development of learners' understanding of Physical Science. A glance at various local journals reveals that not many studies focus on the lived experiences of Physical Sciences learners in South Africa, but rather focus more on the educators, for example: Koopman (2013) and Selvaratnam (2011), higher education learners, Makoe (2008), pedagogical issues, Fakudze (2004) and learning environment,

curriculum issues, policies and so forth. Internationally, there has been a huge increase in the study of the lived experiences of both learners and educators. For full detail on these studies see Price and McNeill (2013); D. Giles (2011); Giles (2011); Giles (2009); Giles (2008); Conceicao (2006); Pun-hon et al. (2011); J. Jhagroo (2011); Chan et al. (2013); Landau (2009); Kim (2012); De Gagne and Walters (2010); Amparo (2013) .

This study focuses on studying the relationship between South African Physical Sciences learners' perceptions of their science educators and these perceptions affect their lived experiences. Educators and learners interact with each other in many different ways in the classroom. Secondary school educators interact with many different learners every day. However, according She and Fisher (2002), many educators tend to take these interactions with their learners for granted and are unable to describe or remember these interactions (She & Fisher 2002). Learner perceptions of the classroom environment have shown consistent relationships between what happens in classrooms and the cognitive development of learners. Research has shown that learners perform better if there is congruence between what happens in class and what the learners prefer (Kaya; Ozay & Sezek 2008). An examination of the relationships between educators' and learners' interactions may yield results that may be used to make more meaningful learning environments within Physical Sciences (Velez 2012). Interpersonal behaviour of educators plays a vital role in directing the processes of teaching and learning in the classroom (Lee, Fraser & Fischer, 2003; Fraser, Alridge & Soerjaningsih, 2010). The educator is responsible for setting the tone in the classroom and for setting up the rapport with the learners. Studies investigating associations between learners' affective outcomes and educator interpersonal behaviour show more consistent positive outcomes than cognitive outcomes (Lee et al. 2003; She & Fisher 2002). Therefore a Physical Sciences educator has a role to make learners aware of possibilities in science fields.

Science educators should be able to use appropriate words, gestures, looks, voice projection, eye contact, and humour in their classes. The way in which the educator communicates, whether verbal or non-verbally, should bring about positive classroom interaction. It could be helpful to educators if their communication behaviour and interactions in teaching were identified. According to Lange (2009), children's foregrounds, is very important and learners use it to scribe meaning to learning. Most of the times, science teaching does not involve learners' perceptions of their foregrounds in meaning production. This may result in learners developing misconceptions and can lead to development of learning difficulties.

In George (1997), assessment of Grade 10 learners' perceptions of their educators' classroom practice and their own attitudes and found that learners said the way science was

taught and its relationship to enjoyment and comprehension of science as being very important. Educators of high school science have a bigger task than the primary school educators in motivating their learners and maintaining the learners positive attitudes towards science as George (1997) found that the attitudes towards science generally decline as the learners' progress through school. There has been some divergent findings as some studies have found that positive attitudes towards science are caused by achievement of good grades, e.g. the study by Reynolds and Walberg using a structural model found that science attitudes are influenced by achievement in science and not the reverse (Burusic, Babarovic & Seric, 2011) .

1.8 Theoretical framework

This study falls within the ambit of phenomenological research. Phenomenology is the study of lived experiences (van Manen 1984).The main research question has a strong focus on Grade 12 Physical Sciences learners' experiences of the subject. Phenomenology is used as both as a philosophy and a research method. For this reason, this study is underpinned by the phenomenological tradition espoused by the work of Edmund Husserl (1970; 1975), who is regarded as the fountainhead of phenomenology. Husserlian phenomenology is interested in reporting the lived experience as is and considers experience as first hand data. It aims to describe experience without any intension of analysing or interpreting the experience as a result it is often referred to as descriptive phenomenology. The life world is considered the world of natural attitude of everyday life, this natural attitude was described by Husserl as the original, pre-theoretical and pre-reflective attitude (van Manen 1984).

Phenomenological research that adopts a Husserlian stance, focus on the phenomenon as experienced not as being conceptualised, categorised or theorised. It aims to get a more deeper knowledge of the nature or meaning of everyday experience by getting rich descriptions of the way we experience the world (van Manen 1984). The phenomenology in education clarifies the meaning of lived experience and provides opportunities for researchers to question the meaning of lived experiences. Husserl articulated a view that promoted the use of the scientific approach in order to bring out the important components of the lived experiences a group of people in question (Lopez & Willis 2004). This narration of lived experiences of Physical Sciences learners provides an explication of the lived or subjective experiences of the participant learners. This means that it brings out of essences, and clarifies the very nature of the phenomenon, by asking what makes an "object or a subject" what it is (van Manen 1984).

In Husserlian phenomenology, it is important for the researcher to eliminate all personal biasor prior knowledge in order to grasp the vital lived experiences of those being studied.

Essentially, researchers must make bracket all prior expert knowledge as well as personal biases (Lopez & Willis 2004). The researcher must aim to achieve Husserlian concept of transcendental subjectivity and, in this concept, the researcher's biases and pre-conceptions are always being assessed as well as neutralised in order for them not to influence the objective of the study. Bracketing is one the techniques that can be used to neutralize the biases and pre conceptions of the researcher. In bracketing the researcher holds back ideas, preconceptions, and personal knowledge when listening to and reflecting on the lived experiences of participants (Lopez & Willis 2004). Phenomenological research is characterised by the practice of thoughtfulness.

1.9 Methodology

The research design describes the plan that guides and directs all activities and processes. This study aims to investigate the lived experiences of Grade 12 Physical Sciences learners with specific reference to their views about their educators, and their educators' delivery of the content in the classroom. A related aim is to investigate whether or not their expectations are met when they enrol for the subject. Consequently the study will employ a phenomenological approach. According to van Manen (1984) a phenomenological methodological paradigm has interplay of four procedural activities, namely: 1) Investigating a phenomenon that is of interests to us and commits us to the world. 2) An experience is investigated as we live it and not as we conceptualise it. 3) Reflecting on essential themes which characterize the phenomenon 4) The investigated phenomenon is described through the art of writing and rewriting (van Manen 1984). Next the study provides a succinct overview of the data construction process

1.9.1 Data construction process

Methodology refers to the theory or philosophy that underpins the method. Method is the process which involves the employment of different forms of data construction instruments (Koopman 2013). This study is situated within the descriptive phenomenological method, this because the phenomenological method allows the researcher to distance himself from the research participants views in order not to contaminate the data through analysis (Broomé 2011).

The most accepted method of data construction within a pure phenomenological paradigm is: 1) rich descriptive essays, 2) interviews and 3) field notes (for full detail See Groenewald, 2004). Due to the fact that the learners might struggle to express themselves accurately with the use of rich descriptive essays and another possible constraint such as language barriers, the study will only employ interviews and field notes. The study will use in-depth semi

structured face-to-face interviews. There will be 2 rounds of interviews on different days in order to extract rich, data until saturation point is reached.

1.9.2 Sampling

When using the phenomenological research paradigm, the most suitable form of sampling is purposive sampling to identify the primary participants (Chan, Walker-gleaves & Remedios, 2013; Groenewald 2004). This sample was selected based on the purpose of the research (Gutman & Midgley 2000). A purposeful sampling technique was used to identify twelve Grade 12 Physical Sciences learners in three high schools that are located in poor urban settlements in Metro North Education District of Cape Town. These areas must be poor areas characterised by informal settlements. The sample will consist of 12 Physical Sciences learners in three schools, each school providing four learners. There is a deliberate mix of learners from different classrooms so that there will be diversity of learning experiences. All the learners were between 17 and 18 years old.

1.9.3 Permissions for interviews

Approval for ethical clearance to conduct the study was granted by both the Cape Peninsula University of Technology and the Western Cape Education Department. Due to the fact that all the participants is under eighteen years of age, the principal of the respective schools was informed about the study and each learner was given an indemnity form which was completed by parents to conduct the interviews. Field notes will be written down after the interview so that they will be used for the researcher's insights and critical examination of emerging issues (Chan et al. 2013).

1.9.4 Data Explication Framework

The explication of data will be guided by Giorgi's methodological procedures. It is a step-wise system of research that is underpinned by the philosophical foundation of Husserlian Phenomenology (Broomé 2011). Giorgi (2009) modified Husserl's method so that it provides the systematic rigor of "science" without becoming reductionistic in its treating of the participants(Broomé 2011). This method is employed when the aim is to discover phenomena and not for verification. The "naïve description" of the learners' lived experiences in Physical Sciences classes from and in the words of the participants is the raw data of this study. This means that the naïve description is the first-person description of the experience as the participant lives it and understands it in his or her everyday common sense mode of understanding (Broomé 2011).

The interview transcripts were read and re-read in order to identify the emerging themes. At first detailed reading at sentence level was done, after that I used selective approach to read the transcripts and finally read them holistically. Throughout all this, the researcher's biases are acknowledged and considered as valuable (Chan et al. 2013). All this was done using Giorgi's(2006) proposal that a disciplinary attitude should be adopted within the context of the phenomenological attitude. Therefore, in this study a teaching attitude was used. This disciplinary attitude helped in making explication feasible as well as manageable.

1.9.5 Ethical considerations

I obtained approval for ethical clearance from the provincial department of education i.e. the Western Cape Education Department (hereafter WCED), principals of schools, educators and learners involved. Data collection was planned with the cooperation of the educator, learners, and the principal in so that the process would not disrupt the lessons and schools' programs. After completing the study, the names of the participating people and schools will be replaced with pseudonyms used to protect confidentiality of all participants (Chan et al. 2013).

1.10 Scope of the study

The scope of this study is specific to the learners being studied. This study might not offer generalisations, but it might be beneficial because of its interpretive nature, which is likely to produce new concepts and elaborate on existing ones (J. R. Jhagroo 2011).

1.11 Chapter 1 Summary

The aim of this study was to add to the literature of the lived experiences of Physical Sciences learners. This study described the lived experiences of Grade 12 Physical Sciences learners in poor urban settlements. The organisation of the remaining chapters is as follows:

1.12 Structure of the thesis

This thesis is presented in six chapters.

Chapter 1, "Introduction", sets the scene, gives an overview of the research. It also gives the personal context, and the pre-understandings I brought to the research. This chapter outlines the purpose of the research and my decision to use a phenomenological research approach.

Chapter 2, “Literature and Theoretical Framework”, describes the underpinning philosophical ideas of the research. The main focus is on the philosophical writings of Martin Heidegger, Edmund Husserl, Amadeo Giorgi and Hans-Georg Gadamer.

Chapter 3, “Methodology and research design”, looks at how philosophical ideas of phenomenology that underpin the research process. The aim of the chapter is to open the research process for scrutiny by others. In this chapter, the researcher’s own lived experience of researching is considered. The methods of sampling, data collection and data explication are explained.

Chapters 4 –“Discuss on the data” here I present the explication of the essence of the phenomenon of the lived experiences of Physical Sciences learners and I explore the nature of learners lived experiences of the Grade 12 Physical Sciences learners.

Chapter 5, “Discussion of findings”, in this chapter, the findings are discussed in relation to the literature. The findings are also used to answer the research questions.

Chapter 6, “Discussion of research process and recommendations” I evaluate the research process and the findings and the implications for teaching Physical Sciences that emerge from this research, and recommend further research.

CHAPTER 2
LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1.1 Introduction

This chapter is divided into two parts. In the first part, I will explain the origins of my research question. In order to do this, I will first discuss what other researchers have found about challenges that science learners encounter when they are learning science. This will be followed by a look at how South African Physical Sciences curriculum has changed over the years. The second part will focus on phenomenology, which is the underlying framework and methodology of this study.

2.1.2 What are the causes of the declining enrolments in Science?

A number of studies have examined educators' views and ideas of effective teaching and educators' experiences of implementing a curriculum (Koopman 2013; Basson & Kriek 2009; Selvaratnam 2011; Ramnarain & Fortus 2013; Ramaila & Ramnarain 2013; Mchunu P.S. 2009). In order to find out the real reason why there are declining numbers enrolling for Physical Sciences, it is important to seek and examine the views from a source that is seldom heard in curriculum reform; the learners themselves. As I have shown in Chapter 1, many researchers are calling for a greater inclusion of the learners' voices in educational research. The main reasons for this call, is that research has shown that learner views provide deeper insights into the teaching and learning process, otherwise unrevealed, and gives the learners a chance to own their own lives (Howard 2001).

In a longitudinal study conducted by George (2000) that tracked 3116 American science learners from seventh grade to eleventh grade, it was found that the overall reason for declining enrolment numbers in science was a decline in learner attitudes towards science. If we can improve learners' attitudes towards science, we can improve enrolment into science subjects. The learners attitudes are improved by having positive relationships between educators and learners and by educators' responsiveness to learners personal lives (Howard 2001). The implications of these findings are that, the high school science educators have a bigger task than the primary school teachers in motivating their learners and maintaining the learners' positive attitudes towards science. Attitude can be defined as the feelings that a person has about an object, based on his or her knowledge and belief about that object (Barmby, Kind & Jones 2009). According to Barmby et al (2009), this definition of attitudes is made based on the model that attitudes include the three components of cognition, affect and behaviour. The knowledge and beliefs about an object possessed by a person give rise to feelings about them, and this knowledge and beliefs may dictate how a person will react to certain situations. In this research "objects" is restricted to various aspects of experiencing

science. Barmby et al (2009) stress the importance of noting that attitudes differ from moods and emotions, even if moods interact with attitudes. Attitudes are learned and thus the influence of teachers and parents play an important role in the development of these students' attitudes toward science.

Research has shown that the learners' attitudes towards science come from three main sources, namely; the educators, the learners themselves, and their peers (George 2000; Anthony 2000; Fonseca & Conboy 2006). Positive reinforcement by the educator found to have positive effects on learners' attitudes towards science. There is some evidence that teacher's teaching style influences learner attitudes towards learning (Ebenezer & Zoller 1993) and that the teaching style is influenced by the philosophy of the science teacher (Matthews 1994). The teacher's philosophy of science cannot be separated from the way they will teach science as this will result in a distorted teaching of science.(Matthews 1994:83).

Anthony's (2000) study, although in mathematics, revealed that the factors influencing success in mathematics is rooted in how well educators motivate their learners. He also found that learners were more likely to blame their failure on curriculum design and the quality of teaching. Easton (2002), found that learners talked about educators who cared about active learning. This means that to a learner, an educator is the greatest influence on learning. Research has shown that motivation and achievement by learners is motivated by the learner perceptions of educator behaviours that encourage the development of learner self-worth, parent involvement, competence and autonomy (Fonseca & Conboy 2006). The science educator has the most influence in improving achievement in school (Fonseca & Conboy 2006). Many Physical Sciences educators are trapped in traditional teaching methodologies with the aim of completing the syllabus and making learners pass examinations (Koopman 2013). According to the Curriculum and Assessment Policy statement (CAPs hereafter), the specific aim of physical sciences is to promote knowledge and skills in scientific inquiry and problem solving; the construction and application of scientific and technological knowledge; an understanding of the nature of science and its relationships to technology, society and the environment (Department of Basic Education 2012). From this statement, it can be deduced that CAPs is strongly influenced by constructivist philosophy of science education, because constructivism stresses on learner engagement in learning and the importance of understanding the learners' current conceptual schemes (Matthews 2011). The underlying question, is that, are the teachers ready or competent enough to follow the constructivist method? One of the implications of the constructivist model is that it requires a shift in the teachers' perspectives from a teacher to a facilitator of learning (Bodner 1986). Constructivist model also emphasises the two directional flow of communication, between teachers and students. The problem with many

science teachers is that they tend to focus mainly on their information output and not the student (Bodner 1986).

The educators are trapped in traditional methodologies despite the fact research has shown that majority of science learners, more so, those from certain cultural and socio-economic groups fail to engage with traditional school science (Calabrese Barton 1998). In Chapter 1, it was shown how this learner “disenchantment” with traditional school science can be a possible reason why there has been a decline in science enrolments. This view is supported by Aikenhead's (2006) study which showed that fewer than half of 11th graders in the United States thought science would be important or useful in their adult lives. Research into learners views of science, shows that learners find school science to be boring, frustrating and dismissive of their life worlds and career goals (Aikenhead 2006).

The science classroom is rich in issues that can be studied about the learners’ personal lived experiences. Past research has shown a strong link between how learners learn science and how they feel about science with their perceptions of the classroom environment (Fraser, Aldridge & Adolphe 2009). According to Fraser et al. (2009), studies have shown that learners’ perceptions, relative to learners backgrounds are more closely related to how they learn. The learning outcome alone cannot provide a complete picture of the educational process, therefore, it is recommended that an assessment of the learning environment be used to bring to the fore the hidden but useful aspects of classroom life. Unfortunately, little research on South African Physical Sciences learners’ lived experiences has been conducted. An explication of the lived experiences of Physical Sciences learners in this present study arose from the need to hear marginalised learners’ views because the learner’s views are rarely heard in the discussion of curriculum reform.

2.2.1 Problems encountered by learners in learning science

According to Maddock (cited in Aikenhead & Jegede 1999), learners in developing countries feel that school science is disconnected from their everyday life because of fundamental differences between the school science and their own indigenous cultures. Cultural clashes between the learners’ life-worlds and the school science offer challenges to the science educators who embrace science for all. These clashes should be seen by educators as an opportunity to develop culturally sensitive curricula and teaching methods, to reduce the impact of these clashes on learners (Aikenhead & Jegede 1999). South Africa is not left behind in this development. In the Curriculum and Assessment Policy Statement (CAPS), there has been a deliberate move towards introducing indigenous knowledge systems to try and soothe the conflict between the learner’s life worlds. This is highlighted by the quote below:

> Physical Sciences investigate physical and chemical phenomena. This is done through scientific inquiry, application of scientific models, theories and laws in order to explain and predict events in the physical environment. This subject also deals with society's need to understand how the physical environment works in order to benefit from it and responsibly care for it. All scientific and technological knowledge, including Indigenous Knowledge Systems (IKS), is used to address challenges facing society. Indigenous knowledge is knowledge that communities have held, used or are still using; this knowledge has been passed on through generations and has been a source of many innovations and developments including scientific developments. Some concepts found in Indigenous Knowledge Systems lend themselves to explanation using the scientific method while other concepts do not; this is still knowledge however.
>
> (Department of Basic Education 2007, 17)

It should be noted that although the indigenous knowledge systems is included in the Grade 10 curriculum, it has not found its way into National Senior Certificate Physical Sciences examination. As a result of this exclusion from the national examination, this content is most likely going to be ignored by educators in classes. This is because of pressures to improve examination results forces educators to concentrate only on the content that is examinable.

According to Aikenhead and Jegede (1999), the cultural clashes between the learners life-worlds and western school science can happen to anyone. They illustrated this point by telling the story of a Canadian astrophysicist Hubert Reeves. Reeves grew up in a family that loved natural beauty and at the same time he was curious about the natural world which predisposed him to an interest in science. Reeves reflected upon a profound experience that changed the way he perceived science. This is what Reeves had to say:

> I watched the sunset over snow-capped summits of the coastal mountains, turning slowly from white to pink, reflected in the calm ocean waters. As I was lost in meditation, a sudden thought broke my mood and wrenched me. . . . Since my last visit to the ocean, something important had happened. As a learner in the physics department at the University of Montreal, I had encountered some months earlier Maxwell's equations. . . . His equations provide us with an excellent mathematical representation of light's behaviour. . . . As I contemplated this calm ocean, gloriously tinted by the setting sun, an inner voice spoke, "These designs, these forms, these shimmering hues, are the mathematical solutions to Maxwell's equations, perfectly predictable and calculable, nothing more." Within, I panicked. I feared that the exquisite pleasure I had enjoyed would simply dissipate. . . . Maxwell's equations ... cancelled out, it seemed, the fragile magic of the rose tinted sky and iridescent sea. Shaken by this quandary, I turned my back on a panorama I could no longer bear, and walked home.
>
> (cited in Aikenhead & Jegede 1999)

Aikenhead and Jegede (1999) say that Reeves' love of nature interacted with his scientific mind. His transition from the world of science to his life-world of enjoying nature could have caused him to lessen or even lose his aesthetic understanding of nature. How many learners in our South African science classes experience this conflict of their life-worlds and school science? What can the educators do to help smooth or limit these conflicts? The answer to these questions can only be answered by asking the learners to tell their stories about their lived experiences in science classes. The present study aims to do exactly that.

It should also be noted that Reeves' problem is not unique. It occurs very often in science classrooms around the world (Aikenhead & Jegede 1999) where learners are expected to construct science knowledge and knowledge meaningfully even though these concepts are in harmony with indigenous norms and values, beliefs , expectations and conventional actions of learner life-worlds. These cultural clashes can create many problems for many learners, many of these of problems are similar to those faced by Reeves (Aikenhead & Jegede 1999). Therefore, there is a need for educators to ensure that they link science to the learners' everyday life-worlds so as to minimise, as much as possible, the conflicts that may arise from the learner's view of their life-world and that of science (Ogunniyi 1988).

Not all learners will react like Reeves when confronted with different worlds. Some scientists can operate seamlessly between cultures of science and cultures of the life worlds (Aikenhead & Jegede 1999). How does this conflict affect an African learner? To answer this question we need to examine the differences between African culture and western science. According to Horton (1971), African traditional systems and western science have different bases, because science is based on things while African cosmology is based on people. Horton further clarifies his position by saying that although African cosmology is based on rituals, the ritual man is not really a different species to the theory building man of western science, but is rather a sub-species. In other words, while science is a body of 'conjectures and refutations'; it is public property while African cosmology is secretive (Ogunniyi 1988). Western science has parted ways with religion and African cosmology is deeply imbedded in religion and magic (Ogunniyi 1988). This has major implications to an educator in an African science classroom. The educator needs to play an active role in minimising the conflicts that might arise from the learner's worldview and that of science.

Learners' success in science depends on three factors, namely, (a) the amount of cultural difference that the learners perceive between their life worlds and their classroom; (b) learners ability to move between their life-world and the world of school science and (c) the assistance learners receive in making the transition easier (Aikenhead & Jegede 1999).

2.2.2 Effective science education

There is no shortage of literature regarding the difficulties that South African Physical Sciences face in implementing the Physical Sciences curriculum (Koopman 2013; Basson & Kriek 2009; Selvaratnam 2011). However, there is a gap in the literature investigating how Physical Sciences learners experience being taught the subject. The study by Fonseca and Conboy (2006), found that about a third of Physical Sciences learners in Portugal do not believe that high school prepares them for a scientific and technologically driven society. According to Basu and Barton (2007), many urban, low-income learners describe science as a subject that invoke many negative sentiments such as being bored, anxious, confused and frustrated. Basu and Barton further say that learners from low income communities do not like science because it is disconnected to their life-worlds and what they are interested in. Despite many learners viewing science as disconnected to their life-worlds, little research has been conducted on how connecting science learning to personal experience might help to improve and sustain the learners' interest in science (Basu & Barton 2007). This is the reason why the current study has been chosen, I want the learners to tell their story about their experiences in science classes. The findings of the study by Fonseca and Conboy show a strong link between achievement and learner's perceptions of educator expectancies, parent involvement, quality of science teaching and a supporting learning environment. Since the educator is responsible for creating a supporting learning environment and providing a quality science teaching, this means that the educator has a great influence on the lived experiences of the learners in his or her class.

Various studies have reported that out-dated traditional teacher centred teaching practices and inadequate content knowledge have resulted in poor teaching standards in Physical Sciences (Koopman 2013; Makgato & Mji 2006; Selvaratnam 2011; Basson & Kriek 2009; Fonseca & Conboy 2006). Adding on to the problem of poor teaching standards is the large number of under-qualified or unqualified teachers who teach in overcrowded and poorly equipped classrooms (Makgato & Mji 2006). A reply to a parliamentary question by the Minister of Basic Education in 2010 revealed that more than 1 700 South African science teachers are not qualified to teach the subject and this means that at least 50 000 learners are not receiving teaching from qualified educators (News 24 2010). These statistics are supported by the science Audit that revealed that a large number of Physical Sciences educators have had no formal subject training. Many science educators are professionally qualified but only 42% are qualified in science(Department of Basic Education 2001a). An Australian report suggested that low interest in science may be due in part to the standard of science teaching in high schools (Lyons & Quinn 2010). The report recommended upgrading teachers' discipline backgrounds and pedagogical skills. This is because an educator with a limited knowledge of science tends to have educator dominated lessons that do not give

learners adequate opportunity to interact (Garbett 2003). Garbett (2003) went further on to say the less competent teachers find it difficult to follow a learner's lead and explore topics by asking the right questions, or starting appropriate activities. This leads to limited planning that is defined by what the teacher knows rather than a meeting between teacher and learner. This causes the learner to have a negative attitude towards science. The teacher should be effective in promoting positive attitudes.

2.2.3 The Shift from the National Curriculum Statement (NCS) to Curriculum and Assessment Policy (CAPS) Physical Sciences curriculum

South Africa is a changing society and science education is part of that process. The National Curriculum Statement (NCS) implemented in 2006 in Grade 10 and first examined in the final National Senior Certificate (NCS) examinations in 2008 has been replaced by the Curriculum and Assessment Policy Statement (CAPS). CAPS was implemented in 2012 in Grade 10 and first examined in the final National Senior Certificate examinations in 2014. What are differences between NCS and CAPS? The first difference between NCS and CAPS is the number of curriculum documents they each have. NCS has five subject documents and CAPS has two subject documents. The table below shows the comparisons of the subject documents.

Table 2.1: Comparing the subject documentation between NCS and CAPS

NCS Documentation	CAPS Documentation
NCS Subject Statement (Grade 10 – 12) Physical Sciences	Curriculum Assessment and Policy Statement (Grade 10 – 12) Physical Sciences
Learning Programme Guidelines	Examination Guidelines
Subject Assessment Guidelines	
Examination Guidelines	
Physical Sciences content Document (2006)	

CAPS has better alignment than NCS, with all relevant information in one document and an Examination Guideline that is extracted directly from the Curriculum Assessment and Policy Statement (Grade 10 – 12) Physical Sciences. While the NCS had numerous inconsistencies across the five documents (Grussendorff 2014). The one document makes it easier for the educators to implement the curriculum. According to Koopman (2013), the sciences educators were struggling to implement the NCS due to the lack of clarity of curriculum documents. If the educators are able to implement the curriculum correctly then, this will greatly improve the experiences of learners. Another aspect is that CAPS is well structured, and more user-friendly and accessible, with simpler language than NCS. There was concern with CAPS in that there were numerous early versions and errors, due to its rushed implementation (Grussendorff 2014).

The total number of topics has been reduced from NCS to CAPS (Grussendorff 2014). In the NCS skills are described in a very generic way in Learning Outcomes (LOs) and Assessment Standards (ASs), for example “communicating and presenting information and scientific arguments”, intention was for these to become more specific to the content area at the level of classroom practice. However, an educator not familiar with the specific skills of Physics and Chemistry will not incorporate these into his/her teaching (Grussendorff 2014). We can conclude by saying that: skills are underspecified in NCS (Grussendorff 2014). In CAPS skills are clearly articulated in prescribed activities and teaching guidelines, for example in the Grade 10 prescribed practical, it says “Measure the boiling point and melting point of water and determine the heating curve and cooling curve of water” (Grussendorff 2014).In the CAPS, the problem solving skills are under-represented at ten per cent (10%), diagrammatic skills (including tables and graphs) are under-represented at eight per cent (8%), but the experimental skills are well covered at thirty five per cent (35%) and the written work (descriptions, discussions, explanations and reports) is over-represented at forty seven per cent (47%) (Grussendorff 2014).

In the NCS the specification of content is low, thus much was left up to the educator to interpret and the educator was required to design learning activities. The aim was to allow the educator to exercise a higher degree of creativity and flexibility but it led to some confusion and inconsistency. For CAPS, specification is high and includes time allocations, prescribed activities, resource materials and teaching guidelines. This is very helpful for educators who lack subject confidence, but it is too restrictive for confident, creative educators if implemented in a rigid way(Grussendorff 2014).

CAPS support a more meaningful learning experience, particularly in contexts where educators struggle to plan their own work schedules. At the same time, CAPS is deemed to be too restrictive for confident, creative educators (Grussendorff 2014). The clearer outline of the topics and the content in CAPS is good for majority of South African educators who lack subject confidence as found in the studies by Koopman (2013); Basson and Kriek (2009); and Selvaratnam (2011). This is clearly stated in the South African science curriculum reforms, which have been geared towards increasing scientific literacy, according to the Curriculum and Assessment Policy Statement (CAPS) for Grade 10 – 12 Physical Sciences (Department of Basic Education 2007). According to the CAPS document, Physical Sciences promotes knowledge and skills in scientific inquiry and problem solving; the construction and application of scientific and technological knowledge; an understanding of the nature of science and its relationships to technology, society and the environment (Department of Basic Education 2007). From this statement, it can be deduced that CAPS is strongly influenced by constructivist philosophy of science education, because some of the most important tenets of constructivism are that a learner is an active participant and therefore

should be engaged in learning and the importance of understanding the learners' current conceptual schemes (Matthews 2011).

Since the CAPS curriculum stresses learner engagement in learning, are educators allowing learners to be engaged during learning? I ask this question because study by Koopman (2013: p230) found that educators "continue to think through their old and historical mind-sets", that is, the educators in Koopman's study are still using the "old framework of thinking". One of the implications of the constructivist model is that it requires a shift in the educators' perspectives from an educator to a facilitator of learning (Bodner 1986). Constructivist model also emphasises the two directional flow of communication, between educators and learners. The problem with many science educators is that they tend to focus mainly on their information output and not the learner. In the same study, Koopman (2013: p228) found that some Physical Sciences educators had negative consciousness and they used this negative consciousness to frame their thoughts. This negative consciousness can affect their teaching. This negative consciousness is likely to negatively affect the lived experiences of their learners.

2.3.1 Phenomenology

Since the aim of this study is to narrate the lived experiences of Physical Sciences learners in schools in a poor urban settlement in contemporary South Africa, phenomenology is a suitable framework for this research. Racher and Robinson (2003) describe phenomenology as a philosophy, an approach, and a research method. In this paper, phenomenology is both used as a theoretical framework and a research method. Phenomenological research aims to clarify essential meanings in our lived experiences that may be taken for granted (Giles 2008). Phenomenological research is the study of experience as it is lived which is projected through an individual's consciousness (Lakateb 2014). According to Brentano, consciousness is an activity between the active subject and an object he is conscious of (Roche 1973). This implies that consciousness is always 'conscious of something; in this study I seek to explore the consciousness of 12 Grade 12 Physical Sciences learners about their experiences when learning the subject. This study will therefore narrate the experiences of Physical Sciences learners as they live it in their classes and as they interact with their educators.

In a phenomenological study like this one, the method used must be shaped and guided by a statement of philosophical underpinnings (Lopez & Willis 2004). Choosing and implementing a method without thoroughly examining its philosophical basis can result in research that has no clear structure and purpose, and its findings might also be vague (Lopez & Willis 2004). Phenomenology is described as the study of essences, the science of

phenomena and the exploration of human experience (Racher & Robinson 2003). Phenomenology, as a movement, was founded by Edmund Husserl (Moran 2000). According to Moran (2000), precursors of phenomenology can be found in the work of philosophers like Brentano, Immanuel Kant, Georg Hegel, and Ernst Mach, but phenomenological method was first formally articulated by Edmund Husserl. Philosophers like Husserl, Heidegger, Schultz, Sartre, de Beauvoir, Merleau-Ponty, have contributed a lot to phenomenological ideas. With so many different philosophers contributing to phenomenology, it means that phenomenology has no single doctrine; but it is a movement united by a central idea (Aspers 2009). The central idea of phenomenology is that it starts with 'mental directedness'. All phenomenologists accept that the common injunction in phenomenology is "to be true to the phenomenon", that is, to describe that which is given in experience (Roche 1973). The injunction shows that phenomenologists believe that description of experience reveals facts about consciousness and about ways that people experience the world, as they are directly revealing facts about the world (Roche 1973). In this study, Grade 12 Physical Sciences learners describe their experiences in learning the subject; these experiences will be explicated to reveal their consciousness.

2.3.2 What is phenomenology?

The term phenomenology describes both a philosophical movement and a range of research approaches (Kafle 2013). In phenomenology, the study of lived experiences of people must be grounded in those people's experiences of that social reality (Gray, 2011). I will begin with the philosophical heritage of phenomenology, including the central ideas of Edmund Hurssel, Martin Heiddeger, Brentano, Gadamer and Giorgi.

2.4.1 Philosophical phenomenology of Husserl (descriptive tradition)

Many scholars consider Edmund Husserl (1858 – 1938) as the founding father of phenomenology (Aspers 2009). Husserl's philosophical ideas about conducting science led to the founding of the descriptive phenomenological approach (Lopez & Willis 2004). Husserlian phenomenology emphasises scientific rigor to be used to study conscious phenomena like the study of lived experience in the "lifeworld" (Giles 2008; Giorgi 2006). Husserlian phenomenology's emphasis is on the world as lived by a person, it does not emphasise on the world nor does it take reality as something separate from the person (Giles 2008). This means that the focus of phenomenology is on people's perceptions of the world they live in and what that world means to them, i.e. it focused on people's lived experience (Lakateb 2014). According to Hurssel, human actions are influences by what people view as being real, therefore, he believed that subjective information should be important to scientists seeking understanding (Lopez & Willis 2004). The subjective information must be obtained

using proper methodological procedures. The life-world according to Husserl is free from theorizing or conceptualizing and it is what we experience and often includes what is taken for granted or common sense (Giles, 2008).

In Husserlian phenomenology, it is essential for the researcher to bracket all personal past knowledge and all theoretical knowledge not based on direct intuition, this is done in order to understand the lived experiences of those studied (Lopez & Willis 2004; Giorgi 2006). In other words, the researcher must consciously withhold his or her consciousness of prior expert knowledge as well as personal biases (Lopez & Willis 2004). The main goal of the researcher is to achieve transcendental subjectivity, that is, the impact of the researcher on the study is frequently examined so as to neutralise prior knowledge and biases which might affect the findings (Lopez & Willis 2004). Transcendental subjectivity means that the researcher's impact on the study is constantly monitored and assessed and biases and preconceptions neutralized (Lopez & Willis 2004). This can be achieved by bracketing. In bracketing, the researcher controls his or her ideas, preconceptions, and personal knowledge when listening to and reflecting on the lived experiences of participants (Lopez & Willis 2004).

Husserl's approach to the study of human consciousness considers that there are certain common features that are attached any lived experience. These common features will be experienced by all persons in that life-world (Lopez & Willis 2004). The common features of that lived experience are called universal essences or eidetic structures. Identifying the commonalities in the participants lived experiences will make the descriptions of the lived experiences scientific and therefore making it possible to make a generalised description. The true nature of the true nature of phenomenon being studied is represented by these essences(Lopez & Willis 2004).

2.4.2 Philosophical phenomenology of Heidegger (interpretive tradition)

Laverty (cited in Giles, 2008) says Husserl and Heidegger did not agree about methods of exploring "lived experiences". Heidegger's phenomenological approach differed from that of his mentor, Husserl, in that Heidegger's approach to phenomenology "emphasized the historicality of understanding as one's background in the world"(Lakateb 2014). This illustrates the point that the learners and the educators are always situated within the community of teaching and learning, regardless whether they are at school or not. Heidegger's phenomenological approach was centrally ontological (Giles 2008). The difference between Husserl's phenomenology and that of Heidegger is that while Husserl's focus was on understanding beings or phenomena, Heidegger's focus was on "Dasein", which means "being the there" or being in a specific setting (or place) with its own unique

circumstances. Heidegger's phenomenology gives meaning to the lived world as reported in Husserllian phenomenology in the sense that the researcher gives an in-depth description of the circumstances that the research participant find him or herself in.

Annells (cited in Giles, 2008) argues that Husserl's main focus was on seeing human beings as "knowers"; while Heidegger saw humans as being "concerned beings", emphasising on their way-of-being in an already existing world. So, according to Heidegger, people and the world are always related in cultural, in social and in historical contexts (Lakateb 2014). What makes us human is our connectedness to other people and the relationships that we make (J. Jhagroo 2011). According to van Manen (cited in Lakateb 2014), there are four significant inter-connected dimensions of lived experience in the lived world; these are; lived other, lived space, lived time and lived body (Lakateb 2014).

Heidegger's phenomenology asserts that people are attached firmly in their life worlds making their subjective experiences linked with social, cultural and political contexts (Lopez & Willis 2004). This is a concept that is related to freedom, and freedom is a central theme of Heidegger's phenomenology. The Heideggarian phenomenologist focuses on the descriptions of the meanings of the individuals being in the world and these descriptions influences how they make choices. Heideggarian Phenomenology does not look purely descriptive categories of the real, perceived world in the narratives of the participants (Lopez & Willis 2004).

Interpretive phenomenological approach assumes that presuppositions or expert knowledge that the researcher possesses act as important guides (Lopez & Willis 2004). A researcher's knowledge of the literature helps him or her to identify areas that are understudied and need research (Lopez & Willis 2004).

2.4.3 Philosophical phenomenology of Gadamer (interpretive tradition)

Husserl's and Heidegger's works had major influence on the work of Hans-Georg Gadamer. Gadamer extended Heidegger's work into practical applications (Laverty 2008). According to Gadamer (cited in Laverty 2003), the purpose hermeneutics was is illuminate the conditions in which understanding takes place and not to develop a procedure of understanding. Like Heidegger, Gadamer believed that language and understanding are inseparable structural aspects of human ('being-in-the world')(Laverty 2008). Gadamer believed all understanding occurs through language and by interpreting we gain understanding (Laverty 2008). He believed that questioning was an important part of the interpretive process and that the questioning helps make new horizons and understandings possible (Laverty 2008):

Gadamer believed that understanding is not just recreating someone else's meaning, but that there was more to understanding (Laverty 2008). This type of questioning opens up other possibilities of meaning and whatever is meaningful becomes part of one's thinking on the subject (Laverty 2008). According to Gadamer (cited in Laverty 2008), understanding and interpretation are always linked, and the latter is an involving process, therefore, there is no definitive interpretation since it is always evolving (Laverty 2008). Gadamer's stance was that Husserl's bracketing was impossible to achieve and any attempts to bracket were absurd. He believed that there is no method that can be totally objective or bias-free from the user (Laverty 2008).

2.4.4 Philosophical phenomenology of Brentano

Franz Brentano is largely considered as the founder of phenomenological psychology. He believed that philosophy had to base itself on the investigations and discoveries of empirical enterprise rather than be a self-justifying activity of reason (Roche 1973). Brentano founded the idea of intentionality in phenomenology. Intentionality is the "aboutness" of conscious activity. According to Brentano (cited in Roche 1973) epistemology (the theory of knowledge) always implies ontology (theory of being) concerning a knower and something to be known, in order to give any sense to the analysis of knowing relation between them. Brentano's phenomenological psychology is a descriptive study of mental acts of persons. He was concerned with classifying modes of experiencing and types of consciousness. The main source data would be each individual's description of their private domains of experience (Roche 1973). Brentano preferred to use the term "inner perception" rather than "introspection" to this source of data.

2.4.5 Phenomenological psychology of Amadeo Giorgi

According to Giorgi (cited in Makoe 2008; Makoe 2007), phenomenology is used to capture and describe as accurately as possible how a phenomenon is experienced. Giorgi's phenomenological method is useful in uncovering the meanings which make up the phenomenon in the life-world of the participants. The purpose is to study how the participants describe their experiences within the contexts of their life-worlds (Makoe 2008;Groenewald 2004). Giorgi (1970)) came up with the idea that instead of looking for variations of the phenomena that is only in the imagination of the researcher, we must consider giving the same phenomena as it manifests itself to different individuals (Whiting 1999). I believe that his idea is appropriate for this study, allowing Grade 12 Physical Sciences learners to describe their lived experiences in the classroom. According to Giorgi (1971), this method moved away further from the natural to the human sciences. Giorgi's method, has the following fundamental ideas: (a) Quality of data is more important than quantity; (b) Co-

operation of the participant must be sought as he or she is a fellow human being with equal status; (c) The varied manifestations of the phenomena through other participants are the only means by which the phenomenon can be known, (d) A phenomenological study aims at arriving at meanings, (e) the phenomena being investigated are revealed by using explication (f) 'Within the method of explication one tries to understand the actual context within which the facts emerge' (Whiting 1999).

It is important to continually study the scripts to reveal what is common or typical about the context that allows the facts to appear. The scripts may reveal different facts identified by the participants but these facts may be related in a significant way (Whiting 1999). The study does not focus on determining reactions to situations or experiments but to fulfil the aims of the research, which is understanding the lived experiences of Grade 12 Physical Sciences learners (Whiting 1999).

2.5.1 Aim of phenomenological research

In phenomenological research, the aim is to illuminate an experience and to bring to "light the meanings woven into the "fabric" of that experience because this allows us to understand human life before we can theorise about it (Giles 2008,p61). The focus of this research is on learners' lived experiences in Physical Sciences classes and the question of what goes on in their minds as they engage with their educators? According to Koopman (2013) this quest demands insight into their knowledge and personal philosophy so that we can gain an understanding of what the learner experiences. The phenomenon that this research is interested in is how the learners' perceptions of their Physical Sciences educators affect their lived experiences. My aim as researcher is to narrate the lived experiences of Physical Sciences learners. When capturing lived experiences of learners, you allow the learners to tell their own stories of what they experience in Physical Sciences classrooms on their own terms (Koopman 2013). In phenomenological research, "research and writing are aspects of one process" (van Manen, 1990, p. 7). Upon hearing the recount of lived experiences, the researcher "writes and re-writes the stories until they consider their interpretation captures the 'essence' of the experience" (Giles 2008).

2.5.2 Phenomenology in science education

This research aims at illuminating the lived experiences of Physical Sciences learners and how their perceptions of their Physical Sciences educators affect their everyday experiences in the Physical Sciences classrooms. In order to achieve this aim, one must gain insight into the views, perceptions, experiences and descriptions of the personal philosophy of the learners(Koopman 2013).In phenomenological research, it is important that the researcher attempt to "return to the things themselves" and as such to capture the essence of lived

experiences that exist before theorizing about it (Giles 2009). Thus, by returning to the phenomenon itself, it can result in the uncovering of what has been taken for granted (Giles 2009). Phenomenological research focuses on lived experiences of a particular phenomenon, in this case, the phenomenon is the learners' lived experiences in the Physical Sciences classrooms (Giles 2009). The learner is the being and the context is the Physical Sciences classroom (Koopman 2013).

2.5.3 Framework of interpretation

In this study, phenomenology is used as the main theoretical framework. This choice of framework is informed by the research question. To answer the main research question, I chose a phenomenological approach that focuses on how individuals interpret their world within their given contexts (De Gagne & Walters 2010). A hermeneutic phenomenological approach captures participants' narrative accounts, which reflects how they interpret and express their experiences. Therefore, through the phenomenological component, I will attempt to understand the classroom experiences of the learners as the phenomena and through hermeneutic component; I will illuminate the interpretations of the learners' experiences. The study gives learners a voice to tell their stories, at the same time, it affords me the chance to gain a perspective on the Physical Sciences learners' perceptions of their experience (J. R. Jhagroo 2011).

2.5.4 Explication of data

The aim of this phenomenological study was to uncover meanings within the lived experiences as narrated by the participants. In this study, the stories will be gathered through semi-structured interviews where participants will be asked a set of questions to describe their own experiences in the Physical Sciences classroom.

Data was explicated using Robert Schweitzer's adaptation of Giorgi's phenomenological method as outlined by Devenish (2011). Giorgi's method involves a four step procedure. These steps are:

(i) Gain sense of the whole: i.e. gain an intuitive overview of the whole transcript.

(ii) Discrimination of meaning units that is focused on the phenomenon being studied, i.e. the lived experiences of Grade 12 Physical Sciences learners. This allows the practice of discovery

(iii) Transforming the participant's descriptions of everyday expressions into psychological language and emphasising on the phenomenon being investigated.

(iv) Transformed natural meaning units are synthesised into consistent statements.

Phenomenology is the study of lived experience. It is the study of the life world, that is, the world as we actually experience not as we conceptualise, categorise or theorise about. Phenomenology aims to produce a clearer and deeper understanding of nature or meaning of everyday experiences (van Manen 1984). This study will apply the principle of phenomenology to gain knowledge and insight about the lived experiences of Physical Sciences learners. The research about the learner perceptions of their Physical Sciences educators and how these perceptions contribute to the learners' lived experiences in the subject in South Africa will be able to add new knowledge as there appears to be very little phenomenological research in the area. South Africa is a significant place to study the lived experiences of Physical Sciences learners as its government has been trying to promote science education through its Dinaledi Programme and the National Mathematics, Science and Technology Education (NMSTE) Strategy.

2.6 Summary

This chapter described the origins of the research questions and what other researchers have found out about what science learners encounter when learning science. It also looked at what happened when NCS was replaced with CAPS. Finally, it gave an explanation of the term phenomenology.

CHAPTER 3
METHODOLOGY

3.1 Introduction

In this chapter I discuss all the methodological orientations, which is, the research method, sampling, the research setting, the research instruments, data explication framework, ethical considerations, amongst others that was employed. I also chronicle, my research journey and how my thinking developed as I was investigating the lived experiences of Grade 12 Physical Sciences learners. This study is deeply embedded in the phenomenological framework and was informed by my main research questions that this research study aims to answer.

I will also discuss how my own ontological and epistemological stance has influenced how I chose the research questions and informed the choice of method and the method of explication. According to Hitchcock and Hughed (1995), ontological assumptions raise epistemological assumptions, it is the epistemological considerations that inform the methodological considerations. The methodological considerations will then direct us to the issues of instrumentation and data collection. The previous statements describe the interrelationship between the theoretical framework adopted, the methodology as well as methods used and my view of the epistemology. This is summarised by figure 3.1 on page 30.

3.1.1 Ontology and epistemology

Ontology is an assumption that is concerned with the nature of being, and zooms in on what Punch (1998) describes as the things exists in the world, and the nature of its reality. Epistemology is philosophically linked to ontology and is concerned with the very bases of knowledge, that is, with how we know what we know, or as Davies (1991) puts it ‘the theory of knowledge’ and what Grix (2001) conceptualise as the methods we use to gain an understanding of our ‘social reality’. The ontological and epistemological foundations of phenomenology are congruent with the basis of teaching, that is, the holistic development of a learner. This is evidenced by the curriculum changes that are underpinned by learner centred constructivist philosophy. Therefore, it is the aim of this research study to influence educator and education managers to view learners in a holistic and human way. Phenomenology allows educators to gain better understanding of the life-world teaching. Phenomenology gives educators a way to uncover the learners’ concealed emotional worlds. According to Tembo (2016), the inner things of the mind are hidden from the world of empirical science.

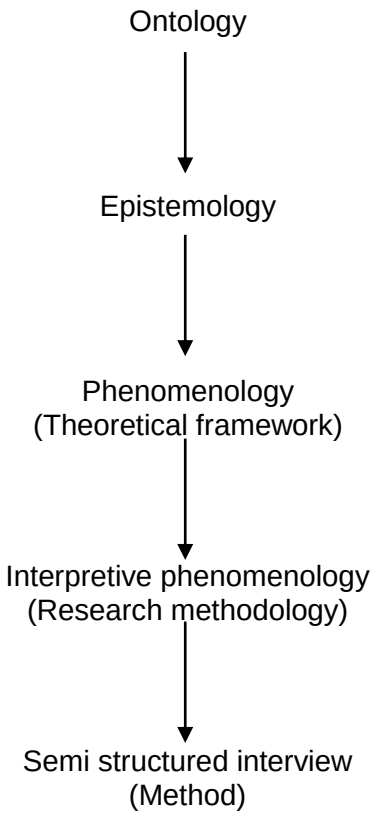
3.1.2 Method and methodology

Methodology and research design provide the guideline to the researcher in planning and conducting the study in a way that makes it to answer the main research question. A research methodology is the philosophical framework which underpins the fundamental assumptions and characteristics of human sciences (van Manen 1990). In other words, the methodology underpins the overall research strategy (Silverman 2000).

This study, adopted phenomenology, both as a theoretical framework and as a method. The overall methodological approach adopted in this study is summarised in the table below.

Figure 3.1: Overview of philosophical foundations underpinning research study

(Adapted from Gray 2011**Bloggs, 1999:34)**



In this study I used the phenomenological methodology. Phenomenological research is the science of lived experience (Husserl 1977). Husserl (1975) who is regarded as the 'father of phenomenology' by most phenomenological scholars pointed out that lived experience should be regarded as the 'starting point' and 'end point' of phenomenological research. He is often remembered for his famous slogan 'returning back to the things themselves' when he emphasised the importance of lived experience. Sometimes phenomenological research can be difficult to understand as it does not have a set of clearly defined steps (Giles 2008; van Manen 1990). The phenomenological method depends on the phenomenon that is being

studied (Ironside 2005). The phenomenological method, therefore, is directed and informed by the philosophical literatures, the findings of other phenomenological researchers and lived through my experiences as a researcher (Ironside 2005; van Manen 1990; Giles 2008).

Phenomenological is a philosophical method of observing, recording and explicating lived experiences through clear and detailed descriptions (Magrini 2012). These detailed descriptions require scholarship on the part of the researcher (Giles 2008). Phenomenology is a broad concept, and has various approaches. Each of the phenomenological approaches has its own philosophical underpinning (Finlay 2009). The aspect that is common between all the different types of phenomenology is that they all focus on lived experiences of live worlds.

The main aim of this study is to determine the lived experiences of selected Grade 12 Physical Sciences learners from three angles, that is:

1) What role do the learners' social backgrounds and future career choices have in their science learning processes?
2) What are the learners' views of their Physical Sciences educators delivering the subject?
3) To what extent are the learners expectations met in the Physical Sciences classroom?

In order to answer these three questions with a high degree of accuracy, Giorgi's phenomenological method is appropriate, because the primary principle of Giorgi's phenomenology is to capture the way in which the phenomenon is experienced (Makoe 2008; Whiting 1999). Giorgi's phenomenological method is considered useful as it will assist in understanding the phenomenon (Makoe 2008). Giorgio's method draws on the following four characteristics, that is:

1) to be descriptive,
2) elements of reduction
3) a strong focus on essences; and
4) explicate intentionality (Makoe 2008)

Firstly, descriptive refers to a descriptive narrative of each individual learner's unique and subjective experiences in the science classroom. Secondly, reduction allows the researcher to critically reflect on the views of each participants' descriptions of their experiences in order to provide an interpretation of the descriptive narrative(Makoe 2008). Thirdly, essences refer to an iterative process of returning to the things themselves. This means focussing on the essentialities of each learner's experiences. This means that the researcher must put aside

any preconceptions or judgements he or she may have about the phenomenon (Makoe 2008). In so doing, the researcher will be able to direct his or her attention on the phenomena being investigated within its contexts (Makoe 2008). Lastly, explicate intentionality means to analyse and describe the experience as it is lived without theorising or including our own views (Makoe 2008). This implies a search for the underlining ideas that gives meaning to the learner's experiences.

In order to understand how South African Grade 12 Physical Sciences learners from poor urban settlements create their own realities as learners, we must try to enter that reality without bias and try to understand how their conceptions of learning has been formed through experience (Makoe 2008). Ashworth (1996) (cited in Makoe 2008) says that only experience itself, freed from bias and prejudice as much as possible will count as evidence. Therefore, the researcher must not question whether information that is given by the participants is correct or false, but such information should be taken as the true representation of the participant's life world (Makoe 2008).

3.2.1 Gaining access to the research setting

It was a challenge to gain access to the research setting. This was caused mainly by schools' programmes for Grade 12 learners. All the schools selected had afternoon tutoring sessions for their Grade 12 learners. To compound on the problem, I was also tutoring in the afternoons in other schools.

In order for me to start collecting data, I obtained consent from the following stakeholders:

(i) Western Cape Education Department, Directorate of Research

(ii) Principals of selected schools

(iii) Parents and learners

(iv) Educators

(v) Cape Peninsula University of Technology

My first step was to obtain ethical clearance from the university. After obtaining ethical clearance from the University, I then asked my supervisor to help me draft a letter to the Western Cape Education Department: Directorate of Research, requesting permission to use the respective schools. The permission was granted and then I requested permission from principals, parents, learners and educators (for full details see Appendix B). Ethical issues that arose due to the nature of this research were the need to obtain informed consent and

maintaining participants' confidentiality. Informed consent means that the agreement to participate in a research process was signed voluntarily by a competent person after explaining the nature, the purpose and the implications of the study. This agreement can be revoked at any time (Ajjawi & Higgs 2007). Ajjawi and Higgs (2007) went on to break informed consent into four elements: disclosure, here the researcher provides adequate information to the participant, comprehension, the participant must understand the information, competence, the participants and their parents must be able to make informed decisions, and voluntariness, the participants must not be forced to participate (Ajjawi & Higgs 2007).

3.2.2 Describing the research setting

This study is concerned with capturing and describing the lived experiences of twelve Grade 12 Physical Sciences learners. The names of the participants and the schools are confidential and therefore pseudonyms are assigned to those involved in this study. The study was conducted in three high schools situated so called 'township[1]" neighbourhoods in the Western Cape. All the schools selected are administered by Metro North Education District, see table below. I selected Cape Town because of convenience in terms of (i) time, (ii) financial implications and (ii) accessibility.

3.2.3 The schools and the community

The study takes place in three different schools. All the schools where this study will take place are either in quintile 1 or 2. In South Africa public ordinary schools are categorised into five groups, called quintiles. The purpose of the quintiles is to determine the allocation of financial resources and to address some of the inequalities of the past. The National Norms and Standards for School Funding was amended in 2009, the schools were divided into five national quintiles (NQ hereafter) using three poverty indicators, that is, income; unemployment rates; and the level of education of the community in which the school is located. The poorest schools are in NQ 1 and the wealthiest schools are in NQ 5. The National Government determines these poverty rankings according to the poverty of the community around the school, as well as, certain infrastructural factors. The schools in quintiles 1, 2 and 3 are non-fee paying schools and dependent on mostly the government funding to finance their budgets. All the schools selected for the study are located in low income areas characterised by informal settlements in the settlements around the schools. An informal settlement is a community housed in self-constructed shelters. The shelters are constructed using a variety of materials such as galvanised metal sheets, wood, boards etc. The communities are around the schools are badly affected by high crime rate.

[1]A township: in South Africa a township is a high density, low income suburb

Figure 3.2: Map showing Western Cape Education Department Metros (Source: https://wcedonline.westerncape.gov.za/branchIDC/Districts/Districts.html)

School A, was started as an unregistered school by unemployed teachers about 14 years ago. The school has developed and they moved into new premises about 4 years ago. The school is aiming to produce quality results in Physical Sciences. The school has a high enrolment and a high failure rate in Physical Sciences. The school is well equipped and has 8 laboratories. The laboratories are equipped with data projectors, the science and mathematics educators are provided with laptops. There are 6 teachers who can teach Physical Sciences at Grade 12 level but only two of them are have been teaching Physical Sciences up to Grade12. The qualifications of the teachers are shown in the table below:

Table 3.1: Science Educators qualifications at School A

Characteristics	Gender	Teaching experience
Qualifications		
BEd		
Dip in Ed.+ BTech+ BEd (Hons)	Male	Over 20 years (Grade 12 educator)
Dip in Ed + BTech	Male	Over 20 years (Grade 12 educator)
BSc + PGCE	Female	Less than 10 years
BSc + PGCE	Male	Less than 10 years
BSc + PGCE	Male	Less than 10 years
BSc (Hons) + PGCE	Male	Less than 10 years

The school has consistently had about 3 Grade 12 Physical Sciences classes every year since 2012. Although the school has been consistently producing distinctions in Physical Sciences, their overall pass percentage in the subject is always less than 48%. School B is the oldest of the three schools, the school has had it fair share of problems, with a number of learner riots in the past 4 years. The school has consistently had one Grade 12 Physical Sciences class since 2012. There is only one Physical Sciences educator teaching from Grade 10 to 12. The school has a fairly well equipped laboratory and the Physical Sciences results for the school for the past 4 years have been below 55%. The table below shows the qualifications and experience of the Physical Sciences educator.

Table 3.2: Science Educator qualifications at School B

Characteristics	Gender	Teaching experience
Qualifications		
Dip in Ed + BTech	Female	Over 20 years

School C is a relatively new school that is still housed in temporary prefabricated classrooms. The school has data projectors but has no science laboratory. The school has had trouble in keeping science educators; they have changed educators several times. This has affected the matric results of the school. The results are below 50%. There are 3 educators that can teach Physical Sciences but only one educator is currently teaching the 2 Grade 12 Physical Sciences classes. The table below shows the qualifications of the science educators at the school.

Table 3.3: Science Educator qualifications at School C

Characteristics	Gender	Teaching experience
Qualifications		
Dip in Ed.+ BTech	Female	Over 20 years (Grade 12 educator)
BSc + PGCE	Male	Less than 10 years
BSc + PGCE	Male	Less than 10 years

3.2.4 What the researcher brings to this study

In my experience, teaching Physical Sciences to learners in poor urban settlements, one thing is always the same every year; the learners. Their hopes, their dreams, their anger, their resilience, their way of understanding the world have inspired me. Although every day, there is a security threat to both learners and educators, we always strive for the best.

3.3.1 Sampling

As this study investigates the lived experiences of Grade 12 Physical Sciences learners, purposive sampling also referred to as convenient sampling. A total of twelve, Grade 12 Physical Sciences learners were selected from three different high schools that are located in poor urban settlements in the Northern District the Western Cape province Town. According to Ajjwi and Higgs (2007) purposive sampling is used to select data rich subjects that will illuminate the phenomenon in order to effectively answer the main research question. Another reason for choosing purposive sampling is to select a small sample to closely examine unusual and extreme elements of how learners experience the teaching and learning of science. This allowed me to consider a number of issues in selecting my research participants, such as learner performance in the subject. From these criteria, I selected poor achievers (learners who scored between 10% and 30%), medium achievers (between 30% and 50%) and high achievers (from 60% to 90%). Other criteria were the demographics or location of the schools. All the participants in the study had to attend schools situated in a

'township' area in schools which fall within either in quintile 1 or 2. Furthermore, other factors include ethnicity/race, language proficiency seeing that I wanted learners who communicated effectively. Lastly, all the learners had to be in grade 12. This was an important because it meant that each and every participant had at least three years of experience with the subject and thereby bringing with them a broad worldview of the teachers. In order to illuminate the lived experiences of the physical sciences learners from schools in poor urban settlements, data was collected from twelve learners, four from each of the 3 schools chosen. Choosing fewer schools allows for in-depth data collection with two rounds of interviews to provide possibility of saturation to be achieved. Saturation is achieved when no new ideas are arising during the data collection process (Ajjawi & Higgs 2007). The schools chosen are located relatively far from each other; this increases the chances that the learners' experiences will be varied. The advantage of the varied experiences is the richness in depth of data obtained and that will get various views illuminating the phenomenon (Ajjawi & Higgs 2007).

3.3.2 Data collection

In phenomenology, the in-depth individual semi-structured interviews offer the best method for collection of rich detailed first person accounts of lived experienced. According to Denscombe (cited in Bailey 2011), the choice of semi-structured interviews gives some structure to an interview where pre-identified issues can be interrogated and discussed. The data for this study are the experiences of Grade 12 Physical Sciences learners. These experiences will be collected by means of semi-structured interviews. Semi-structured interviews are not standardised and offer flexibility during the interview process (Gray 2011; Ecklund 2013). A list of questions was compiled and used. The order in which the questions were asked was changing, depending on what direction the interview takes (Gray 2011). At times the interview questions were rephrased as clearly most of the learners were struggling with the language. Prompting questions were asked to probe for extra information or as new issues arose.

The interviews were recorded and then transcribed. The in-depth semi-structured interview allows for probing when there is need for more information and when the interview thinks that that the participant needs to expand their answers (Gray 2011). Probing is important in phenomenological approach where the objective is to explore subjective meanings that ascribes to lived experiences (Gray 2011). In this study, probing was used to allow the interview to go into new pathways that were not part of the original plan but help towards achieving the objectives of the research. Smith et al. (2010) recommend the first questions during an interview should be the type of questions that will encourage the participant to talk freely and at length. Therefore, the first questions asked about the family of the participant.

The questions should not make the participant uncomfortable as it is important to ensure that the participant does not believe that the researcher has an ulterior agenda.

All the learners involved in the study were given the researcher's contact details so that if they needed to discuss the research in more detail then they can do so at any time convenient to them (Smith, Flowers & Larkin 2010). The participants will be recorded in in-depth interviews. The questions used in the interviews were open ended. The intention is to offer the participant an opportunity to freely describe their experience. A follow up question is asked when the participant has reached a point where they can no longer say something spontaneously about the question. The follow up questions are purposely leading in a sense to try and retrieve as much information from the learner (Broomé 2011). This interview technique is intended to "re-open the door" to some aspects that were not described fully and expressly by the participant (Broomé 2011). My aim is get the verbal description of the experience as described by the participant to be as accurate as possible.

3.3.3 The interview

In this study, I interviewed twelve Grade 12 Physical Sciences learners to understand pre-entry attributes, academic, and social factors that affected their lived experiences in the Physical Sciences classrooms. Some questions in the interview encouraged the learners in the study to describe memories prior to enrolling for Physical Sciences. This will help to shed light on how their background possibly influenced their decision to choose Physical Sciences in the FET phase. These questions were also aimed at understanding how academic and social factors that possibly encouraged to enrol for the subject. I asked questions related to their lived experiences. I used the responses to get central themes of factors that affected the participants' lived experiences. The interview questions further explored extra and co-curricular activities that affected the learners' lived experiences in the physical Sciences classrooms.

3.3.4 Field notes

The interactions between me and the participants, how they reacted, what they said, how they said it and how they acted as well as their non-verbal communication were recorded in my field notes. Two types of field notes field notes were written during the research process. This idea of keeping field notes was adapted from Ajjawi and Higgs (2007), but, instead of keeping three types of field notes like they did, I only kept two types. The field notes that I kept were the transcript file and the personal file. In the transcript file I kept the unprocessed data from the interviews and in the personal file I kept how the participants responded during the interviews. The field notes include comments about how animated the expressions were and comments about the energy of the non-verbal communication, that is, their body

language, facial expression, and whether they were nervous or relaxed. It also includes how they responded to questions, whether they struggled with language or to find the correct words to express them. Using the method suggested by Minichiello, Aroni, Timewell, Alexander (2008), I used the information that was in the in the personal file to reconstruct the conversations in context instead of just relying on a contextual verbal recording. Any observable verbal and non-verbal behaviours of participants and the reasoning strategies, that they used during the interview, were recorded.

Narrations of lived experience that are based on the experience of the participant they might contain some inaccuracies (Broomé 2011). This is because, the data obtained through interviews can be affected by memory decay, alterations or participants' response errors (Broomé 2011). Descriptions are not perfect but they contain enough adequate descriptions that contains rich information that has psychological meanings (Giorgi 2009; Giorgi & Giorgi 2003; Broomé 2011). The purpose of the interviewing technique is to help the participants to describe their experiences fully and clearly.

The descriptions obtained from the participants will be recorded using a digital voice recorder for transcription later. These voice recordings will then be transcribed into text and these transcripts will be used as the raw data for explication. All information that can be used to identify the participants or their schools will be replaced by pseudonyms to protect the privacy of the participants and other interested parties. The replacement of names will be done during the transcription process.

3.4.1 Data explication

According to Groenewald (2004), the heading "data analysis" must be avoided in phenomenology since it has ambivalent connotations. He argues further that the term "analysis" means "breaking into parts" and breaking into parts implies that there is "loss of the whole phenomenon", whereas explication implies the constituents of the phenomenon can be investigated while keeping the context whole (Groenewald 2004). Since the main aim of this study is to learn something about the participants' psychological world, therefore the data explication sought to understand their stories and conversations (Ecklund 2013). The explication did not look at frequency of stories because in phenomenology, frequency is not important. What is important is to illuminate the social and social world of learners and to learn about the meanings in social and mental world of the learners. In order to achieve this, I engaged with text during the process of explication (Ecklund 2013). Data was explicated using Giorgi's(1970) four-step method as described below:

(i) After transcribing the interviews, the transcribed text is read and re-read

(ii) Through reading text, the central themes were identified by labelling and characterising each part of the text

(iii) The themes were clustered in order to provide structure and relationship

(iv) A table was produced with quotations that show each theme and capturing the participants' experiences.

I chose Giorgi's method because as a researcher, a structured approach will provide a framework and help with the data explication (Whiting 1999). Giorgi's method is best suited for this study because the method allows to investigate the same phenomena as it experienced by other individuals (Whiting 1999). In this study, twelve Grade 12 learners are asked the same interview questions to describe their lived experiences; therefore Giorgi's method will be suitable for the consideration to the phenomena of lived experiences as described by the participants.

According to Whiting (1999), the central tenets of Giorgi's method are:

(i) Emphasis on the quality instead of the quantity of data;

(ii) treating participants as fellow human beings with same status as us and from whom we must seek cooperation;

(iii) the phenomena can only be known through its varied manifestations as revealed through others;

(iv) the aim of the study is to report on the daily realities on others and the layers of meaning embedded in these realties;

(v) explication is used to elucidate meaning and illuminate the phenomena in question; and

(vi) the focus of the study is to answer the research question with a high degree of accuracy.

3.4.1.1 Employing the hermeneutic cycle

Once I had completed transcribing the interviews, I began the data explication by employing the hermeneutic circleby reading and re-reading the transcripts, doing reflective writing and interpretation (Kafle 2013). Quality is an important aspect of phenomenological research, therefore it is important to maintain the quality throughout the research (Kafle 2013). Van

Manen (1997) identified four quality criteria for phenomenological research, these are: (1) orientation, (2) strength, (3) richness, and (4) depth. He identified these criteria for quality since hermeneutic phenomenology is a pedagogic practice that involves reading and analysing texts that explicate the life world stories of research participants (Kafle 2013). The process by which the researcher gets involved in the world of the participants and their stories is called orientation (Kafle 2013). The capacity of text to illuminate and clarify the main intention of the understanding of inherent meanings as expressed by the participants through their stories is called strength (Kafle 2013). Richness describes the quality of the text that tells and clarify the meanings as viewed by the participants (Kafle 2013). Depth describes the extent to which the text can penetrate and express the best of the intentions of the participants (Kafle 2013). According to Langdridge (2007), the quality of hermeneutic phenomenological research is determined by (1) the rigour of the explication, (2) persuasive account and (3) participants feedback. The rigour of the explication is the attitude shown by how the researcher pays attention to the participants' stories that either confirm or disconfirm the theme (Kafle 2013). This means that "nothing must be taken for granted" in hermeneutic explication.

In hermeneutic phenomenological research a researcher is required to pay attention to the rhetoric, that is, the art of skilful writing and speaking effectively (Kafle 2013). The aim of hermeneutic phenomenology is to explicate the core essences as experienced by the participants. Everyday language is not sufficient to express these core essences as intended by the participants, that is why hermeneutic phenomenology demands for a rhetoric that best elicits the true intentions of research participants (Kafle 2013).

3.4.2 Bracketing and phenomenological reduction

The first stage involved the reading the whole transcript in order to get a holistic and intuitive understanding of the phenomena under investigation (Giorgi 1975; Holroyd 2001). It is during this step that the researcher assumes the phenomenological attitude (Kafle 2013; Finlay 2009; Giorgi 2008; Broomé 2011). This phenomenological attitude is different from the natural everyday attitude or understanding of the world (Broomé 2011). In phenomenological attitude, the researcher withholds his or her personal past knowledge and prior theoretical knowledge in order to take a fresh look at the data (Broomé 2011). This means that the researcher withholds his prior-knowledge, presuppositions, theoretical, and cultural knowledge (Broomé 2011; Kafle 2013; Makoe 2007; Whiting 1999). The idea of bracketing comes from Husserl's epoche (Groenewald 2004; Broomé 2011; Kafle 2013; Makoe 2007). Epoche is freedom from presuppositions (Groenewald 2004; Koopman 2013). Bracketing allows the researcher to present the data without contaminating it with bias or own belief. Bracketing also allows consciousness to be purified and clarify the phenomena (Amparo

2013). This allows the researcher to remain true to the phenomenological slogan of “back to the things themselves” (Broomé 2011) while remaining within the phenomenological circle of data explication. The researcher takes the phenomenon as it presents itself and without judgement and bias (Broomé 2011; Whiting 1999). The bracketing stance taken helped to purify the consciousness in order to illuminate the phenomena without the preconceptions of the researcher.

Conducting all the interviews personally helped a lot to get the sense of the whole. I also transcribed each interview personally and then read each transcript several times as explained in the above sections. At times I found it difficult to remain true to the phenomenological circle by adhering to the epoche, bracketing the self as I was engaging with both the interviews and the data construction process. Next I discuss these challenges.

3.4.3 Delineating natural meaning units (NMU)

During this stage, I read and re-read data from each participant’s transcribed interview and then identified the parts of the interviews which reveal the participants’ experiences in relation to the main research question and sub questions (Holroyd 2001; Whiting 1999). It requires that the participants descriptions to be read so as to get a holistic sense of the experience (Giorgi 2009; Giorgi & Giorgi 2003; Broomé 2011). The descriptions that were narrated by the participants were taken in without critical reflection on the experience of the participants in their everyday mode of living (Broomé 2011). It was during this stage that I innovated Giorgi’s method by adapting and merging two methods gleaned from Devenish (2011) and Whiting (1999). I adopted the use of a research key, from Devenish. The research was developed directly from the research questions. Once the research key was done, I re-read the participants stories and used a table to divide each participant’s story into what Giorgi calls the natural meaning units (NMU) (De Castro 2003). In order to treat all data equally without being tempted to analyse, the interviews were reduced to natural meaning units. A natural meaning unit represents a statement that is expressed in the participant’s own words and that statement makes complete sense (Van der Mescht 2004). During this step, the different natural meaning units that contain meaning are discriminated (De Castro 2003). These units must be looked at and understood in terms of the whole meaning. This was done by grouping main ideas into categories with subcategories that focus on the research question. These categories expanded more as more insights emerged from each interview (Koopman 2013). Natural meaning units are obtained through distanciation by the researcher not to push the data too much towards his or her bias as he or she explicates transcripts. Each natural meaning unit contains a single meaning and is numbered according to the research key (Koopman 2013).

3.4.3.1 Forming central themes

From each natural meaning unit, I captured the essence to generate meaning by removing all unnecessary items. This was used to generate central themes based on the experiences of the research participants. The central themes are generated by looking for multiple references that occur at least four times in the text (Koopman 2013). These central themes are placed next to the participant's narrative.

3.4.3.2 Forming constituent profiles

Central themes are then read and re-read searching statements are repeating, these repetitive statements are removed leaving non–repetitive statements containing e meaning statements for each participant. These non-repetitive statements of descriptive meaning are called constituent profiles (Holroyd 2001). The constituent profiles was searched for referents, these referents are extracted and listed separately (Holroyd 2001). Referents are specific words that highlight the meaning of the experience being researched (Holroyd 2001). Here the focus was on high frequency words, emotive language and the participants' behavioural queues during the interview narrated as field notes.

3.4.3.3 Forming a thematic index

Van Manen (1997) recommends that data be explicated by uncovering the thematic aspects. This is done by reconstituting the constituent profile (Holroyd 2001). The thematic index shows the central themes that emerged as a result of data explication (Holroyd 2001; Amparo 2013; Ajjawi & Higgs 2007). The thematic index is a non-repetitive sequenced list of meaning statements and referents. The thematic index is used to search for interpretation of themes (Holroyd 2001). It contains constituent profiles, these are statements that are attributed to singular meanings of experience (Holroyd 2001). The thematic index will be searched for words that convey a meaning relevant to the phenomena under investigation. Any repeated statements will be removed and any non-relevant statements will be removed to create a thematic index of the important aspects of the phenomena that is being studied (Holroyd 2001). In this study, the phenomena under investigations are the lived experiences of Grade 12 learners in the Physical Sciences classrooms.

3.5 Searching for thematic index

The search for thematic index allows us to be able to compare referents, central themes and constituent profiles so that we can develop a set of interpretive themes (Holroyd 2001). These interpretive themes will be used rigorously to explicate meaning attributed to the phenomenon being investigated. The interpretive themes will be compared to original

transcripts for verification and accuracy by imaginatively altering the context to test the invariant structure of experience of being taught Physical Sciences as captured in the interpretive themes (Holroyd 2001). If the themes remain unchanged through this process, they are then considered as universal and invariant aspects of the essence of the phenomena being studied (Holroyd 2001). According to Haney (cited in Holroyd 2001), “the ‘unbuilding’ of the first phase of phenomenological method, that is, the eidetic reduction, must be completed by the rebuilding of the world as intentional constitution”. The rebuilding of the world as intentional constitution starts by using the interpretive themes to explicate meaning attributed to the phenomena being studied (Holroyd 2001).

3.6 Ethics

Ethical issues are important in hermeneutic phenomenology. The protection of the participants’ privacy is a fundamental issue in phenomenology. In this study, pseudonyms will be used to protect the participants’ identities. The purpose, aim and procedure of the study was explained to the participants beforehand so that an informed consent will be granted (Kafle 2013). I will adhere strictly to the ethics and confidentiality and will share research findings with the participants.

For the above reasons, the following ethical issues were ensured;

- The schools, learners and educators participate voluntarily through the permission of the WCED.
- The research process is explained fully to the participants, their guardians, their educators and principals.
- The learner seeking permission from learners to participate will be translated to Xhosa to allow the guardians to understand the process.

3.7 Summary

This chapter outlined the Interpretive Phenomenological Analysis that was used in the present study. In this chapter I described the sampling method and the methods for data collection and data explication. I also discussed research questions, research design, and the role that I played as a researcher. The following chapter discusses the qualitative data collected and the findings of the research

CHAPTER FOUR
DATA EXPLICATION

4.1 Introduction

This chapter narrates the lived experiences of twelve Grade 12 Physical Sciences learners as divulged in two in-depth face-to-face semi-structured interviews. The interview questions were designed in such a way to provide greater understanding of how each learner experiences the school subject Physical Sciences in poor urban settlements of Cape Town. Each participant in this study was given a pseudonym to ensure anonymity. In order to preserve the accuracy, the responses of each participant are presented as closely as possible, as reported in the transcripts from interview session recordings. All participants were isiXhosa first language speakers and most of them struggled with the English language. There were times when I had to probe their responses in their native isiXhosa language to get a more accurate and deeper descriptive understanding as divulged by them. According to Duffy and Dorner (2011) human beings are by nature narrative creatures, homo narrans, as they respond well to telling stories through storytelling about their understandings and perceptions of life.

Care was taken throughout the explication process to each individual learners story about his or her experiences that I interviewed and applied Husserl's (1975) concept of the 'epoche" which means to abstain from interpreting their stories and the meaning they attempted to bring across. Based on this premise, this chapter is divided into two sections:

1. The first part covers the social conditions and the learner's perception of self.

2. The second part covers the learner's experience in the science classroom by focusing mainly on the interactions with their Physical Sciences educators.

4.2 Making sense of the whole

Before explicating the data, each interview was transcribed. After converting the verbatim data to text, I iteratively read through the whole transcript to get an overall sense of the whole story of each learner (Giorgi 1975). For the purposes of this study, I adopted the bracketing stance that allowed phenomena to emerge without interference from my theoretical knowledge and prior knowledge (Whiting 1999). According to Whiting (1999), phenomenological reduction is part of the explication process and does not mean that the researcher must forget everything which is known by the researcher in relation to the phenomenon being investigated. For example, as a science teacher, with more than 20 years teaching experience, I cannot forget everything I know about the lived experiences of Physical Sciences learners.

In order to make sense of each learner's stories, I conducted the interviews personally and I had to read and re-read each transcript to become more familiar with the words of the participants and the order in which the words were spoken. This helped a lot when I was explicating data. I transcribed everything using the words of the participants verbatim, and did not try to interpret the meaning.

4.3.1 Creation of a 'research key'

After I had transcribed the participants' interviews, I had a lot of data to explicate. To make the explication process less cumbersome, I created a research key based on interview questions. I then isolated the natural meaning units (NMUs) that have a similar meaning and used Roman numerals to number the NMUs that were identified. I sorted manually, the numbered NMUs into categories that were based on the interview questions, and then created abbreviated NMUs by removing excess information. The categories of the research key are listed below.

Social conditions and learners' perceptions of self

i. Parents and home conditions
ii. Siblings and what they do
iii. Home language and feeling about English as a language of instruction and confidence in English
iv. Reasons for choosing Physical Sciences at FET and who was your inspiration?
v. Description of self as a person and rating self-esteem and self-confidence in the subject, Physical Sciences as you entered the FET phase in Grade 10?
vi. Expectations when they chose the subject
vii. Were expectations and are you happy that you chose the subject?
viii. Brief history of your academic experience in Physical Sciences from grade 10 to your current grade?
ix. Were you taught by the same educator or did you change educator?
x. Persistence in the subject.
xi. Plans to study after leaving school?

Interactions with educator

i. Role of educator in transforming self-esteem through the years
ii. Role of educator in development into the science learner you are today
iii. Characteristics that make their educator different
iv. Advice to educators to engage their learners better and to make the subject more interesting, enjoyable, and fun

v. Physical Sciences classroom climate
vi. Role of Physical Sciences educator in persistence in the subject
vii. Social and affective experiences with your Physical Sciences educators
viii. Feelings during these lessons and what Physical Sciences educator means to you?
ix. The best science educator you had/have and why he/she is so great?
x. Unsuccessful interactions with a Physical Sciences educator
xi. Views on practical work, excursions and Extra-classes:/ activity to be added
xii. Academic experiences in Physical Sciences classroom interactions like
xiii. How do you feel when you are working with your Physical Sciences educator?

4.3.2 Identifying the central theme

The research key became the major component of my data explication process which allowed me to achieve my objective. The other component was the innovation that I obtained from Lisa Whiting in her article entitled 'Analysis of phenomenological data: personal reflections on Giorgi's method'. It impressed me a lot because it gave shorthand, ready to use, reference system which helped me to access and handle large quantities of data from a phenomenological perspective. At this stage, I separated the NMUs and indicated the dominant theme in the NMU. Each NMU was typed into a table and numbered according to the research key. Once this was done, I then reread with "openness" which Giorgi (1975) describes, re-reading helped identify the central theme from each unit. The central theme just highlights the fundamental issue of each NMU as it emerges. The central theme makes no attempt to relate the NMU to the study and does not interpret its meaning. According to Whiting (1999), this is very important when you are using Giorgi's phenomenological method. In order to illustrate these stages, the following tables from the 12 participants' interview transcripts for the two interviews identify the natural meaning units and their associated themes.

4.3.3 Applying the research key to explicate data from first interview

Using the concept conceived by Devenish's (2011), I took the research key and created a shorthand ready reference system to simplify the data from each participant. Then, using the research key, I created two tables for each participant. This means that, I created a table for each interview that I conducted. I then grouped all the participants' tables according to interviews. All tables from the first interviews were grouped together and so were tables from the second interview. Then using the method described by Whiting (1999), the next step was to identify the central theme that each natural meaning unit was associated with. I then typed the central theme next to the natural meaning unit.

Table 4.1: Transcripts for interview 1: social conditions and learners' perceptions of self

[21]Vuyani'stranscript for interview 1		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	I only have my mother, my father, I don't know where he is, My mother is a domestic worker in Cape Town and the condition that we are living in, is not very nice, but it's a good place but there is a lot of crime.	Personal background and contextual factors
ii.	I only got two brothers which are behind me, the one is doing grade 7 and the youngest one is doing grade 2 in the Eastern Cape.	Personal background and contextual factors
iii.	I speak isiXhosa. It is good because it helps other children not speaking the language that we speak, which is isiXhosa, to understand better and it can collaborate other things and be together.	Personal background and contextual factors
iv.	Well, my grade 9 teacher told me that I must do Physical Sciences because I was good in technology and natural sciences My Grade 9 teacher was my inspiration. I would have preferred my grade 9 teacher to continue teaching me physical science	Intrinsic and extrinsic motivation
v.	I would say I am a nice person but some people are saying I am a harsh person because I always be in an anger situation. I know how to control my short temper because I haven't hurt anyone	Intrinsic and extrinsic motivation
vi.	In grade 10, Physical Sciences, to me it was one of the easiest subjects, but going to grade 11 it was a little bit hard, but at Grade 12 it changed. How and in what sense My confidence in the subject is too better, it is 5 out 10. I am confident that I will pass.	Intrinsic and extrinsic motivation
vii.	Expected an interesting subject.	Intrinsic and extrinsic motivation
viii.	Expectations are being met. Because like I said before, it is an interesting subject and there a more things , it is not complicated unlike other subjects	Intrinsic and extrinsic motivation
ix.	In grade 10 Physical Sciences was one of the easiest subjects, at first my teachers was Ms X, she taught me well Physical Sciences but I did not manage to pass Physical Sciences. Then in 2013 my other Grade 10 teacher was also great, but in Grade 11 I wouldn't say it was good, there was a lot of work in Grade 11 so I didn't manage to put all the effort in Physical Sciences. But in Grade 12, I managed to improve in Physical Sciences, even though I didn't improve very well. From Grade 10 to 12 I had 4 Physical Sciences teachers; I don't think it was good idea. If a teacher is teaching you grade 10, must teach that learner in grade 11 and even in Grade 12	Intrinsic and extrinsic motivation
x.	The inspiration that the teacher have on me	Intrinsic and extrinsic motivation
xi.	I am planning to do marine studies at CPUT.	Personal background and contextual factors
[1]Luyolo's transcript for interview 1		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	First of all I have one parent, which is my mother and she does not work, she stays at home, I am living in good condition. Like we are not struggling a lot. I have brothers, so we are not struggling with anything	Personal background and contextual factors
ii.	I have got 4 brothers and 2 sisters which are younger than me, 2 brothers which are older than me are not working, but one is still finding a job and the other is a final year student at CPUT. The sisters are younger they are at the primary	Personal background and contextual factors
iii.	We speak isiXhosa. I am feeling good because English is a language that combines many people, because English is a language that you are getting connected with someone who does not speak isiXhosa.	Personal background and contextual factors

[21] pseudonym

	I am confident to speak English	
iv.	It is because it is what I want to be in life needs me to do Physical Sciences and other, like maths so that I can achieve to be an engineering. My neighbour inspired me, because she saw my results when I was coming from grade 9 and she asked me what I want to do, I told her that I to be an engineering. It is very good and is that I am interested to it.	Intrinsic and extrinsic motivation
v.	I can describe myself as a good person; I am shy about other things. I am a confident person	Intrinsic and extrinsic motivation
vi.	I expected Physical Sciences to become easier than I thought, but it became a very difficult way, but I tried to figure it out so that I can go all the way. I expected to do more practicals as I am in Grade 12 now, we have done many things from even grade 11	Intrinsic and extrinsic motivation
vii.	Others have been met and others are being met now. I am happy	Intrinsic and extrinsic motivation
viii.	First it was tough, but I kept on practising Physical Sciences, but I do realise that Physical Sciences is very important but I got many inspiration to Physical Sciences teachers. In grade 10 it was not that good, because it was my first time to do Physical Sciences so I didn't get that much, I didn't put myself much attention to it but at some point, when the time goes I did very well in Physical Sciences	Intrinsic and extrinsic motivation
ix.	I changed teachers, it was disturbing.	Intrinsic and extrinsic motivation
x.	It is because to be an engineering you need to have physics, so that you can know about engineering things and all that stuff. It is self-inspiration because I have checked about engineering and I saw the results that they need Physical Sciences	Intrinsic and extrinsic motivation
xi.	Engineering	Personal background and contextual factors
[1]Noluyanda's transcript for interview 1		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	I am raised by a single mother, my dad died in 2007, my mother doesn't work, she survives on grant. Our living conditions are very difficult because we cannot afford everything.	Personal background and contextual factors
ii.	I have a brother and a sister. My sister is a nurse and my brother works for a construction company. Only my brother is helping financially at home and my sister stays far.	Personal background and contextual factors
iii.	My home language is isiXhosa. I struggle a lot in English but I would like the language of instruction remain English because everywhere we talk English.	Personal background and contextual factors
iv.	I love it; I love the practicals it involves. My sister was my inspiration to do the subject	Intrinsic and extrinsic motivation
v.	I am a friendly person and also a hard worker, because I need to work hard in order to achieve my goals. My confidence has dropped.	Intrinsic and extrinsic motivation
vi.	I expected to do more practical because if we do more practicals you can see it and you can understand more	Intrinsic and extrinsic motivation
vii.	I am happy, because I can understand more things about Physical Sciences; I have made a choice for my career based on Physical Sciences.	Intrinsic and extrinsic motivation
viii.	In Grade 10 I started off very confident but I didn't have much information about the subject, so I dropped (failed) and repeated. I didn't drop the subject because I love it	Intrinsic and extrinsic motivation
ix.	It was hard because I used to understand more better than the first teacher who taught me Physical Sciences. Teachers should continue with learners from Grade 10 to 12	Intrinsic and extrinsic motivation
x.	Because of my career choices	Intrinsic and extrinsic motivation
xi.	medicine	Personal background and contextual factors
[1]Siphosethu's transcript for interview 1		

Research key item	Natural Meaning Units (NMUs) (reported in participant's own words)	Central theme
i.	About myself, sorry about that, about my parents, my mom works as a dental assistant in Mitchel plain and my Dad works at ABSA. The conditions that I stay are not that bad but there is a high rate of crime. There are no job opportunities so there is a crime rate that is coming through	Personal background and contextual factors
ii.	I only have two brothers, the elder one is at CPUT doing his second year to become a chemical engineer and my younger brother is doing grade1	Personal background and contextual factors
iii.	I speak isiXhosa and English. I feel really well because English is a language where by it combines; it unites people of this country because it is the only language that brings communication with other people of different countries. I am confident speaking English	Personal background and contextual factors
iv.	I chose Physical Sciences because I was doing great in Maths and I became interested when I was in high school to choose Physical Sciences. It's a subject that gives more opportunities in the career field. My brother was the one who inspired me.	Intrinsic and extrinsic motivation
v.	I am very calm and I am a go getter. What I mean when I say I am a go getter, is that I make sure that I do whatever it takes that I maintain that thing to become my own My self-esteem, I believe in myself when I say I am doing this. In grade 10 I was raring to go, because I was so curious about it and to learn more about it. As time went by I became more confident although at times there are things that you don't understand about the subject you are doing but you continue to do the subject	Intrinsic and extrinsic motivation
vi.	I expected, for example, practicals, that we were going to do practicals. The subject is more about practicals	Intrinsic and extrinsic motivation
vii.	They are being met. Yes they have been met, because we do a lot of practicals in my school. Our teachers make sure that we do them every quarter	Intrinsic and extrinsic motivation
viii.	In grade 10, this is where I became more focused in Physical Sciences. The things that I was doing in grade 10 are similar to things I did in Grade 12 so I became more relaxed	Intrinsic and extrinsic motivation
ix.	I was taught by different teachers. I think it is a better way of changing teachers because some other times I don't understand him so it's better to have something from another person so that you can understand that teacher. I prefer to change teachers.	Intrinsic and extrinsic motivation
x.	I became more attracted to it as the time goes, so I did not drop out. It was coming from me; sometimes it was my brother who motivated me. My teacher also motivated me.	Intrinsic and extrinsic motivation
xi.	I want to become chemical engineering if possible I want to become a psychologist.	Personal background and contextual factors

[1]**Fezile's transcript for interview 1**

Research key item	Natural Meaning Units (NMUs) (reported in participant's own words)	Central theme
i.	I live with my two sisters, my mother stays in the Eastern Cape, I have one parent, my mother is not working. The only person who is working is my sister. She is working as a bricklayer.	Personal background and contextual factors
ii.	I have two sisters and one brother. The two sisters are older than me and the brother is younger than me	Personal background and contextual factors
iii.	I speak isiXhosa. I don't know what to say but English is killing me because every time when I have to speak to a person who is speaking English, I feel like I can faint sometimes, because of fear. I prefer mother tongue teaching	Personal background and contextual factors
iv.	My Grade 10 Physical Sciences teacher encouraged me to do science. She said there were many opportunities in physics. First of all, my sister is my inspiration.	Intrinsic and extrinsic motivation
v.	First of all I am a shy person, as I said, when speak to a person who speaks English, I am struggling. Confidence was not that much, because I didn't trust myself	Intrinsic and extrinsic motivation
vi.	First of all to learn skills and get experience. Expected to do more practicals.	Intrinsic and extrinsic

		motivation
vii.	Expectations have not yet been met, because we do few practicals. But I am happy that I chose Physical Sciences because I see success in me.	Intrinsic and extrinsic motivation
viii.	It is not improving, because I aim to get code 6 but I get code 4, so I won't say my performance is going up	Intrinsic and extrinsic motivation
ix.	Yes I was taught by the same teacher	Intrinsic and extrinsic motivation
x.	First of all, the reason I remained in physics class is that I want to learn from it, I want to use it because it will help me in the future.	Intrinsic and extrinsic motivation
xi.	First of all I want to be electrical engineering.	Personal background and contextual factors

[1]Yanga's transcript for interview 1

Research key item	Natural Meaning Units (NMUs) (reported in participant's own words)	Central theme
i.	I live here in (township mentioned) with my mother, she is a single mother so raised me. My father is in prison, he was arrested, I think it was around this year. Even when he is around, there is no change. Him and my mother are separated, so I only knew my father in 2012. My mother works here in PEP store here in Philipi and she works there.	Personal background and contextual factors
ii.	My brother was working, he was in police, but in life there are problems so he is no longer working and my sister recently got a job	Personal background and contextual factors
iii.	I speak isiXhosa. To be honest with you, I love English, but, although it's not my home language, but I am trying by all means to understand English and I am trying to speak it so that I can understand the language, because I believe that in order to make it in life, I believe that I must prepare myself for the future because in high institutions English is the only language that is being spoken so, I must prepare myself for that. So I love speaking English although I am not good at it, but I am trying.	Personal background and contextual factors
iv.	Firstly I saw my potential in natural sciences in grade 9, I got code 6, then I saw that I am in love with this, and then let me do this science thing then. To be honest with you, there was no one besides me	Intrinsic and extrinsic motivation
v.	I wouldn't say I am a shy person, I am not a shy person, I am not a loud person, I look at a situation and then know what to react in each situation. I am not shy and I am not that loud. I think my marks will say a lot about that because in Physical Sciences is my top subject. I love Physical Sciences, no other subject, it's Physical Sciences the best and I want to it, I want my career to relate in Physical Sciences, so the passion of Physical Sciences is growing day and day in me, so Physical Sciences, I am so in love with it. I love Physical Sciences.	Intrinsic and extrinsic motivation
vi.	I expected more practicals and calculations and the experiments, So we can understand what is going on	Intrinsic and extrinsic motivation
vii.	To be quite honest with you, to the side of the practicals we haven't done much experiments. In Physical Sciences, especially chemistry some topics , there are some topics that you need to do a practical that you can understand then, so for an example, last year I was struggling with the intermolecular forces, it was hard for me to understand, so it needed a practical. For instance last year we did exothermic and endothermic reactions and I understood it clearly so I don't have a problem, even when I wake up, if you ask me about endothermic and exothermic reactions I can tell you about them because I did the practical and I saw it and understood and I experienced how to do it. So, ya, practicals, because of lack of instruments here in our school we haven't done much practical. The practical side has not been met but the calculation side has been met.	Intrinsic and extrinsic motivation
viii.	Starting from grade 10, I was a top learner in Physical Sciences here in my school and I am still a top leaner.	Intrinsic and extrinsic motivation
ix.	I was taught by the same educator	Intrinsic and extrinsic motivation
x.	I believe if you love something, the difficult part about this question is that, I did not think of this question because I love Physical Sciences, so I didn't see these difficulties, if you love something you practice it and then it becomes easier in you, so I haven't had any difficulties in Physical Sciences. The only subject I have difficulties is Mathematics, in Physical Sciences I wouldn't say.	Intrinsic and extrinsic motivation

xi.	When I leave school, I want to do something that has to do with Physical Sciences; it would be cool if I do chemical engineering or electrical engineering. I would do bachelor of science that would be great. Anything to do with Physical Sciences.	Personal background and contextual factors
[1]Sisipho's transcript for interview 1		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My mother likes to attend meetings and she is a hardworking person, she likes to cook and make sure everyone is ok. My father likes to attend meetings.	Personal background and contextual factors
ii.	I have a brother and last year he was doing matric and he failed and this year he is doing nothing, he did a learners and he didn't pass	Personal background and contextual factors
iii.	I speak isiXhosa. Sometimes I can say it's alright but sometimes I feel like I want to learn in my mother tongue. I struggle speaking English. It sometimes affects my school work but not all the time	Personal background and contextual factors
iv.	Because I want to do civil engineering. My inspiration was my grandmother because in the Eastern Cape there are no roads, like ambulances struggle to go to houses. So my inspirations was my grandmother so I wanted to do civil engineering so I can make roads so ambulances could go easily	Intrinsic and extrinsic motivation
v.	I am a hard worker. I was confidence because I told myself that I will do it, I can do it, because others did it, what will stop me? I chose physics because that is what I wanted to do.	Intrinsic and extrinsic motivation
vi.	I expected to do more practicals	Intrinsic and extrinsic motivation
vii.	Expectations have been met and I am happy that I chose the subject	Intrinsic and extrinsic motivation
viii.	In grade 10, I did struggle with physics, then I read my books and I started to become a little better than before. In Grade 12 I am starting to improve my marks	Intrinsic and extrinsic motivation
ix.	I was taught by the same teacher. I am happy	Intrinsic and extrinsic motivation
x.	Because I wanted to achieve my goal	Intrinsic and extrinsic motivation
xi.	Study civil engineering at CPUT	Personal background and contextual factors
[1]Nosipho's transcript for interview 1		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My parents are not working, my father was working in Gauteng in the mines, he got injured and is no longer working. They are living in the same house with my mother.	Personal background and contextual factors
ii.	I have three sisters and one brother. Only my two sisters are working.	Personal background and contextual factors
iii.	I speak IsiXhosa but I love English. I am confident in speaking it	Personal background and contextual factors
iv.	I chose Physical Sciences because of my marks and because of my parents who told me that I can do science there are a lot of opportunities, and because I am confident I can do my work and I know I will sacrifice because it's a very challenging subject.	Intrinsic and extrinsic motivation
v.	I am a hard-worker. It is challenging me sometimes so I cannot say it's easy. I am confident because I work hard and try by all means to pass it because I love the subject even though its challenging, but I try all my best then it's a challenging subject, then I cannot say I am the best learner.	Intrinsic and extrinsic motivation
vi.	I expected more practicals and more calculations. My expectations are to get the certificate of Physical Sciences and be a top learner and try to motivate other to choose Physical Sciences because there are a lot of opportunities that they get.	Intrinsic and extrinsic motivation
vii.	I am satisfied. We do practicals once a term.	Intrinsic and extrinsic motivation
viii.	Yes, there is an improvement, but in grade 11 really challenged me, but	Intrinsic and extrinsic

		motivation
ix.	I think it is good to change teachers, because sometimes you can listen to person but you don't exactly get what you want and the explanations of the teachers are not the same, they do not explain the same way	Intrinsic and extrinsic motivation
x.	It's because I am a very patient person and it's because I am looking at my background and looking at this subject and the opportunities that I can get and look at the way that I come from Grade 10 and think, how can I drop out? Because I have tried and tried	Intrinsic and extrinsic motivation
xi.	Nursing, I want nursing; my choices are nursing, pharmacy and biochemistry.	Personal background and contextual factors
[1]Afika's transcript for interview 1		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	I have a single parent, my mother passed away in 2002 and my father is now working in Mthatha. I live with my brother here in (Township mentioned). The conditions that I live in at home are fine. I can't complain.	Personal background and contextual factors
ii.	I have another brother in Free State, who is also working.	Personal background and contextual factors
iii.	I speak isiXhosa Well, English, I can't say much, because we need English these days, we need English to find work. We cannot learn in our own language some other subjects here in school because when you apply for work out there, you need to speak English fluently. I am confident speaking English	Personal background and contextual factors
iv.	My sister was my inspiration, she did Physical Sciences and she always used to tell me about how challenging it is, so I decided, let me take it and see these challenges she was speaking about.	Intrinsic and extrinsic motivation
v.	I can be confident sometimes and a bit shy sometimes. My self-confidence is not that much sir. I am not confident that much because I am still struggling with physics.	Intrinsic and extrinsic motivation
vi.	I expected practicals but now more like physics is mixing	Intrinsic and extrinsic motivation
vii.	Have not been met much, when I was in Grade 9, I thought ok, physics is about practicals, doing practicals all the time, I didn't know much about calculating, now I see there are both practicals and there is a little bit of calculation. We have done enough practicals.	Intrinsic and extrinsic motivation
viii.	I have never got code 4 in physics, it's code 3 and below	Intrinsic and extrinsic motivation
ix.	I was taught by different teachers from Grade 10 till now	Intrinsic and extrinsic motivation
x.	The love of it, I love Physical Sciences	Intrinsic and extrinsic motivation
xi.	Study IT	Personal background and contextual factors
[1]Khaya's transcript for interview 1		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My parents, I still have two parents, they are still alive both of them. They are working. My father is working as a caretaker and is trying by all means to put food on the table.	Personal background and contextual factors
ii.	I have brothers and sisters and they are all still at school. I am the eldest	Personal background and contextual factors
iii.	We speak isiXhosa. I feel good about learning in English, maneer. I like English, I struggle sometimes, but only because it is a must to understand English.	Personal background and contextual factors
iv.	I chose Physical Sciences because I like challenges, I like calculating and solving problems. My inspiration was my teacher from primary school.	Intrinsic and extrinsic motivation
v.	I am a shy person and at the same time I am confident. In grade 10 Physical Sciences, I can say it was very easy, because I knew	Intrinsic and extrinsic

	everything that I was taught, maneer.	motivation
vi.	I expected practicals and calculations because I like them and enjoy them.	Intrinsic and extrinsic motivation
vii.	My expectations have not been met because it is too theoretical and very few practicals	Intrinsic and extrinsic motivation
viii.	In grade 10, I was performing very good but in grade 11 it was becoming very difficult	Intrinsic and extrinsic motivation
ix.	I was taught by 4 different teachers, it is very difficult for me to adapt to the style of a particular teacher.	Intrinsic and extrinsic motivation
x.	It is because, meneer, what I want to do after school, it requires physics.	Intrinsic and extrinsic motivation
xi.	I want to study to be a doctor or pharmacist	Personal background and contextual factors

[1]Thulisile's transcript for interview 1

Research key item	Natural Meaning Units (NMUs) (reported in participant's own words)	Central theme
i.	My parents, actually I am living with my mother and in the meantime she is not working, she is unemployed. Life is quite difficult because she doesn't work and has to provide for me and I am not alone there, there is another dependant in the house, there is my brother who is attending school, he needs money for transport and she needs to provide for the house, sometimes she doesn't meet all the necessities or all the needs.	Personal background and contextual factors
ii.	I have a little brother, who is also at school.	Personal background and contextual factors
iii.	I speak isiXhosa. Well at first, English was not my favourite language, because sometimes I get teased when speaking it. I get teased by my friends and people around me and others, but I tried to push myself hard and tried to read magazines and all those newspapers just to regain my confidence speaking English, especially in front of the class but now I think I am quite comfortable since I am doing Grade 12 so next year I am going to see new people, new different places, so I need to try by all means to speak English fluently.	Personal background and contextual factors
iv.	Well I had a cousin sister, she is very good in science and she inspired me to do physics, because I thought she could help me with some projects and she also told me about the possibilities and the chances of jobs out there when you have Physical Sciences so I was inspired by her to doing Physical Sciences, but I don't think I will meet the requirements because when I was in grade 10, I found Physical Sciences more interesting, it was like, it was easy thing to do but as levels get higher I am struggling and I am not sure what caused it, because I had that interest but every now and again I lose it, and as a result I am dropping in my marks in Physical Sciences	Intrinsic and extrinsic motivation
v.	I am a hardworking person. My confidence has decreased a lot like in Grade 10, I was able to stand in front of a class and explain to them but now I can't do that anymore because I am not even sure if what I am talking about is right or not and I think it is because, I am not sure, but Physical Sciences is now getting very hectic. It is getting h difficult and difficult. I am trying to read my books but I still don't understand and I think maybe I don't make enough time, I don't know.	Intrinsic and extrinsic motivation
vi.	Actually, when I started doing Physical Sciences, I wanted to explore new things, I wanted to see how rockets meet up in the sky? I wanted to explore, I wanted to see different things in the world, like how the things are done out there, but now my interest is getting lower and lower and I am losing it.	Intrinsic and extrinsic motivation
vii.	We don't really do a lot of practicals here at school; maybe we just do them once a term. My expectations are not really met. My confidence keeps on degrading for Physical Sciences, it doesn't like go up and up so that I gain confidence to speak about physics to inform people about physics, to learn and explore, but every time, I get confused, I get my questions not to be answered, which makes it less interesting.	Intrinsic and extrinsic motivation
viii.	So in grade 10, I was trying to push myself and even got level 5 one time, but in grade 11 I dropped by a level to code 4 and when I started Grade 12, in March I had dropped to code 3, I tried to improve in June to code 4 but still now, I don't have hope because we didn't have a teacher for about a week.	Intrinsic and extrinsic motivation
ix.	The thing is, here at school from Grade 10, our Physical Sciences teachers were changed frequently, like in a term we would change two	Intrinsic and extrinsic

	teachers to get another teacher, which made me not to follow, we would change from this teacher to another teacher who would teach using or her methods.	motivation
x.	I can't drop because I can't change it now, I am in Grade 12, so I have no chance to change it, I just have to get hope and continue with my studies	Intrinsic and extrinsic motivation
xi.	I planned to do pharmacy but with my Physical Sciences results, I don't think I will meet the requirements, my second choice was nursing.	Personal background and contextual factors

[1]Nomawethu's transcript for interview 1

Research key item	Natural Meaning Units (NMUs) (reported in participant's own words)	Central theme
i.	My parents actually are in the Eastern Cape, I stay with my brother. My parents in the Eastern Cape are unemployed both and aunty is supporting me and my younger sister.	Personal background and contextual factors
ii.	My brother passed Grade 12 in 2009, and he has done Physical Sciences and mathematics but he passed poorly, he couldn't get good marks	Personal background and contextual factors
iii.	IsiXhosa. I am a little bit low on self-esteem because sometimes, I can't speak English. I prefer to be taught in isiXhosa. (last sentence is translated)	Personal background and contextual factors
iv.	I wanted to prove to someone that Physical Sciences is easy subject but I failed at Grade 10, I got code 2 every time, in Grade 11 term 1 I got code 3, term 2 code 4, term 3 I raised the bar with code 5 and last term	Intrinsic and extrinsic motivation
v.	I am a very shy person but I try to rate myself. I a little bit lost speaking English, but now in Grade 12, I try my best to speak English	Intrinsic and extrinsic motivation
vi.	In Physical Sciences I expected more practicals than theory	Intrinsic and extrinsic motivation
vii.	No, in our school we are poor, we don't have equipment. Sometimes we do practicals; we go to other schools to borrow some equipment. Only do formal experiments	Intrinsic and extrinsic motivation
viii.	I am not happy that I chose Physical Sciences	Intrinsic and extrinsic motivation
ix.	I was performing very bad, we were changing teachers. Our teacher is not doing well sometimes she could not answer the questions that is difficult for us	Intrinsic and extrinsic motivation
x.	I did not drop out because Physical Sciences is the subject that is needed mostly	Intrinsic and extrinsic motivation
xi.	I planned to study Chemical Engineering but I didn't meet the requirement for it with the report for term 2, but in term 1 I made it.	Personal background and contextual factors

4.4 Explicating the first interview

When I explicated the first part of the interview, the findings of this part of the interview are revealed within two central themes and eight NMUs. The central themes are (1) Personal background and contextual factors and study plans and (2) intrinsic and extrinsic motivation.

Table 4.2: Central Themes from interview 1

Central theme 1: Background, opportunities and plans for study	Central theme 2: Intrinsic and extrinsic motivation
1. Family structure and living conditions	1. Feelings about English as a language of instruction
2. Personality	2. Inspiration to do Physical Sciences
3. From field notes	3. Self-esteem and confidence in the subject
4. Plans for tertiary studies	4. History of academic experience

I used the central themes to outline the first part of this chapter as shown in Table 4.1. Drawing from my experiences both as a learner and teacher of Physical Science I felt I could relate to the lived experiences of the Physical Sciences learners, but I had to make a conscious decision to treat everything in the phenomenological manner by bracketing my own lived experience. This enabled me to explicate the phenomena under investigation objectively as if I am looking at each person's lived world and engagement with the subject like a complete foreigner to the field and subject. This ensured that I applied a pure phenomenological explication of the participants' transcripts. To add depth to our understanding of the participants, I included their descriptions that I had recorded on my field notes.

Gleaning from Devenish (2011), I decided to follow the path that is most suited to answer my research question, which he applied by drawing from Husserl's (1975) famous slogan of 'returning to the things themselves'. According to Husserl (cited in Devenish, 2001:20), the main idea in applying phenomenological data explication is "not to listen to a series of propositions", but to allow the data to speak for itself as divulged in the interviews. The idea of allowing the data to speak for itself allows the essential features of the phenomena under investigation to be revealed. Furthermore it also points to the sub-conscious undercurrents to be revealed. As Husserl (1970) referred to it as the eidetic residuum of each individual learner.

4.4.1 Participants' life-history portrait

In presenting my findings, I share the portraits of the life-history of the 12 participants; these portraits will be followed by discussions of central themes that framed the lived experiences of the participants. The portraits summarises participants' backgrounds and future goals. Each life-history portrait will also show supporting social relationships that help to support them throughout their educational career. I used the responses of the participants, to capture

these life-history portraits. These portraits will help to better understand why they responded in certain ways. This will also be helpful later when I interpret their experiences.

The main reason as to why I decided to share the participants' portraits of life history, is that researchers like Basu and Barton (2007) found that many learners from urban, low-income societies expressed negative sentiments about science, describing it a discipline that cause confusion, frustration, boredom and anxiety. They said the main reason these learners do not like science because it is not connected to their experiences or interests. With low passes in Physical Sciences in township schools, little research has been done on how it is that "connections to personal experience" affects the learner's lived experiences in learning the subject. Basu and Barton (2007) found that learners in urban, low-income neighbourhoods do develop a sustained interest in science, and that this interest is not always cultivated in school, therefore understanding the participants' life-histories will make us understand why they react in certain ways to situations and why they have persevered in the subject. Therefore, for this reason, I started by looking at the background, demographics and life history of participants. The academic performances of the participants are representative of diverse learner demographics of schools, from top achievers, to average learners and low achievers. The diversity among the individuals that comprise this purposeful sample was intentionally designed to offer me the depth and breadth of meaningful, lived experiences as Physical Sciences learners and to increase the opportunity for narrative descriptions that would be rich and insightful (Amparo 2013).

It should be noted that for all 12 participants, English is not their home language and at school they all do English First Additional Language as a subject. Most of the times their statements are not grammatically correct and have been quoted verbatim in this study. This is a point of interest because all learners in the country write the same Physical Sciences examination whether they do English Home Language or English First Additional Language. It is important to state that all participants were black Africans because there is evidence in the literature that western science education is not designed to promote healthy co-existence of western and African cultures but it is used for sanitising and civilising (Jegede 1993). This might affect the learners' lived experiences if there is conflict between the two worlds of science and culture such that the learner is torn between two worlds. African Society relies on interpersonal communication and learning is a communal activity where the learner is expected to be passive and give all authority to the educator (Jegede 1993). Western science is seen as public property and is divorced from religion while African cosmology is very secretive and always interwoven with religion.

Table 4.2, Profiles of the Participants, shown below summarises the family backgrounds of participants. For organizational purposes the participants are listed according to their

schools, School A is where I started my interviews and School C is where I conducted interviews last. This sequence is completely random and is not intended to rank the participants in any way. Herein, the participants are introduced using their pseudonyms. Later in the chapter, each participant will be described with more detail using information obtained from interviews and field notes.

Table 4.3: Profiles of participants

Participant	Gender	School	Parental structure
Vuyani	Male	School A	Single mother works as domestic worker. Father's whereabouts unknown
Luyolo	Male	School A	Single mother not working
Noluyanda	Female	School A	Single mother not working. Father died in 2007
Siphosethu	Female	School A	Both parents working
Fezile	Male	School B	Single mother, but not staying with her. Lives with 2 sisters
Yanga	Male	School B	Single working mother, Father is in prison. Father never helps
Sisipho	Female	School B	Father and mother, both are not working
Nosipho	Female	School B	Father and mother both are not working. Father was injured while working in mines
Afika	Male	School C	Single Father but not living with him. Mother passed away.
Khaya	Male	School C	Father and mother both working and trying very hard.
Thulisile	Female	School C	Single unemployed mother
Nomawethu	female	School C	Both parents are in the Eastern Cape.

4.4.1.1 Participant 1 "Vuyani"

Vuyani is raised by a single mother who works as a domestic in the suburbs of Cape Town. He is the eldest of three brothers. He feels that his family's living conditions are not very nice. The financial situation at home is not good, such that the youngest is in the rural areas being raised by grandparents. He lives in the crime ridden informal settlement.

He describes himself as a confident person and, by his own admission, says that he is a nice person and not physically violent but people think that he is a short-tempered person.

> "I would say I am a nice person but some people are saying I am a harsh person because I always be in an anger situation. I know how to control my short temper because I haven't hurt anyone"

He hopes to study marine studies after leaving school. My field notes described Vuyani as "confident and focused" during the interview. He has a deep voice which I jokingly referred to as a "radio voice".

4.4.1.2 Participant 2 "Luyolo"

Luyolo was also being raised by a single mother, his mother is unemployed. He says they are not struggling financially at home. He has four brothers and two younger sisters, two of the brothers are older than him and he is the middle child. None of the siblings is employed.

He says he is a good, shy and confident person. He was not shy during the interview. The field notes also include comments that I found out from him that he drives an “iphela” after school. Iphela is a Township name for informal taxis mainly old Toyota Cressidas and the newer Toyota Avanzas that transport people within the townships. He is very confident when he speaks; however, he a little trouble expressing himself in English.

4.4.1.3 Participant 3 “Noluyanda”

Noluyanda is also raised by a single unemployed mother, her father passed away. The living conditions are difficult, as they survive on the government grant. She has two elder siblings who don’t do much to assist the family financially. She describes herself as a hard worker who is also goal focussed. She once failed Physical Sciences and repeated a Grade, but she never gave up. She wishes to study medicine after leaving school. The field notes also include comments about how she spoke softly but confidently. Her fluency in English is average.

4.4.1.4 Participant four “Siphosethu”

Siphosethu’s family is quite well off by township standards, she lives with both her parents who are professional. Her family is stable financially but the place where they live is badly affected by crime. She is a middle child; she has two brothers, one is studying at a tertiary institution and the other one is in grade 1.The elder sibling is studying at tertiary level. She says she is a very calm person and that she is a go-getter who would anything to achieve her goals. She sounds very confident of herself and has a good command of the English language. She wants to become a psychologist. According to my field notes, Siphosethu spoke very fluently but had an accent. She spoke loudly and gave detailed answers.

4.4.1.5 Participant five “Fezile”

Fezile’s mother is a single parent and does not live with Fezile; she lives in the Eastern Cape. Fezile lives with his two elder sisters and only one of the sisters is working. He has one brother. He says he is a shy person. After completing high school, he wants to study electrical engineering. My field note described Fezile as cheerful and has a good sense of humour. He is attached to his educator as he needs constant encouragement. He is sensitive, humble, and very soft spoken.

4.4.1.6 Participant 6 “Yanga”

Yanga lives in the informal settlements with his mother and brother. His mother is employed but his father is in prison. This is what Yanga said about his family:

> "My father is in prison, he was arrested, I think it was around this year. Even when he is around, there is no change. Him and my mother are separated, so I only knew my father in 2012. My mother works here in Y store here in Township X and she works there."

Yanga is a bright learner and is very ambitious and talkative. Yanga says he is not a shy person but also not a loud person, in his own words, he said that he responds according to the situation. He says he loves his Physical Sciences and to him it is the easiest subject. He attends tutoring provided by an organisation called "Go for Gold". He is very passionate about Physical Sciences. In my field notes field notes Yanga is described as very intelligent, ambitious and talkative. Yanga spoke very rapidly and loudly; the field notes also include comments about how whole-heartedly Yanga answered questions, with extensive details and examples. He could not resist telling me how bright he was and how his classmates were envious of him.

4.4.1.7 Participant 7 "Sisipho"

Sisipho has both parents, she was not comfortable to talk about what her parents do, she just said the liked attending meetings. She has a brother who was doing matric in 2014 but sadly the brother did not pass well. Sisipho says that she is a hard worker. She wants to study engineering after school. In my field notes, Sisipho is listed as struggling to speak English and she says it sometimes affects her performance at school. She lights up when asked about her teacher. She is soft spoken and very determined to achieve.

4.4.1.8 Participant eight "Nosipho"

Nosipho lives with her unemployed parents; her father was injured in a mining accident in Gauteng. She has three sisters and one brother. Of the five siblings only two are working. After completing high school, she wants to study nursing, or pharmacy or biochemistry. In the field notes, I described Nosipho as a much focused person, she speaks confidently and clearly. She is also very much attached to her teacher.

4.4.1.9 Participant nine "Afika"

Afika has a single father, his mother passed away. He lives with his brother and the father is working in Mthatha. He has two working brothers. Afika is not really sure about his confidence and he says that he is struggling with Physical Sciences.

> "I can be confident sometimes and a bit shy sometimes. My self-confidence is not that much sir, I am not confident that much because I am still struggling with physics."

He wishes to study Information Technology. My field notes listed Afika as a bright eyed boy who spoke confidently but was deeply hurt by what was happening in his classroom. He is ready to give up on his dreams.

4.4.1.10 Participant ten "Khaya"

Both Khaya's parents are working and trying hard to make ends meets. He is the eldest child the other siblings are also at school. After matriculating, he wants to study medicine or pharmacy. According to my field notes, Khaya is a confident young man, who is focused to achieve. He speaks calmly and softly. You can see his disappointment when you ask him about his educator.

4.4.1.11 Participant eleven "Thulisile"

Thulisile is living with her single unemployed mother. Life is a struggle for them. She has a brother who is attending college and this poses a challenge for the mother to have money for bus fare for him.

> "My parents, actually I am living with my mother and in the meantime she is not working, she is unemployed. Life is quite difficult because she doesn't work and has to provide for me and I am not alone there, there is another dependant in the house, there is my brother who is attending school, he needs money for transport and she needs to provide for the house, sometimes she doesn't meet all the necessities or all the needs."

She planned to study pharmacy after school, but she fears that she will not qualify due to her poor results. Her second choice of study is nursing. According to field notes, Thulisile is a pained individual. Although she spoke confidently and clearly, she felt let down by her teacher and by her school. I could see the pain in her eyes as she spoke.

4.4.1.12 Participant 12 "Nomawethu"

Both Nomawethu's parents are unemployed and live in the Eastern Cape. She and her brother live with their aunt. She has a brother who didn't pass matric well.

She describes herself as someone who has a low self-esteem. She plans to study chemical engineering after matric. She describes herself as having very little self-esteem. My field notes listed the following attributes about Nomawethu "soft spoken and dejected". She struggles to speak English and seemed to have given up on her dreams. She was very angry, especially when asked about her educator.

4.5 Intrinsic and extrinsic motivation

The participants listed many aspects of their motivation to do Physical Sciences. Participants were motivated mainly by factors that were both intrinsic, e.g. love of science and extrinsic, e.g. encouragement by family members and career choices.

4.5.1 Feelings about English as a language of instruction

On analysis of all the twelve participants, it was discovered that only three of them spoke English well enough. This is evident in their statements which have grammatical mistakes; the statements are recorded here verbatim. In one instance, the statement had to be translated from isiXhosa to English. Despite their obvious struggle with the English language, nine out twelve participants felt that it is good to have English as a language of teaching and learning. Out of these nine participants, none of them mentioned how using English as a language of teaching and learning affects them academically. On the use of English as a language of teaching and learning, Vuyani feels that it helps to communicate with non-Xhosa speaking people. He said “It is good because it helps other children not speaking the language that we speak, which is isiXhosa, to understand better and it can collaborate other things and be together.” In this statement he uses a big word “collaborate”, I did not ask whether he knew what it meant. Vuyani’s views were echoed by Luyolo who felt that the use of English as a language of teaching and learning is very good as English unites people. He said “I am feeling good because English is a language that combines many people, because English is a language that you are getting connected with someone who does not speak isiXhosa. I am confident to speak English”. Noluyanda says that although she struggles a lot with English, she would like it to remain the language of teaching and learning because it is a language that is used in many sectors. “She says “I struggle a lot in English but I would like the language of instruction remain English because everywhere we talk English”. Siphosethu articulated the same sentiments as she feels that English is a language that unites people, therefore, according to her, English should be used as a language of instruction. “I feel really well because English is a language whereby it combines; it unites people of this country because it is the only language that brings communication with other people of different countries. I am confident speaking English”

Yanga was the most articulate of all the participants, he says he loves English and tries by all means to understand the language as it is the only way to the future because the institutions of higher learning use it. However, by his own admission, he is not very good at English but really spoke well. He said “To be honest with you, I love English, but, although it’s not my home language, but I am trying by all means to understand English and I am trying to speak it so that I can understand the language, because I believe that in order to make it in life, I

must prepare myself for the future because in high institutions English is the only language that is being spoken so, I must prepare myself for that. So I love speaking English although I am not good at it, but I am trying." Nosipho said she loves speaking English but she is not very fluent even though she says she is confident speaking it. She said "I speak IsiXhosa but I love English. I am confident in speaking it." Afika also weighed in with his views, he said "Well, English, I can't say much, because we need English these days, we need English to find work. We cannot learn in our own language some other subjects here in school because when you apply for work out there, you need to speak English fluently. I am confident speaking English". Thulisile says that at first she didn't like English because she was being teased speaking the language. She says this teasing made her more determined to learn the language and started reading newspapers and magazines to improve her language. Now she is comfortable speaking the language.

> "Well at first, English was not my favourite language, because sometimes I get teased when speaking it. I get teased by my friends and people around me and others, but I tried to push myself hard and tried to read magazines and all those newspapers just to regain my confidence speaking English, especially in front of the class but now I think I am quite comfortable since I am doing Grade 12 so next year I am going to see new people, new different places, so I need to try by all means to speak English fluently."

Khaya put it more clearly, says that he likes being taught in English even though he still struggles with the language. When further probed, he clarifies and says it is because English is compulsory.

> "I feel good about learning in English, maneer. I like English, I struggle sometimes, but only because it is a must to understand English."

Three participants felt that they would prefer to be taught in their mother tongue. Fezile, who struggles a lot to speak English, said he would prefer to be taught in his mother tongue, which is isiXhosa. This is what he had to say:

> "I don't know what to say but English is killing me because every time when I have to speak to a person who is speaking English, I feel like I can faint sometimes, because of fear. I prefer mother tongue teaching"

His sentiments were echoed by Sisipho who thinks that, although it is alright to learn in English, there are times when she feels that she wants to learn in isiXhosa.

> "Sometimes I can say it's alright but sometimes I feel like I want to learn in my mother tongue. I struggle speaking English. It sometimes affects my school work but not all the time"

Nomawethu struggles to speak English and couldn't finish whole sentences in English. She clearly says that she prefers to be taught in isiXhosa. She says "I am a little bit low on self-

esteem because sometimes, I can't speak English. I prefer to be taught in isiXhosa." (The last sentence is translated).

4.5.2 Why they chose Physical Sciences

In all the three schools where this study was conducted, what emerged invariably was that there were no active programmes for helping grade 9 learners to choose subjects in the FET phase. According to the learners and through personal communication with some of the physical science teachers the schools have stringent conditions for those wishing to do Physical Sciences and mathematics in Grade 10. For example, some research participants and teachers pointed out that those learners who fail mathematics and Physical Sciences in grades 10 and/or 11 to rather switch to mathematical literacy and history. These subjects are described as softer/easier subjects so that the schools average pass percentage during the National Senior Certificate examinations are improved. Therefore, some learners stated that they feel pressured to focus on knowing the content and not so much on understanding how the content relate to their everyday lived experiences outside of the school environment even before starting the lessons. These negative pressures are evident in the learners' responses to the interview question about who inspired them to enrol for Physical Sciences. Most of the learners said that they were not inspired by their teachers to do Physical Sciences. Only two of the learners were inspired by teachers to do Physical Sciences, Vuyani said "my grade 9 teacher told me that I must do Physical Sciences because I was good in technology and natural sciences" and Fezile who stated "My Grade 10 Physical Sciences teacher encouraged me to do science. She said there were many opportunities in physics". Furthermore, even though Fezile was encouraged by his Grade 10 Physical Sciences teacher to do the subject, he still thinks that his first inspiration was his sister. He says "First of all, my sister is my inspiration." He did not mention the reason why her sister is her inspiration, but looking at Fezile's background, his sister is the only person working in the family. All other learners were inspired by their own ambitions and love for the subject, or by the people in the community and family members. Four of the participants were inspired by their sisters to do Physical Sciences, none of them mentioned brothers.

Most of the participants chose Physical Sciences because of the career choices, for example, Luyolo said "because it is what I want to be in life needs me to do Physical Sciences and other, like maths so that I can achieve to be an engineer". For others like Sisipho, it was not only about a career choice, but also about serving the community and family, she said the following about hers career choice: "Because I want to do civil engineering. My inspiration was my grandmother because in the Eastern Cape there are no roads, like ambulances struggle to go to houses. So my inspiration was my grandmother so I wanted to do civil engineering so I can make roads so ambulances could go easily"

4.5.3 Effect of academic experiences on confidence in the subject

During the interviews, the questions 'How would you rate your self-esteem and self-confidence in the subject Physical Sciences as you entered grade 10?" and "Could you give me a brief history of your academic experiences in Physical Sciences from grade 10." were asked as separate questions, but during the explication process, when I created my research key, I combined the responses. The reason why I combined the responses was that every participant answered these questions in a similar fashion. The learners' academic experiences affect their self-confidence. All participants had high confidence when they started in Grade 10.

Four learners reported that their confidence has decreased. Noluyanda said bluntly "My confidence has dropped." She says this was caused by repeating Grade 10 because she failed. Fezile had this to say "Confidence was not that much, because I didn't trust myself". He says this was caused mainly by the fact that he struggles with the English language and that affects his performance in Physical Sciences. Fezile says, "I don't know what to say but English is killing me because every time when I have to speak to a person who is speaking English, I feel like I can faint sometimes, because of fear. I prefer mother tongue teaching". Afika says that "he can be confident at times, although he is not confident that much". Nomawethu is not confident; she lacks self-esteem that is according to her.

There were five learners who felt that their confidence in the subject has remained high. Luyolo says that he is confident because that is what he is interested in. Siphosethu was "raring to go from Grade 10, and although there are some things that she doesn't understand" she is still says that she is confident. Yanga said that his confidence is still high as he is still a top performer. He said the following, when asked about his confidence in the subject:

> "I think my marks will say a lot about that because in Physical Sciences is my top subject. I love Physical Sciences, no other subject, it's Physical Sciences the best and I want to it, I want my career to relate in Physical Sciences, so the passion of Physical Sciences is growing day and day in me, so Physical Sciences, I am so in love with it. I love Physical Sciences."

Sisipho is also still very confident in the subject; she says "if others can do it, then what will fail me?" Two other learners reported an improvement in their confidence in the subject. These felt that the more they practiced the subject, the better they performed and this led to an increase in confidence. This is what Nosipho said:

> "It is challenging me sometimes so I cannot say it's easy. I am confident because I work hard and try by all means to pass it because I love the subject

> even though its challenging, but I try all my best then it's a challenging subject, then I cannot say I am the best learner."

Siphosethu supported what Nosipho said, although she put her point of view in a slightly different manner.

> "My self-esteem, I believe in myself when I say I am doing this. In grade 10 I was raring to go, because I was so curious about it and to learn more about it. As time went by I became more confident although at times there are things that you don't understand about the subject you are doing but you continue to do the subject"

Three participants felt that their confidence in the subject had decreased. Afika's confidence in the subject also not changed, but his reasons were different to those of Yanga. He says he is not confident enough in the subject because he is still struggling. Vuyani's the only learner whose confidence in the subject is continually altering as he changes teachers and grades.

4.5.4 Expectations when choosing Physical Sciences

When asked what they expected when they Physical Sciences, most learners said the expected to do more practical work and do many calculations. All the participants recognised the importance of doing practical work but they did not agree on whether enough practicals have been done. Yet, six of the participants felt they have done enough practicals. Fezile said, "Expectations have not yet been met, because we do few practicals", he is supported by Yanga who said "To be quite honest with you, to the side of the practicals we haven't done much experiments". Four other participants share these sentiments about practical work in their Physical Sciences classes. Some of those who said their expectations about practicals were being met still had some doubts, for example Nosipho said, "I am satisfied. We do practicals once a term." Nosipho's statement shows that the practicals are only done for those compulsory practicals that form part of the School Based Assessment (SBA). This is further confirmed by Nomawethu who said, "in our school we are poor, we don't have equipment. Sometimes we do practicals; we go to other schools to borrow some equipment. Only do formal experiments" and Thulisile who said "we don't really do a lot of practicals here at school, maybe we just do them once a term"

4.5.5 Changing educators

Out of the 12 participants, the vast majority, i.e. 8 participants had changed Physical Sciences educators from Grade 10 to Grade 12. The four participants who had not changed educators were from School B. This question brought many different responses from the participants.

Table 4.4: Opinions about changing educators

Response	Changed Educators and liked it	Changed educators and hated it	Changed educators but had no opinion about it	Did not change educators and liked it	Did not change educators and hated it
Number of respondents	1	7	2	1	1

Most participants did not like changing educators, like Vuyani said "From Grade 10 to 12 I had 4 Physical Sciences teachers; I don't think it was good idea. If a teacher is teaching you grade 10, must teach that learner in grade 11 and even in Grade 12", he was supported by Luyolo who said "I changed teachers, it was disturbing." Noluyanda mentioned that she would have preferred to continue with her Grade 10 educator. Khaya was of the view that changing educators makes it difficult for him, he said "I was taught by 4 different teachers, it is very difficult for me to adapt to the style of a particular teacher." In Khaya's case, it was very extreme as he changed educators four times in three years. Thulisile, from the same school as Khaya echoed Khaya's sentiments by saying:

> "The thing is, here at school from Grade 10, our Physical Sciences teachers were changed frequently, like in a term we would change two teachers to get another teacher, which made me not to follow, we would change from this teacher to another teacher who would teach using or her methods."

Sisipho was very happy that she did change educators during the FET phase of her education. She said "I was taught by the same teacher. I am happy". In contrast to Sisipho, Nosipho did not like having the same teacher from Grade 10 to Grade 12. She had this to say:

> "I think it is good to change teachers, because sometimes you can listen to person but you don't exactly get what you want and the explanations of the teachers are not the same, they do not explain the same way"

Siphosethu liked being taught by different teachers, she said:

> "I was taught by different teachers. I think it is a better way of changing teachers because some other times I don't understand him so it's better to have something from another person so that you can understand that teacher. I prefer to change teachers."

Two of the participants, Fezile and Yanga did not have an opinion on this.

4.6 Classroom climate and interactions with educator and peers

Next I turn my focus to the second phase of the data construction phase. In the second phase of data construction, I explicate the learner's experience in the science classroom by focusing mainly on the interactions with their peers and their Physical Sciences educators.

Table 4.5: Transcripts for interview 2: Interactions with educator

Vuyani's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My teachers always inspire me to become a person who is better and be a provider in my family, I would say	rather state classroom interaction with teacher
ii.	I wouldn't say it was inspiration from myself. There was a student who was doing Grade 12, so he always inspire me to do Physical Sciences because it has lots of opportunities than other subjects. Mainly the students but not really the teachers	Academic interactions
iii.	Our Grade 12 teacher, I would say he is a good teacher and is inspirational. Playing a big role in doing the subject.	Interaction with Physical Sciences teacher in classroom
iv.	Teachers must not be too harsh to children but engage with children and ask some questions if the student doesn't understand. Teachers must do more practicals because some students understand that part of the subject by doing practicals Fair enough, my teacher he teach us very well, makes it relevant to everyday life Not competitive, I want to pass more than 50%	Personal opinions about learning in Physical Sciences
v.	Some learners disturb and teachers throw them outside. I don't want to be a science teacher, it is very complicated working with children	Social and affective interaction with educator
vi.	I want the subject more, but my teachers always tell me, if I drop out I will be nothing so I had to stay and practice more. I did not want to drop out of the subject, to me it was fun and one of the easiest subjects	Academic interactions
vii.	My teacher is quite friendly; they do not discriminate even if you don't pass the subject.	Social and affective interaction with educator
viii.	Lessons are well prepared and feeling inspired, I am getting more about Physical Sciences	Social and affective interaction with educator
ix.	Grade 10 teacher in 2012, she was great, she was inspiring children to stay in school and not drop out.	Personal opinions about learning in Physical Sciences
x.	No unsuccessful interactions	Social and affective interaction with educator
xi.	Extra lessons, you get to ask some more questions and there is more time after classes. During school hours there is not enough time, we need to move on to another topic. Physical Sciences, if for example, a certain student wants to be in electrical engineering, then thy should have career days	Personal opinions about learning in Physical Sciences
xii.	Depends on the chapters, like chemical equilibrium I would like to leave	Academic interactions
xiii	I like working with my science teacher, he is friendly.	Social and affective interaction with educator
Luyolo's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My self-esteem has changed through the years as the teacher gave me inspiration that I must focus on my studies because I am not doing well, now I am doing my best to make them proud and even myself to be proud of Physical Sciences.	Academic interactions
ii.	I developed because I kept reading my books, doing all work that they gave me. The role that the teacher is playing they inspire us with all the work that they give us. The science teacher encourages.	Academic interactions
iii.	The teachers are patient and kept themselves busy with us so that we can understand. They don't want to leave the learner without understanding. The teachers are all the same. My neighbour has a big impact on my science.	Personal opinions about learning in Physical Sciences
iv.	Teachers must be polite when they teach children and have time to just make learners feel comfortable.	Personal opinions about learning in Physical Sciences

v.	Friendly, everyone is enjoying in the physics classroom, no one is fighting, it's all fun	Social and affective interaction with educator
vi.	It is myself who is inspiring himself to remain doing the subject, because I saw many opportunities in Physical Sciences, without even going to the engineering I can do even more.	Academic interactions
vii.	They are good I can say can approach them anytime. My Physical Sciences teacher means to me a lot as a parent, he advises me to do things that are good in life.	Social and affective interaction with educator
viii.	I feel quite good because I do understand physics, I do give attention.	Social and affective interaction with educator
ix.	My best teacher is from Grade 11, he was very nice and he was also nice to all other children and inspires learners to learn.	Personal opinions about learning in Physical Sciences
x.	No unsuccessful interactions	Social and affective interaction with educator
xi.	More practical work so that we can learn easily. We need more excursions so that people can know the way out about other people and get inspiration from other people not here at school.	Personal opinions about learning in Physical Sciences
xii.	Sometimes they are effective, sometimes they are not because things we cannot understand at the first time. Lessons motivate to do science.	Academic interactions
xiii.	I feel quite good because I was happy with them and even now I am happy.	Social and affective interaction with educator
Noluyanda's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	Self-esteem has changed and the teachers played a big role in my transformation because I have now learnt more about Physical Sciences and I am able to understand it. My grade 10 teacher was my biggest influence	Academic interactions
ii.	I have developed because now I am more confident now but I seem not to understand my Grade 12 teacher like I understood my Grade 10 teacher	Academic interactions
iii.	My grade 10 teacher, she explains it and makes sure you understand before she moves on to another chapter. She is patient with the learners and makes sure you understand. Being patient makes her different.	Personal opinions about learning in Physical Sciences
iv.	Teachers should be more patient because we are not all active to get something quickly, we need time to think and understand it.	Personal opinions about learning in Physical Sciences
v.	Climate is very friendly but sometimes it is frustrating because there are those who want to be forward and not give us a chance, hogging the limelight and look down on us.	Social and affective interaction with educator
vi.	I persisted because of encouragement from teachers and my own inspiration, because if you don't work hard you cannot succeed	Academic interactions
vii.	I am able to approach them. Sometimes if I didn't understand something in class I go to him at break time and he will explain to me	Social and affective interaction with educator
viii.	Depends on the topic. Momentum, I don't like it. The teacher moved too fast and I didn't understand it	Social and affective interaction with educator
ix.	Means a lot to me, taught me many thing's	Personal opinions about learning in Physical Sciences
x.	Grade 10 teacher because she was very patient and motherly and caring	Social and affective interaction with educator
xi.	Yes it helped me because when doing an experiment you are able to see it better more than when someone talks about it. They must introduce job shadowing.	Personal opinions about learning in Physical Sciences

xii.	Mostly, the lessons are effective, there are learners who disrupt classes but usually the teacher chucked them out.	Academic interactions
xiii.	I fell happy working with my grade 10 teacher.	Social and affective interaction with educator
Siphosethu's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My self-esteem has changed very well, because compared to Grade 11 to 12. My teachers played a huge role through the transformation because they were always there to support me through the way.	Academic interactions
ii.	My teachers have been very supportive.	Academic interactions
iii.	They are people that can be approachable, they make sure that if I didn't get something, they explain it, they make sure that I do understand what they are teaching in front of the class, they are passionate about it. Science teachers differ, in Physical Sciences, it's an enjoyable class. There are no other ways of doing this thing.	Personal opinions about learning in Physical Sciences
iv.	I must say, they must be more patient to their students and sometimes make jokes, because when a teacher makes jokes about something in class, it's easier to get that knowledge, even if that teacher asks you about it the following day, it won't be difficult to understand.	Personal opinions about learning in Physical Sciences
v.	I would say it is friendly, because it's a communication of two people; you and your teacher, so it's friendly on my side. Other learners are patient. There is healthy competition, even if someone gets more marks that you, it makes you push harder.	Social and affective interaction with educator
vi.	I didn't drop out because my science teacher played a huge role in my persistence in the subject, because he made sure I got what I wanted and understand in class.	Academic interactions
vii.	They are friendly, sometimes you find it difficult to discuss with your friendly, the teachers are there to support you. If you didn't understand something in class, you go to them. They are approachable.	Social and affective interaction with educator
viii.	I feel more relaxed, and I have a high self-esteem and believe in myself because it is about the subject I would like to do the most.	Social and affective interaction with educator
ix.	Means a lot to me. The best science teacher I ever had was in Grade 11. Is a very friendly teacher. He made sure that when I am not feeling well or I didn't do well in an assessment, he reaches a point to ask why I didn't do well and helps me understand.	Personal opinions about learning in Physical Sciences
x.	No unsuccessful interactions.	Social and affective interaction with educator
xi.	There is need for extra classes. Practical work helped me a lot, when you do practicals, you get more knowledge.	Personal opinions about learning in Physical Sciences
xii.	Lessons are motivating.	Academic interactions
xiii.	I feel relaxed when I work with him.	Social and affective interaction with educator
Fezile's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	It has decreased, for example I started getting code 6 in physics, now I am getting code 4 and 5. The teacher must do more to encourage us	Academic interactions
ii.	She must encourage me to focus in physics and maths	Academic interactions
iii.	My teacher is a good teacher. She does her work. She makes things become easy.	Personal opinions about learning in Physical Sciences
iv.	Teachers should start with basics and move to difficult ones.	Personal opinions about learning in Physical Sciences
v.	It is interesting because I always learn something new.	Social and affective

		interaction with educator
vi.	Teacher encourages me not to give up and says practice makes perfect.	Academic interactions
vii.	She is approachable and understands our problems. She is like a mother to us. She makes us feel special. She understands our problems and helps us.	Social and affective interaction with educator
viii.	She explains and makes us happy and we learn new things	Social and affective interaction with educator
ix.	She means the world to me. Good teacher, she keeps encouraging learners.	Personal opinions about learning in Physical Sciences
x.	No unsuccessful interactions.	Social and affective interaction with educator
xi.	We need excursions and job shadow.	Personal opinions about learning in Physical Sciences
xii.	Classes are effective and motivate me. I want to learn more	Academic interactions
xiii.	She inspires confidence in me and always helps me.	Social and affective interaction with educator
Yanga's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My self-esteem has not changed. I am still a high achiever.	Academic interactions
ii.	My teacher, starting from grade 10, has helped me a lot in terms of question papers and textbooks. She made me continue in Physical Sciences. In grade 11 there were some topics she was not good at, so I went through the topics at home. My teacher is very helpful.	Academic interactions
iii.	She does care, wow. She is caring a lot. She want a person who is willing to learn. She will do whatever is in her powers to help you, even if it's not about Physical Sciences. She helped me register for NBT tests.	Personal opinions about learning in Physical Sciences
iv.	Physical science is the subject that I pass the most. So it helps to develop the relationship with the teacher. I believe, when you pass a teacher's subject, she changes the way she looks at you. So you develop a bond. Too much theory does not help. Teachers need to do informal experiments to help learners.	Personal opinions about learning in Physical Sciences
v.	I have a problem with other learners in my class. They are jealous. If I make a mistake they laugh at me. It's not good at all. At Go For Gold and Kutlwanong they make it personal competition	Social and affective interaction with educator
vi.	She makes time for us	Academic interactions
vii.	Learners are harassing every time. My teacher noticed and asked me to be calm. I don't give these learners attention.	Social and affective interaction with educator
viii.	She means a lot to me, she is a person that I will never forget. I really appreciate what she has done	Social and affective interaction with educator
ix.	At Go For Gold, there are three teachers, I love my teacher but there are teachers that are better than her and they satisfy me.	Personal opinions about learning in Physical Sciences
x.	I didn't understand Faraday's law last year because my teacher did not understand it.	Social and affective interaction with educator
xi.	In grade 10, we went to Ithemba Laboratories. Go For Gold is a good project but it's based in construction. I want a career that has to do with Physical Sciences. Go For Gold took us to excursions and helps you to discover what you like.	Personal opinions about learning in Physical Sciences
xii.	Frustrating	Academic interactions
xiii.	Some teachers are better	Social and affective

		interaction with educator
Sisipho's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My self-esteem has not changed, because she always inspires us about science, and she always tells us that there are many opportunities, there are many companies that can hire you with science and maths. My teacher is a role player.	Academic interactions
ii.	I study and go to extra classes. Actually my teacher is the one that finds us places to do extra classes, like Kutlwanong	Academic interactions
iii.	Our teacher is helpful. There is no much difference. Our Physical Sciences teacher is a big inspiration.	Personal opinions about learning in Physical Sciences
iv.	Teachers should do more practicals. When you don't know everything. I ask the teacher to help me	Personal opinions about learning in Physical Sciences
v.	Lessons are frustrating sometimes, when you don't understand.	Social and affective interaction with educator
vi.	I think she is good teacher. She is very important; she means a lot and inspires to do something.	Academic interactions
vii.	I would like to do more practicals. Lessons are helpful a lot and is friendly	Social and affective interaction with educator
viii.	I feel calm and confident.	Social and affective interaction with educator
ix.	She helps us and explains, if she can't explain she will find someone who will explain it better. She is open when she doesn't know something. It is a good characteristic and she doesn't want to feed us wrong information.	Personal opinions about learning in Physical Sciences
x.	None	Social and affective interaction with educator
xi.	Job shadowing will help get more information.	Personal opinions about learning in Physical Sciences
xii.	I feel inspired. She understands other people	Academic interactions
xiii.	My teacher inspires.	Social and affective interaction with educator
Nosipho's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	Yes, I got a low self-esteem because I didn't pass June examination. I almost gave up but then I reminded myself on why I chose Physical Sciences. I then motivated myself. My teacher dis help big time and got a tutor for us and encouraged me.	Academic interactions
ii.	It's my hard work, teacher encourages and advices	Academic interactions
iii.	She is very kind and helpful and encourages us. She is different because she is the only teacher teaching Physical Sciences.	Personal opinions about learning in Physical Sciences
iv.	Teachers need to be patient, and need to work together with learners and give learners a chance to see what the subject is about. Sometimes it's frustrating and it needs a lot of time.	Personal opinions about learning in Physical Sciences
v.	There is healthy competition	Social and affective interaction with educator
vi.	She encourages the learners and reminds learners about backgrounds	Academic interactions
vii.	She is approachable and understand learners and even discussing personal things	Social and affective

		interaction with educator
viii.	I feel special and blessed. I feel I have confidence	Social and affective interaction with educator
ix.	She means the world; she has been encouraging from Grade 9. She is great because she teaches us very well and makes the time for us.	Personal opinions about learning in Physical Sciences
x.	No unsuccessful interactions.	Social and affective interaction with educator
xi.	Needs to have excursions	Personal opinions about learning in Physical Sciences
xii.	Motivating, calming and I like to be in Physical Sciences class big time. Sometimes the lessons are effective.	Academic interactions
xiii.	I feel grateful and thankful to her and encouraged by her	Social and affective interaction with educator
Afika's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	It has changed, I am not confident now. The issue of changing teachers and some teachers are not effective	Academic interactions
ii.	Most of the times I fail Physical Sciences. I can't blame anyone. The problem is me	Academic interactions
iii.	She was not explaining well. The teacher is not approachable, her face is always angry.	Personal opinions about learning in Physical Sciences
iv.	Must do more practicals and must be friendly and give learners time to ask questions.	Personal opinions about learning in Physical Sciences
v.	Sometimes it is fair. Learners laugh at each other. The teacher can't control it.	Social and affective interaction with educator
vi.	My class teacher in Grade 10, life sciences teacher encouraged me.	Academic interactions
vii.	I was not very close to my Physical Sciences teacher. Here characteristics makes us keep our distance.	Social and affective interaction with educator
viii.	Sometimes motivated, sometimes frustrated.	Social and affective interaction with educator
ix.	Very important because you can't do anything without a teacher. Physical Sciences teacher in Grade10 was friendly and supportive.	Personal opinions about learning in Physical Sciences
x.	Bad things happen in the classroom. Disharmony in the classroom	Social and affective interaction with educator
xi.	We do practicals but not the way I expected when I chose Physical Sciences	Personal opinions about learning in Physical Sciences
xii.	I gain a lot in Physical Sciences class even though there are disruptions. I always feel motivated	Academic interactions
xiii.	I was confident working with her.	Social and affective interaction with educator
Khaya's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	My self-esteem has not changed; I was a little bit less confident when I started because I didn't concentrate on it that much. I	Academic interactions

	started to get it in grade 11. Afternoon classes helped a lot. The teacher didn't help us much to be honest.	
ii.	Teacher encouraged us a lot; a teacher in Grade 10 encouraged and said that I had potential when I repeated Grade 10.	Academic interactions
iii.	The class is disruptive so all the time when the teacher is standing in front of us there are casualties and learners make noise and silly comments, so our teacher decided to sit and not teach, just write notes and classwork on the board and sit down and let us do it on our own.	Personal opinions about learning in Physical Sciences
iv.	We need to do more practicals, if we did more practicals and afternoon lessons every day, people will like Physical Sciences and understand it better.	Personal opinions about learning in Physical Sciences
v.	Fair, frustrating and competitive, some students are brighter. I am not the brightest; I try to be in the same level as those brighter.	Social and affective interaction with educator
vi.	The encouragement from teacher and love of subject	Academic interactions
vii.	The new teacher is more approachable, the older teacher, I cannot say much about her, there was no connection between her and the students. The subject was boring and frustrating.	Social and affective interaction with educator
viii.	I feel frustrated and lost.	Social and affective interaction with educator
ix.	I can't say she meant that much. She did not mean anything, she helped us a lot in the in the beginning. This class is a combination of two classes. Last year's teacher was more approachable. The teacher does not offer support	Personal opinions about learning in Physical Sciences
x.	My Grade 10, my Physical Sciences teacher was approachable and eager to teach. She loved challenges. Planning was good	Social and affective interaction with educator
xi.	There is need to do more practicals and excursions. Excursions and practicals will help and going to laboratories to do experiments	Personal opinions about learning in Physical Sciences
xii.	We have not been learning a lot because of the changes with the teachers. The teaching styles are different and there is no continuity, we carry on our own without our teacher.	Academic interactions
xiii.	I was scared of our teacher, she was bitter, she answers harshly	Social and affective interaction with educator
Thulisile's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	It did, it dropped a lot. I want to skip the role of the teacher	Academic interactions
ii.	I did not get enough encouragement from teacher. I did not get enough support from my teacher, I got a vibe that discouraged.	Academic interactions
iii.	She tried to make the subject more interesting at some point, but at some point we get we get demotivating from my teacher, but we tried to push ourselves. She is very discouraging and shouting.	Personal opinions about learning in Physical Sciences
iv.	Teachers should come ready for class to teach and should have more examples for each topic. At first I thought Physical Sciences was not that difficult, but as time goes because of the teacher, I thought it was the most difficult. Lots of lessons were not well prepared.	Personal opinions about learning in Physical Sciences
v.	Lessons are frustrating and not well prepared. Learners are not disciplined, too much noise. There is not much competition but frustration.	Social and affective interaction with educator
vi.	I actually got support from my family, I can't talk much about my teacher. What made me remain is the support I got from my family, from my cousin, from my friend. I want to be a pharmacist but I can't say much about my teacher. I am sorry.	Academic interactions
vii.	My Physical Sciences teacher, despite that she is teaching me Physical Sciences, outside the class she gives me motivation that I didn't expect to hear from her. Sometimes she approached me alone and told me about how to succeed. It was different from classroom, because in the classroom she is someone else, outside she is friendly. The class had an effect on her, she was too moody.	Social and affective interaction with educator
viii.	Get bored in the classroom, feel sleepy. Sometimes I have interest but the class is noisy and I lose my interest	Social and affective interaction with educator

ix.	The best science teacher from Grade 10, he taught me. Physical Sciences and I still remember those topics that I did with him. He was active and always ready for the classroom. Always tried to ensure that the learners are listening attentively. He moved at the correct pace and I got code 5 in Physical Sciences. The Grade 10 teacher was approachable.	Personal opinions about learning in Physical Sciences
x.	There are a lot of unsuccessful interactions with my teacher, but I try to push myself.	Social and affective interaction with educator
xi.	Job Shadow.	Personal opinions about learning in Physical Sciences
xii.	Yes, excursions and the science week. Lot more excursions are needed, we need to feel that we live science	Academic interactions
xiii.	I was normal, I expected nothing much and nothing less. I expected her to do things as she normally does, nothing exciting, everything average	Social and affective interaction with educator
Nomawethu's transcript for interview 2		
Research key item	**Natural Meaning Units (NMUs) (reported in participant's own words)**	**Central theme**
i.	Our teacher didn't play much role, sometimes when she couldn't answer, she will drop out the questions. Many questions were not answered.	Academic interactions
ii.	Teacher didn't play much, I had to work on my own. Teacher didn't encourage us. Makes things difficult	Academic interactions
iii.	No, she is a difficult person; she does not know how to explain. She doesn't answer questions, she always says , I don't know.	Personal opinions about learning in Physical Sciences
iv.	Teachers should make more practicals because they help us understand concepts.	Personal opinions about learning in Physical Sciences
v.	Fair, you can ask questions	Social and affective interaction with educator
vi.	She encouraged very little and made threats that if you don't know then you won't know science	Academic interactions
vii.	She is easy to approach but will always say, come the following day for your answer.	Social and affective interaction with educator
viii.	Physical Sciences lessons are boring	Social and affective interaction with educator
ix.	No science teacher was ever good.	Personal opinions about learning in Physical Sciences
x.	Skip the question	Social and affective interaction with educator
xi.	No excursions have been done	Personal opinions about learning in Physical Sciences
xii.	I enjoy more Physical Sciences because I now understand	Academic interactions
xiii.	I like working with her, but she could have done more and be more approachable. She was moody, she is like the weather.	Social and affective interaction with educator

4.7 Classroom experiences

The second part of this chapter is about finding how institutional experiences affect the participants' lived experiences as Physical Sciences learners. Many interview questions sought to understand the level of educator support to learners. After reading and rereading the interview transcripts of the second part of the interview, I identified 3 central themes from this part of the interview. Once the central themes were located, I used them to arrange how each heading and sub-heading will follow each other. I used the table below, to arrange my chapter.

Table 4.6: How the second part of Chapter 4 is arranged

Central theme	Academic interaction with educator	Social and affective interaction with teacher	Personal opinions about learning in Physical Sciences
Sub-headings	Role of educators in the development of self-esteem and development as a science learner	Physical Sciences classroom climate	What makes the science educator different
	Role of educator in the persistence in the subject	Social and affective experiences with the Physical Sciences Educator	Giving advice to Physical Sciences Teachers
	Role of educators in the academic achievement	Feelings during Physical Sciences lessons	Best science teacher you ever heard
		Feelings about working with the Physical Sciences educator	What the Physical Sciences teacher means to me
		Unsuccessful interactions with Physical Sciences educator	Extracurricular activities to be added

4.7.1 Role of educator in personal transformation

The participants were asked to give a brief description of the role of their educators in their personal and academic development as Physical Sciences learners. In personal development, five participants said their self-esteem had increased over the years, only four of these participants attributed the increase in their self-esteem was due to the influence of their Grade 12 educator. Vuyani said "My teachers always inspire me to become a person who is better and be a provider in my family, I would say", Luyolo concurred with him by saying "My self-esteem has changed through the years as the teacher gave me inspiration that I must focus on my studies because I am not doing well, now I am doing my best to make them proud and even myself to be proud of Physical Sciences". Siphosethu concurred with them by saying "My self-esteem has changed very well, because compared to Grade 11 to 12. My teachers played a huge role through the transformation because they were always there to support me through the way".

One participant felt that the biggest influence in increased self-esteem was their Grade 10 Physical Sciences educator. Noluyanda said "Self-esteem has changed and the teachers played a big role in my transformation because I have now learnt more about Physical

Sciences and I am able to understand it. My grade 10 teacher was my biggest influence" One other participant, Khaya felt that afternoon classes helped him a lot. He said "My self-esteem has not changed; I was a little bit less confident when I started because I didn't concentrate on it that much. I started to get it in grade 11. Afternoon classes helped a lot. The afternoon classes are normally conducted by educators from other schools who come and do tutoring.

Two learners said their self-esteem has not changed over the years. They said their self-esteem was high when they enrolled for Grade 10 and it is still high. Sisipho said "My self-esteem has not changed, because she always inspires us about science, and she always tells us that there are many opportunities, there are many companies that can hire you with science and maths. My teacher is a role player". For Yanga, his self-esteem remained high because he has always been a top achiever. Yanga said "My self-esteem has not changed. I am still a high achiever."

Two participants felt that educators caused them to have a decreased self-esteem, Afika said "It has changed, I am not confident now. The issue of changing teachers and some teachers are not effective", his sentiments were echoed by Thulisile, who was so angry and said "It did, it dropped a lot. I want to skip the role of the teacher". Nosipho on the hand felt that her low self-esteem is due to her own short-comings. She said "Yes, I got a low self-esteem because I didn't pass June examination. I almost gave up but then I reminded myself on why I chose Physical Sciences. I then motivated myself. My teacher did help and got a tutor for us and encouraged me to continue".

4.7.2 Role of educator in academic transformation

The role of the educator in the development of learners as science learners was so limited according to most participants' responses. Seven participants felt that their teachers played a limited in their development. Vuyani said "I wouldn't say it was inspiration from myself. There was a student who was doing Grade 12, so he always inspire me to do Physical Sciences because it has lots of opportunities than other subjects, mainly the students but not really the teachers". Vuyani was supported by Fezile, who said "She must encourage me to focus in physics and maths", and Khaya was blunt in his criticism of the role of Physical Sciences in developing him as a science learner, he said "The teacher didn't help us much to be honest.". Nomawethu was another learner who was not happy about the role of Physical Sciences educators on her development as a science learner. She said "Teacher didn't play much, I had to work on my own. Our teacher did not encourage me. Makes things difficult". Noluyanda credited her development to her Grade 10 Physical Sciences educator and not to

her Grade 12 teacher. She said “I have developed because now I am more confident now but I seem not to understand my Grade 12 teacher like I understood my Grade 10 teacher”

Three participants felt that the educator played a minor role in their development as science learners. Luyolo’s response to this question was “I developed because I kept reading my books, doing all work that they gave me. The role that the teacher is playing they inspire us with all the work that they give us. The science teacher encourages”. The role of the educator was added after further prompting. Yanga felt that, although his educator was helpful, she had limitations when it came to content knowledge. He said “My teacher, starting from grade 10, has helped me a lot in terms of question papers and textbooks. She made me continue in Physical Sciences. In grade 11 there were some topics she was not good at, so I went through the topics at home. My teacher is very helpful”

One participant, Nosipho, felt that most of the development was due to her handwork and the educator just plays a supporting role. She said “It’s my hard work, teacher encourages and advices”. Only two participants felt that their educators played a significant role in their academic development. Sisipho said “I study and go to extra classes. Actually my teacher is the one that finds us places to do extra classes, like Kutlwanong”. Kutlwanong is a Saturday tutoring program run by mathematics and Physical Sciences educators. Siphosethu felt that her teachers were very supportive. She said “My teachers have been very supportive”.

4.7.3 Role of educator in academic persistence

Although most participants did not see an educator as a big role player in their academic development as a Physical Sciences learner, it was quite surprising that the many of the participants felt that the Physical Sciences educators played a big role in their persistence in the subject. Five participants felt that their Grade 12 Physical Sciences educators helped them to persist in the subject. Noluyanda said “I persisted because of encouragement from teachers and my own inspiration, because if you don’t work hard you cannot succeed”, she was supported by Siphosethu who said “I didn’t drop out because my science teacher played a huge role in my persistence in the subject, because he made sure I got what I wanted and understand in class”. Fezile also felt that his educator has played a significant role in his persistence in the subject. He said “Teacher encourages me not to give up and says practice makes perfect”. Yanga was very brief and said “She makes time for us”. One participant, Afika felt that his persistence was due to his Grade 10 life sciences educator, he said “My class teacher in Grade 10, life sciences teacher encouraged me”.

Four participants said they persisted because of their own motivation. Vuyani said “I want the subject more, but my teachers always tell me, if I drop out I will be nothing so I had to stay and practice more. I did not want to drop out of the subject, to me it was fun and one of the

easiest subjects" and Luyolo also felt that he persisted because of his career choices, he said "It is myself who is inspiring himself to remain doing the subject, because I saw many opportunities in Physical Sciences, without even going to the engineering I can do even more". Two of these four were not happy about the role of their educators, Thulisile was very angry about the role played by her teacher, she said:

> "I actually got support from my family, I can't talk much about my teacher. What made me remain is the support I got from my family, from my cousin, from my friend. I want to be a pharmacist but I can't say much about my teacher. I am sorry"

Thulisile was supported by an angry Nomawethu who said "She encouraged very little and made threats that if you don't know then you won't know science".

4.8 Social interactions with educators and peers

A number of interview questions sought to find out how the learners viewed the levels of academic support from educators and about how the learners interact with other learners.

4.8.1 Classroom climate

The participants described their classroom climates with a variety of feelings. Only four participants expressed completely positive feelings about their classroom climate. Luyolo said it is "Friendly, everyone is enjoying in the physics classroom, no one is fighting, it's all fun "Siphosethu concurred with him by saying "I would say it is friendly, because it's a communication of two people; you and your teacher, so it's friendly on my side. Other learners are patient. There is healthy competition, even if someone gets more marks that you, it makes you push harder". Fezile is the only participant that described the classroom climate as interesting; he said "It is interesting because I always learn something new". I think Fezile wanted to say the lessons are effective and that in every lesson he learns something. Nosipho felt that there is healthy competition. In this statement, "healthy competition" means there are no ill-feelings towards each other when they compete.

Four participants expressed mixed feelings about their classroom climate. Noluyanda said "Climate is very friendly but sometimes it is frustrating because there are those who want to be forward and not give us a chance, hogging the limelight and look down on us". Afika is another participant that expressed mixed feelings about what happens in the classroom, he said "Sometimes it is fair. Learners laugh at each other. The teacher can't control it". Khaya also expressed mixed feelings, he said "Fair, frustrating and competitive, some students are brighter. I am not the brightest; I try to be in the same level as those brighter". Nomawethu concurred with them by saying "Fair, you can ask questions".

Four participants were really frustrated by what goes on in their Physical Sciences classrooms. Vuyani said there is a lot of disturbance coming from other learners. He said "Some learners disturb and teachers throw them outside. I don't want to be a science teacher, it is very complicated working with children", Yanga is another participant who was frustrated by his fellow classmates' behaviour in the classroom; he said "I have a problem with other learners in my class. They are jealous. If I make a mistake they laugh at me. It's not good at all. At Go for Gold and Kutlwanong they make it personal competition". Sisipho also expressed frustration during lessons; she said "Lessons are frustrating sometimes, when you don't understand."

4.8.2 Social and affective experiences with educator

Eight participants were happy to report about the positive social and affective experiences with their Physical Sciences educators. Most of these participants saw the value of an approachable educator who can give advice and career guidance. Most of the participants really liked being cared for by an educator. Luyolo stated that "They are good I can say can approach them anytime. My Physical Sciences teacher means to me a lot as a parent, he advises me to do things that are good in life". His sentiments were echoed by Fezile who said "She is approachable and understands our problems. She is like a mother to us. She makes us feel special. She understands our problems and helps us". Nosipho weighed in with her views on the educator who gets to know them personally, she said "She is approachable and understand learners and even discussing personal things". Vuyani highlighted the importance of educators treating every learner fairly without discriminating learners in terms of ability of learner. He said "My teacher is quite friendly; they do not discriminate even if you don't pass the subject". On the other hand, Noluyanda emphasised on the importance of being able to approach the educator outside the classroom in order to get personal attention, she said "I am able to approach them. Sometimes if I didn't understand something in class I go to him at break time and he will explain to me". Yanga expressed his relief, because his educator supported him in times of difficulty, he said "Learners are harassing every time. My teacher noticed and asked me to be calm. I don't give these learners attention". It seems that Yanga is being targeted by other learners in his class, because, according to him, they are jealous of his top achievement.

From the results, the educators from Schools A and B are very approachable and help to enrich learners' experiences. However, not the same can be said about the educator in School C. The participants in School C reported bad experiences on social and affective interactions with their educator. Afika said that he wants to keep his distance from his educator by saying "I was not very close to my Physical Sciences teacher. Her characteristics make us keep our distance". Khaya concurs with Afika by exclaiming "The

new teacher is more approachable, the older teacher, I cannot say much about her, there was no connection between her and the students. The subject was boring and frustrating". Their two other classmates were a little kinder in their comments. Thulisile had reported bad experiences with her educator in the classroom, but felt that her educator was different outside the classroom. She said

> "My Physical Sciences teacher, despite that she is teaching me Physical Sciences, outside the class she gives me motivation that I didn't expect to hear from her. Sometimes she approached me alone and told me about how to succeed. It was different from classroom, because in the classroom she is someone else, outside she is friendly. The class had an effect on her, she was too moody."

Nomawethu concurs with Thulisile that the educator is approachable outside the class but still does not answer their questions. She said "She is easy to approach but will always say, come the following day for your answer".

4.8.3 Feelings during lessons

Seven participants said they had positive feelings during lessons. They gave various reasons as to why they had those feelings. Vuyani said he was inspired because the lessons were well prepared. He said "the Lessons are well prepared and feeling inspired, I am getting more about Physical Sciences". Luyolo's positive feelings were due to the fact that he understands the subject, he said "I feel quite good because I do understand physics, I do give attention". He did not say whether it was because of the educator that he understands. Siphosethu said she was quite relaxed during lessons, she exclaimed that "I feel more relaxed, and I have a high self-esteem and believe in myself because it is about the subject I would like to do the most". Fezile felt happy because his teacher explained well, he quipped by saying "She explains and makes us happy and we learn new things". Sisipho said she felt 'calm and confident' while Nosipho said "I feel special and blessed. I feel I have confidence".

Three participants expressed mixed feelings during Physical Sciences lessons. Noluyanda said how she feels during lessons depends on the topic, she said "Depends on the topic. Momentum, I don't like it. The teacher moved too fast and I didn't understand it". Afika said he felt "Sometimes motivated, sometimes frustrated". Thulisile was not happy because "Lessons are frustrating and not well prepared. Learners are not disciplined, too much noise". Yanga on the other hand feels inspired by the educator but his classmates make it difficult for him.

Two participants expressed mixed negative feelings during lessons. Khaya said "I feel frustrated and lost", while Nomawethu put it bluntly by saying "Physical Sciences lessons are boring". Yanga was another participant who expressed positive feelings during lessons.

4.8.4 Educator effects on academic experiences

With regards to the educator effects on academic experiences, some participants expressed that they had mostly positive experiences during lessons. Siphosethu said “Lessons are motivating”, she was supported by Fezile who said “Classes are effective and motivate me. I want to learn more”. Sisipho replied in support of Fezile and Siphosethu by saying “I feel inspired. She understands other people”. Nomawethu said she enjoys Physical Sciences because she now understands it.

Other participants expressed mixed feelings. Vuyani said “Depends on the chapters, like chemical equilibrium I would like to leave” while Luyolo said “Sometimes they are effective, sometimes they are not because things we cannot understand at the first time”. Noluyanda concurred with them that the lessons invoke different feelings. Noluyanda said “Mostly, the lessons are effective, there are learners who disrupt classes but usually the teacher chucks them out”. Afika expressed similar sentiments by saying “I gain a lot in Physical Sciences class even though there are disruptions. I always feel motivated” and Nosipho said “Motivating, calming and I like to be in Physical Sciences class big time. Sometimes the lessons are effective”.

Three participants expressed negative academic experiences in their Physical Sciences. Yanga had a one word answer for this question, he said “Frustrating”. Khaya was more open when answering this question, he said “We have not been learning a lot because of the changes with the teachers. The teaching styles are different and there is no continuity, we carry on our own without our teacher”. Thulisile said “I was normal; I expected nothing much and nothing less. I expected her to do things as she normally does nothing exciting, everything average”.

When asked about any unsuccessful interactions with their educators, only three two participants said they have had unsuccessful interactions and one participant didn’t want to answer the question. Nomawethu said “Skip the question”.

4.8.5 Feelings when working with Physical Sciences educator

When asked about how they feel when they are working with their educators, the participants expressed various feelings. When I was explicating these responses, I categorised them into three categories, viz, (i) positive feelings, (ii) mixed feelings and (iii) negative feelings. I then took the keywords from each of the participants’ responses and sorted them into a table (see Table 4.5). This table helped me to write about how they feel.

Table 4.7: Keywords used to describe feelings when working with Physical Sciences educator

Positive feelings	Mixed feelings	Negative feelings
Like; friendly Happy Relaxed Inspired (twice) Grateful: thankful Confident	Like, moody	Some educators are better Scared Nothing less, nothing more

Eight participants described working with their educators with positive feelings and emotions. The findings suggested that they enjoyed working with their educators. Vuyani said “I like working with my science teacher, he is friendly”. Luyolo agreed with Vuyani by saying “I feel quite good because I was happy with them and even now I am happy”. Some participants preferred working with their Grade 10 educators to their Grade 12 educators; Noluyanda said “I feel happy working with my grade 10 teacher”. Some participants portrayed feelings of relaxation and inspiration. Siphosethu said “I feel relaxed when I work with him” and Fezile said “She inspires confidence in me and always helps me”. Sisipho echoed Fezile’s sentiments by saying “She inspires confidence in me and always helps me”. Another participant expressed sentiments of gratitude. Nosipho said “I feel grateful and thankful to her and encouraged by her”. Afika said “I was confident working with her”.

One participant expressed mixed feelings about working with the Physical Sciences Educator. Nomawethu said “I like working with her, but she could have done more and be more approachable. She was moody, she is like the weather”. This reflected unpredictability of her teacher.

Three participants expressed negative feelings about working with their Physical Sciences educator. Yanga felt that some teachers are better. Yanga has been exposed to extra tuition at Go For Gold. Khaya said “I was scared of our teacher, she was bitter, she answers harshly”. Thulisile was equally not happy about working with her teacher, she said “I was normal, I expected nothing much and nothing less. I expected her to do things as she normally does, nothing exciting, everything average”

4.9 Personal opinions about learning in Physical Sciences

Participants were asked questions to give advice to Physical Sciences educators and to give their personal opinions about teaching and learning in Physical Sciences.

4.9.1 What makes your educator different?

When asked about how what they think makes their educator different, eight participants were very positive when describing their educators and the other four were very negative. None of the participants expressed mixed feelings. The positive responses came from

participants from all the four participants from School A and all four participants from School B, while the four participants from School C were all negative.

The participants really liked being cared for by the educator. Yanga exclaimed “She does care, wow. She is caring a lot. She wants a person who is willing to learn. She will do whatever is in her powers to help you, even if it’s not about Physical Sciences. She helped me register for NBT tests”. NBT tests are National Benchmark Tests that the learners write at various Universities, these test the learners aptitude and are used in the selection of learners by the universities for certain courses. These tests can also be used to support the learner academically once they are selected for a certain course. The idea for a caring, helpful, inspirational and approachable educator was appreciated by most participants. Vuyani said “Our Grade 12 teacher, I would say he is a good teacher and is inspirational. Playing a big role in doing the subject”, his sentiments were echoed by Luyolo who said “The teachers are patient and kept themselves busy with us so that we can understand. They don’t want to leave the learner without understanding”. Siphosethu is happy because “They are people that can be approachable, they make sure that if I didn’t get something, they explain it, they make sure that I do understand what they are teaching in front of the class, they are passionate about it. Science teachers differ, in Physical Sciences, it’s an enjoyable class. There are no other ways of doing this thing”. Participants were also happy when the educator made work to be easier, Fezile said “My teacher is a good teacher. She does her work. She makes things become easy”.

Four participants were unhappy about their educators, and all four of them were from School C. Afika said “She was not explaining well. The teacher is not approachable, her face is always angry”. Afika was supported by his classmate Khaya who said “The teacher didn’t help us much to be honest. The class is disruptive so all the time when the teacher is standing in front of us there are casualties and learners make noise and silly comments, so our teacher decided to sit and not teach, just write notes and classwork on the board and sit down and let us do it on our own”. Thulisile was more critical of their educator when she said “She tried to make the subject more interesting at some point, but at some point we get we get demotivating from my teacher, but we tried to push ourselves. She is very discouraging and shouting”. Her views were echoed by Nomawethu who said “No, she is a difficult person; she does not know how to explain. She doesn’t answer questions, she always says , I don’t know”.

4.9.2 Learners’ advice to educators

The participants offered advice to educators. Multiple participants advised educators to connect theory to practical. From the analysis of the learners’ comments, it is evident that

many educators do not link theory with practical work; Vuyani said “Teachers must do more practicals because some students understand that part of the subject by doing practicals”. Vuyani’s sentiments were echoed by Yanga who said “Too much theory does not help. Teachers need to do informal experiments to help learners”. Sisipho also felt that “Teachers should do more practicals”. Khaya felt that in addition to practical work, extra lessons are also needed; he said “We need to do more practicals, if we did more practicals and afternoon lessons every day, people will like Physical Sciences and understand it better”. Another dimension was added by Afika who felt that besides doing more practical work, educators need to be patient and also answer learners’ questions. Afika said “We need to do more practicals, if we did more practicals and afternoon lessons every day, people will like Physical Sciences and understand it better”. Afika’s statement shows that some educators are not patient, which is a worrying thing especially when dealing with a challenging subject like Physical Sciences.

Another advice that came up was that educators needed to be polite and patient when dealing with learners. Luyolo said “Teachers must be polite when they teach children and have time to just make learners feel comfortable”. This statement tells us that at times learners feel uncomfortable because of the way educators treat them. Luyolo’s sentiments were echoed by Noluyanda who said “Teachers should be more patient because we are not all active to get something quickly, we need time to think and understand it”. This statement made me wonder if educators were not impatient with slow learners. This was because another participant had similar sentiments, Siphosethu said “I must say, they must be more patient to their students and sometimes make jokes, because when a teacher makes jokes about something in class, it’s easier to get that knowledge, even if that teacher asks you about it the following day, it won’t be difficult to understand”. Similar statement was said by Nosipho when she said “Teachers need to be patient, and need to work together with learners and give learners a chance to see what the subject is about. Sometimes it’s frustrating and it needs a lot of time”.

Fezile advised educators to start from basics, he said “Teachers should start with basics and move to difficult ones”. Thulisile was frustrated that educators come to lessons ill-prepared. She said “Teachers should come ready for class to teach and should have more examples for each topic. At first I thought Physical Sciences was not that difficult, but as time goes because of the teacher, I thought it was the most difficult. Lots of lessons were not well prepared”

4.10 Summary

Chapter 4 presented the data explication using an adaptation of Giorgi's phenomenological method in order to describe the lived experiences of Grade 12 Physical Sciences learners. Twelve Grade 12 Physical Sciences were interviewed to better understand their lived experiences. This chapter discussed the central themes that emerged while the data were explicated. Through the interviews, demographics, five themes and their clusters were listed. Each participant provided details about their lived experiences. I felt that this was necessary to accurately portray the learners' frustrations, joys, perceptions and needs. The central themes and natural meaning units that were revealed by the data were expounded upon using statements from each learner to give a true sense of the experience. I used these findings to draw the conclusions that I will discuss in Chapter 5 and implications that I will discuss in Chapter 6.

CHAPTER FIVE
DISCUSSION OF FINDINGS

5.1 Introduction

This chapter presents a discussion of the research findings drawn from data presented in chapter 4. It further provides a discussion of themes, research questions, and the conclusions reached. The study investigated the experiences of 12 Physical Sciences learners from Township Schools in Cape Town. In Chapter 4 I presented the findings of each individual learner's experiences using the five central themes that arose from the data explication process. I emphasised on using the participants' words verbatim to describe their experiences with the phenomena, which is learning Physical Sciences. I tried to get into the minds (inner consciousness) of each individual participant. According to Hurssel (cited in Koopman 2013), insight into the inner consciousness of each individual is a central part of phenomenological research. This study involved 12 participants who were selected purposely, from whose interview transcripts the data were constructed. I gained richer understanding of their perceptions and insights relating to their experiences in learning Physical Sciences by exploring their inner consciousness. The interview data formed the basis of my explication in Chapter 4.

In Chapter 5, I reflect on the research process and provide a summary of it while bearing in mind the uniqueness of each individual learner's experiences. Finally, I shall discuss the implications of the major findings of the study.

5.2 Reflections on the results

The main source of the data that were explicated in Chapter 4 was semi-structured interviews and field notes. These interviews provided access to the inner consciousness of the respective learners (Koopman 2013). I focussed on their consciousness since this helps reveal meaning and understanding through their stories. I chose the phenomenological methodology because it illuminates the participants' experiences of learning Physical Sciences. The phenomenological method was the most appropriate method that could be used to answer my research questions more accurately than any other method. In addition, phenomenology reveals authentic data to show the essence of experience and its significance (Tembo 2016). This means that phenomenology gives a deeper and richer elucidation to science teaching and learning in order to improve the pedagogical practices of science teachers. Phenomenology foregrounds the human experience and brings a holistic approach to teaching learners. In this study, each participant is understood from an individual perspective. This approach helps in achieving the purpose of the study.

The purpose of the study was to:

- get deeper understanding of the perceptions held by learners divulged through their stories;
- give disadvantaged learners a voice to tell their stories;
- give educators the chance to understand the views that the learners bring into classrooms, so that they can understand the needs of the learners
- make educators aware that, they not only affect the learner's engagement with the content, but also have a responsibility to support the learners;
- shed light and insight into what goes on in the mind of learners as they are taught Physical Sciences;

The purpose of this phenomenological study was achieved through answering the research question. The main research question is:

How do Grade 12 learners from selected schools in the Western Cape experience Physical Sciences as a school subject?

The research question was answered by critically investigating:

1) What role do the learners' backgrounds, future career choices and self-conceptions have in their science learning experiences?

2) What are the learners' views of their Physical Sciences educators and the classroom climate?

3) To what extent are the learners expectations met in the Physical Sciences classroom?

Each interview question focused on a different aspect of answering the research question. As a result of this study, five themes emerged, which were: (i) personal background and contextual factors, (ii) intrinsic and extrinsic motivation, (iii) academic interactions,(iv)personal opinions about learning in Physical Sciences and (v)social and affective interaction with educator. These themes were further analysed to generate a statement of essences that describe the phenomenon of lived experiences of grade 12 Physical Sciences learners.

In the next section, I will discuss these sub-questions and subsequently discuss the final question.

5.3.1 Effect of learners' backgrounds and future career choices on their science learning experiences

In Chapter 4, I presented the narrative of the 12 participants' experiences of learning Physical Sciences. I used both their backgrounds and contextual factors in order to understand why they responded in certain ways. The biographic profile of the participants purposefully sampled to show 50% male and 50% female. Seven of the 12 participants were from single parent families. The learners in this study moved through personal emotional journeys explaining their lived experiences. Their experiences show how they are determined to escape the social and economic realities of living in the informal settlements that are characterised by high crime rate and high unemployment. Their biographies capture the interplay between social, economic and psychological dimensions of their thoughts. These findings are supported by prior research, Eccles et al. (1983), found that educational and career decisions of a learner are linked to their expectations for success and the value that the learners place to the options that they think they have. A number of factors can be attributed to a learner's decision to choose Physical Sciences. Their goal is to study science related courses at university. It is the notions of goal commitments and personal aspirations are the ones that keep learners persistent in the subject. This goal commitment is included in the models in persistence and retention models and literature. Most of the participants continued in the Physical Sciences classes because of their career choices when they leave school. The findings revealed that the participants' background and future study plans help them to cope with difficult learning environments and various emotions they go through when learning Physical Sciences. Their motivation influences almost every aspect of their learning experiences in Physical Sciences classrooms. It is reasonable to assume that the learners' life histories as revealed from the interview responses direct their consciousness. Their stories capture the interplay between social, educational and economical dimension. This notion is consistent with Astin's (1984) model of student involvement that learner's environment and experiences influences learner's persistence and retention.

Many Physical Sciences learners drop the subject in Grade 10 and 11, therefore because of the high levels of subject abandonment, the learners who enrol for Physical Sciences at Grade 12 are already a group that is focused and motivated. The research findings supported the notion that learners from urban, low-income communities can develop sustained interest in science and that this interest is not always developed at school (Basu & Barton 2007). Many participants in this study were motivated by encouragement from family and community members as well as their own career choices. The findings also supported the research of Basu and Barton (2007), as it manage to find a strong link between a sustained interest in doing physical science and real opportunities for learners to develop skills that moved them toward their own futures plans, and these include both personal and

professional desires. For example, when asked why she chose to do Physical Sciences, Sisipho said “Because I want to do civil engineering. My inspiration was my grandmother because in the Eastern Cape there are no roads, like ambulances struggle to go to houses. So my inspirations was my grandmother so I wanted to do civil engineering so I can make roads so ambulances could go easily” Most of the learners see doing Physical Sciences as an opportunity to escape poverty. However, even with such high motivation, many do not enjoy success with Physical Sciences.

The findings showed that learners who were struggling academically had a low self-esteem when it came to the subject. These findings were consistent with previous research, for example the results of George's (2000) study on measuring students’ attitudes towards science show that science self-concept is the influence of attitudes toward science throughout the high school years. George (2000) found that self-concept had a bigger effect on attitudes more than teacher variables. This implies that by strengthening learners’ science self-concept it may be possible to increase involvement and commitment to science. The findings also supported research of Gorham and Christophel (1992) that learners are more likely to blame the educator or educator behaviours for their lack of motivation and then credit themselves and their career choices for their being motivated. The learners’ states of motivation were directly linked to educator characteristics. The educators in School A and School B were described as approachable and friendly people by their learners. The learners in School A and School B were all motivated. The educator in School C was seen as unapproachable and unfriendly and her learners were not motivated.

In general, the findings from this study confirm findings of Gorham and Christophel (1992) that the learners’ perceptions that the educator behaviours de-motivate them more than motivate and that motivation is caused by context factors such as interest in science and the relevance of science in their lives and career choices. There is also evidence that shows that learners lose motivation due to some ineffective teaching. Some learners who had low self-esteem became motivated during the FET phase experience in Schools A and B. Surprisingly; some learners of the “bad” educator of School C were motivated. In School A and B where we had “good” educators, some learners in their classes were not motivated.

All the participants were isiXhosa home language speakers; they did English First Additional Language as a school subject. Most of them were not fluent in English and yet they mostly preferred to be taught in English. Their preference to learn in English had nothing to do with learning of scientific concepts; they said they preferred English because it is a language for in which the National Senior Certificate examination will be written and for future endeavours it is used for business and higher education programmes. Only three participants said they would prefer to be taught in their mother tongue.

The findings of the study suggest interplay between learners' backgrounds, their future plans and their relationships with their educators and peers on how they experience being taught the subject. The results revealed six factors that make learners persevere and cope with their lived experiences of learning Physical Sciences. These six factors are consistent with the findings of Lubben et al. (2010). The learners persevere because:

(i) they have an interest in the subject

Participants said they chose the subject because they love it. For example, Noluyanda said "I love it; I love the practicals it involves". Her sentiments were echoed by other participants like Yanga and Afika. Yanga said "Firstly I saw my potential in natural sciences in grade 9, I got code 6, then I saw that I am in love with this, and then let me do this science thing then", Afika was brief in his statement, he said "The love of it, I love Physical Sciences".

(ii) they are achieving good results in the subject

There were also participants who justified their choices on the basis of good marks. Yanga said "Firstly I saw my potential in natural sciences in grade 9, I got code 6, then I saw that I am in love with this, and then let me do this science thing then".

(iii) they have extracurricular experience in subject area

Some participants referred to the influence of extracurricular activities, Yanga said "In grade 10, we went to Ithemba Laboratories. Go For Gold is a good project but it's based in construction. I want a career that has to do with Physical Sciences. Go For Gold took us to excursions and helps you to discover what you like".

(iv) they have role models

Role models were also mentioned by the participants, Thulisile said "cousin sister, she is very good in science and she inspired me to do physics, because I thought she could help me with some projects and she also told me about the possibilities and the chances of jobs out there when you have Physical Sciences"

(v) they enjoy some topics

Some topics that they enjoy were mentioned, for example Yanga said "For instance last year we did exothermic and endothermic reactions and I understood it clearly so I don't have a problem, even when I wake up, if you ask me about endothermic and exothermic reactions I can tell you about them because I did the practical and I saw it and understood and I experienced how to do it"

(vi) their families encourage them

Family also plays an important role for the learner to persevere in the subject, for example Siphosethu said" My brother was the one who inspired me".

5.3.2 Learners' views of their Physical Sciences educators and the classroom climate

The interviews in this study revealed these interactions: subject experiences, educator interactions and peer interactions. The findings support existing literature and models relating to learner persistence, highlighting the role of social and academic integration (Astin 1984). Academic integration involves elements of personal development and academic self-esteem while social integration involves the degree to which learner interacts with educators.

The major finding in this study is that many learners believe that their lived experiences were being negatively affected by their educators. Many of them said they started off with high self-esteem and high expectations when they enrolled for the subject at Grade 10 level. At Grade 10 level, most participants had a high self-esteem, mainly because upon entering Grade 10, learners must choose the subjects which they will do in the FET phase. Because many schools set high standards for learners as a requirement to do Physical Sciences and mathematics, many learners who enter Grade 10 are already motivated for these subjects because they are aware of what is required from them group. Many of them experienced dissatisfaction in the way the educators are teaching them. This dissatisfaction might be caused by their educators' negative consciousness. Koopman (2013) found that many Physical Sciences educators had negative consciousness that generated their ways of thinking and directed their ideas and this affected the way they taught Physical Sciences. He says that educators were not always conscious of their impact on learners. Eccles et al. (1983), model emphasises the importance of socialisers such as educators and peers in directing how they access, interpret their lived experiences (Aschbacher et al. 2010). This study supports findings that learners are influenced by their relationships and their daily social interactions with other people around them.

In order to have effective science education, it is important to create environments for maximising learning success (Fonseca & Conboy 2006). The findings in this study show that learners perceive lack compassion and support from some teachers. Relationships between learners and teachers are governed within the cultural context of African tradition as a relationship between young and old. In this relationship, elders must to be respected and elders are responsible for managing order. This is well reflected in the results that I obtained. The educators are leading and the learners are following, this leads to a bit of dissatisfaction on the learner side. The findings show that the learners experienced unique interactions with

their educators in the classrooms. These unique interactions depended on the characteristics of the teachers. The responses from learners echoed findings from other research (see Lee et al. 2003) where Physical Sciences educators in high schools are described as directive, controlling and not supportive of student expectations.

Learners in School A and in School B perceived their educators and classroom climates much more favourably than those in School C who saw their educator as a very unfriendly, nasty and uncaring individual. In the interviews, the differences between the three schools were clearly revealed; the differences arose from the fact that the educators had different characteristics.

In school B and C, the educators lacked full content knowledge according to some learners. In school B the teacher was aware of her lack of content knowledge, therefore she encouraged her learners to attend various tutoring activities. She was described as friendly and motherly. In school C, educator was dismissive to the learners, and all her learners had no kind words to say about her.

The findings of the present study were constituent with the findings of Dickie et al. (2006) which found that learners equated good teaching with respect for learners, encouragement, openness and approachability. Science teachers need to be aware of the relationship between learners' perception of the learning climate in classes and their persistence and success. It is the role of the educator to set up the classroom environment.

5.3.3 To what extent are the learners expectations met in the Physical Sciences classroom

Most of the participants said they expected to do more practical work. The research findings show that there is very little practical work being done, most of the time the practical work that was done were the formal practicals. Formal practicals, according to CAPS, are compulsory and must be part of the School Based Assessment (SBA). These compulsory practicals are done once a term. One of the reasons given by learners was lack of laboratory equipment in the schools. The research findings supported the notion that educators see doing practicals as less important than covering the theory needed to pass the National Senior Certificate examination (Koopman 2013:230). One educator was quoted saying:

> "There is simply no time for practical work. Not even during the week"
> (Koopman 2013: 230)

This puts pressure on learners and negatively affect their lived experiences. In their quest to improve the pass rates, the educators are ignoring an important expectation of learners, i.e.

practical work. Most of the learners said they enrolled for Physical Sciences hoping that there will be many practical.

Of the eight participants that had changed Physical Sciences educators between Grade 10 and Grade 12, a whooping seven did not like the change. Most of them would have preferred to continue with their Grade 10 educator. The findings did not suggest that remaining with the same educator throughout the FET phase will improve the lived experiences, as the remaining four participants that did not change educators, only one of them liked the idea. Two participants that did not change educators had no opinion about it and one hated the idea of remaining with one educator.

In analysing learner descriptions of how their educators affect their lived experiences, the learners believed that building positive relationships with educators was very important. The findings show that Grade 12 teachers have very little time to motivate the learners. This finding is supported by previous research, Koopman (2013:230), found that educators were mainly worried about making learners pass the National Senior Certificate examinations. This puts a lot of pressure on learners and negatively affects the lived experiences of learners. The way that the learners' expectations were not being met support the findings by Koopman (2013) that science teachers struggle to transform their practices. The findings of this study have raised awareness of the need to include learners in the decisions about how the teaching should be done.

Some learners raised the lack of content knowledge of their educators, for example, Yanga raised two issues. First, he said "In grade 11 there were some topics she was not good at, so I went through the topics at home" and secondly he said "I didn't understand Faraday's law last year because my teacher did not understand it". Other comments from participants, like Nomawethu when she says "No, she is a difficult person; she does not know how to explain. She doesn't answer questions, she always says, I don't know", reveal lack of pedagogical content knowledge (PCK) of some teachers. PCK is defined as a personal attribute of an educator, it is both a knowledge base and an action. It is the "knowledge of, reasoning behind, planning for and the actual teaching of a particular topic in a particular way for a particular reason to particular learners for enhanced outcomes (Garritz & Irazoque 2014). Rollnick and Mavhunga (2012) say that PCK is often hidden in that educators do not realise that they have it or that it is important. These findings are consistent with findings from other researchers who found that some Physical Sciences educators have low level of subject matter content knowledge as well as pedagogical content knowledge (Rollnick et al. 2008; Basson & Kriek 2009; Selvaratnam 2011). Ramaila and Ramnarain (2013), reveal that despite significant reform in science education in the country, there is little to suggest that the quality of science education has improved. They base their statements on the results of the

Trends in International Mathematics and Science Studies (TIMSS) that have shown that the South African learners have performed poorly in mathematics and science when compared to learners from other developing countries. In response to curriculum changes, very few professional development activities have been organised for teachers and this is major constraint in the implementation of the National Curriculum Statement (NCS) (Ramaila & Ramnarain 2013). Educators in South Africa feel that there is a content overload and therefore feel overwhelmed by the challenges created by the reforms in the Physical Sciences curriculum (Koopman 2013). Lack of PCK may limit the ability of educators to facilitate meaningful learning. Many learners also complained about chaotic classrooms. Educators need to learn about classroom management.

5.3.4 Answering the main research question

The main research question "How do Grade 12 learners from selected schools in the Western Cape experience Physical Sciences as a school subject?" seeks to understand the lived experiences of physical sciences learners. From the results, I identified 5 central themes that describe learners' experiences. Koopman (2013: p228) found that negative consciousness of Physical Sciences educators through which they formed their thinking process which filtered their ideas became the collective mind-set through which they based their teaching philosophy. The results of this study clearly showed that this negative consciousness of educators is negatively affecting the lived experiences of their learners. The scrutiny of the experiences of learners in Physical Sciences classrooms has provided new insight into the phenomenon for this researcher. Learners are the main reason why educators are employed, without learners there can never be schools and teachers. A learner cannot be expected to perform very well when their expectations are not met. The interviews conducted for this study led me to find out that learners really need to do practical work and need co-curricular activities to improve their experiences in the subject. The findings of the research clearly indicate that there is merit in involving learners in designing learning programmes. Learners feel that educators have to be patient and more understanding. These learners' feelings show us the climate in many Physical Sciences classrooms there is very little patience and educators put a lot of undue pressure on learners. The frustrations I heard in the participants' voices during the interviews informed me of the extent that learners wanted to be included in the process and the teaching process left them feeling de-motivated. Decisions about what happens in the classrooms are often made by educators and not the learners. The answer to this problem is simple, if one wants to know what a learner needs to be successful just ask a learner. This study made me aware of educators' lack of awareness of how their personalities and behaviours affect the experiences of learners.

5.4 Summary

In Chapter 5, I first restated what the aims of the research were, and how I hoped to achieve these aims by answering the main research question. I used the sub-research questions to build up to answering the main research question. I then discussed the findings related to literature.

CHAPTER SIX

DISCUSSION OF RESEARCH PROCESS AND RECOMMENDATIONS

6.1 Introduction

In this final chapter I summarise the findings followed by an evaluation of the research process and offer recommendations for physical sciences educators based on the findings. I then discuss the limitations, and the opportunities for further research. I then reflect on the research methodology and conclude.

6.1.1 Summary of findings

(i) **English as a language of instruction:** Most participants struggled to speak English but they still preferred English to be the language of instruction. Only three of the twelve research participants felt that they would prefer to be taught in their mother tongue.

(ii) **Choosing Physical Sciences:** The findings of the study suggest interplay between learners' backgrounds, their future plans and their relationships with their educators and peers on how they experience being taught the subject. The results revealed six factors that make learners persevere and cope with learning Physical Sciences. These six factors are consistent with the findings of Lubben et al. (2010). The learners are persevering because: they have an interest in the subject, they are achieving good results in the subject, they have extracurricular experience in the subject area, they have role models, they enjoy some topics, and their families encourage them.

(iii) **Confidence in the subject:** All participants had high confidence when they started in Grade 10. Four of the participants reported that their confidence has decreased, and five of the participants felt that their confidence in the subject has remained high and only three had their confidence increasing.

(iv) **Expectations when choosing Physical Sciences:** When asked what they expected when they choose Physical Sciences, most learners said the expected to do more practical work and do much more calculations. All the participants recognised the importance of doing practical work but they did not agree on whether enough practical work has been done. Yet, six of the participants felt they have done enough practical work.

(vi) **Changing educators:** Eight participants had changed Physical Sciences educators from Grade 10 to Grade 12. Most participants did not like changing educators. Of the four participants that did not change educators, only one was unhappy to be taught by the same teacher.

(vii) **Role of educator in personal transformation:** Only four of these participants attributed to the increase in their self-esteem were due to the influence of their Grade 12 Physical Sciences educator. Two participants felt that educators caused them to have a decreased self-esteem.

(viii) **Role of educator in academic transformation:** The role of the educator in the development of learners understanding of science was limited according to most participants' responses. Seven participants felt that their teachers played a limited role in their development. Three participants felt that the educator played a minor role in their personal development in understanding science as a discipline. This finding confirms studies done by Aikenhead (1996), Jegede (1999) and Ogunniyi (2003). One participant felt that most of the development was due to her handwork and the educator just plays a supporting role.

(ix) **Role of educator in academic persistence:** Although most participants did not see an educator as a big role player in their academic development as Physical Sciences learners, many of the participants felt that the Physical Sciences educators played a big role in their persistence in the subject. Five participants felt that their Grade 12 Physical Sciences educators helped them to persist in the subject, four participants said they persisted because of their own motivation.

(x) **Classroom climate:** Only four participants expressed completely positive feelings about their classroom climate. Four participants expressed mixed feelings about their classroom climate and the remaining four participants were really frustrated by what goes on in their Physical Sciences classrooms. The frustration is caused by what they see as lack of planning by the educators and lack of empathy from educators. Others are frustrated by their own fear of failing.....

(xi) **Social and affective experiences with educator**: Eight participants were happy to report about the positive social and affective experiences with their Physical Sciences educators and saw the value of an approachable educator who can give advice and career guidance. Most of the participants really liked being cared for by an educator. The participants in School C reported bad experiences on social and affective interactions with their educator.

(xii) **Feelings during lessons**: Seven participants said they had positive feelings during lessons. Three participants expressed mixed feelings during Physical Sciences lessons saying it depends on the topic. Others expressed that lessons are frustrating and not well prepared. Two participants expressed negative feelings during lessons because they could not grasp the work.

(xiii) **Educator effects on academic experiences**: Six participants expressed that they had mostly positive experiences during lessons. Three participants expressed mixed experiences. Three participants expressed negative academic experiences in their Physical Sciences. One participant was very upset about her educator that she didn't want to answer the question.

(xiv) **Feelings when working with Physical Sciences educator:** Eight participants described working with their educators with positive feelings and emotions. The findings suggested that they enjoyed working with their educators. One participant expressed mixed feelings about working with the Physical Sciences Educator. Three participants expressed negative feelings about working with their Physical Sciences educator.

(xv) **Learners' advice to educators:** The participants offered advice to educators. Multiple participants advised educators to connect theory to practical. From the learners' comments, it is evident that many educators do not link theory with practical work. Educators were advised to be more polite, patient and not to come to class unprepared. Participants also felt that educators should start from basics. Some participants felt that some lessons were not well prepared.

These findings provide schools and educators with descriptive and supportive evidence of what needs to be done if they want to improve learners' experiences in the Physical Sciences classroom. The voices of learners in South Africa, with regards to curriculum planning, are seldom heard. This study afforded the opportunity for 12 poor learners to express their views and perceptions about the teaching and learning of Physical Sciences. It is important to understand the lived experiences of Physical Sciences learners because Physical Sciences is a high priority subject in South Africa given the large monetary investment in the subject by the DBE.

6.2 Data collection process

This phenomenological study used two sources of data, namely the interview and field notes. I compiled my data as divulged in semi-structured one-on-one, face to face interviews. Each learner was allowed to share their stories by focusing on the essential essences of their

experiences in the Physical Science classroom as well as their experiences with working with their Physical Sciences educators. Each interview was consistent with the research question and aligned to the phenomenological method of enquiry. The questions focused on the learners' lived experiences as they dealt with their peers and their teachers inside and outside the classroom. The questions were crafted in such a way that they mostly related to their daily feelings, expectations, perceptions and the challenges they faced on a daily basis. In the field notes, I recorded everything that I observed, like the tone their voices, facial expressions, body language and various other non-verbal behaviours.

6.2.1 Using the semi structured interview

In this study, the goal of the semi structured interview was to uncover what Grade 12 Physical Sciences learners experience in their classrooms. I selected the semi-structured interview as a method for data collection because the sequence and wording of most the questions is similar for each participant. This ensures that any differences found in the answers are not due to the differences in questions asked but are caused by the differences among the respondents (Barriball & While 1993). In the semi-structured interview, the validity and reliability does not depend on the repeated use of the same words in each question, but depends on conveying equivalence of meaning (Barriball & While 1993).The semi-structured interview is standardised by the equivalence of meaning and this helped to facilitate comparability. The use of semi-structured interview has an advantage when working with respondents whose understanding of English is limited. Many of the participants struggled to express themselves in English but they had to be included in to secure the validity of the final results.

6.2.2 The epoché and its applicability to my study

I returned the epoche, first by reading through the whole transcript to get the sense of the whole in order to achieve a holistic and intuitive understanding of the lived experiences of the Physical Sciences learners. During this step I assumed a phenomenological attitude as described by Kafle (2013), Finlay (2009), Giorgi (2008) and Broomé (2011). In phenomenological attitude, I bracketed my everyday knowledge of being a science teacher in a township school so that my biases and pre-knowledge do not affect the way I look at the data. I had to put aside my presuppositions, theoretical, cultural and experiential knowledge. Bracketing allowed me to present the data without positing its own context without doubt or belief and made the findings that I presented here to remain true to the phenomenological slogan of "back to the things themselves" while remaining within the phenomenological circle of data explication. This enabled me to take the learners' lived experiences they presented themselves and without judgement and bias. Bracketing and withholding of existing

knowledge allows the researcher to see and describe clearly what was present for consciousness from the participants and perspective (Broomé 2011). The bracketing stance taken in this study allows the phenomena to emerge on its own rather than be clouded by the preconceptions of the researcher. It is not an easy task to remove one's self from their biases but it important to do so because one of the main objectives of a phenomenological study is not to contaminate the data so that we can focus on the voice of the learner so that their experiences can be legitimately presented (Husserl, 1983).

I conducted all the interviews personally; this was very helpful in getting the sense of the whole. I also transcribed each interview personally and then read each transcript several times as explained in the above sections. At times I found it difficult to remain true to the phenomenological circle by adhering to the epoche, bracketing the self as I was engaging with both the interviews and the data construction process.

Conducting this study was an enjoyable journey because I connected the results of the study to what has already been written about in the literature. During this whole process it was hard for me to keep my own biases on this phenomenon out of the writing of the findings. My biggest problem was that as a Physical Sciences teacher for many years, I felt I needed to say something. What helped me from not doing so was to apply the phenomenological principle of the Epoche as I was writing Chapter 5. I had to remind myself constantly to abstain from giving my opinion and rather focus on the literature in order to bring me back to what the research is saying about the lived experiences of grade 12 Physical Sciences learners.

6.2.3 Field work

The data collection process was not an easy task as the learners availability depended on the schools programmes and their schedules. Learners were not prepared to remain after school as they were not prepared to walk alone back home as it puts them in danger of being attacked by criminals. The schools are located in highly dangerous neighbourhoods. The scheduling of interviews was very challenging. It was always difficult to find a private and quiet place to hold interviews as the schools are overcrowded. There were disturbances during interviews.

6.3 Future research

Further research is essential in Physical Sciences learners' lived experiences. There is need to understand the classroom environments that lead to more pleasant and satisfying experiences. Further research can study how male learners and female learners respond to the same science teacher. One might find this study helpful to meet learners' expectations

and to retain them. The findings might help to provide a picture of the learners' lived experiences.

The themes discussed offer opportunities to conduct an in-depth research on individual themes may offer greater understanding on the factors that affect lived experiences of learners. A longitudinal research study would assist understanding the learners lived experiences through each year of their FET Phase.

6.4 Implications for practice

This study looked at lived experiences of Grade 12 Physical Sciences learners as they learn the subject. My aim was to interrogate the participants so that they reveal their true selves and their lived experiences as Physical Sciences learners. This study suggests interplay between learners' backgrounds, their future plans and their relationships with their educators on how they experience being taught the subject. The findings provided schools and educators with descriptive and supportive evidence of what needs to be done if they want to increase science enrolments.

The voices of learners in South Africa with regards to curriculum planning are never heard. This study afforded the opportunity for 12 poor learners to express their views and perceptions about learning Physical Sciences. It is important to understand the lived experiences of Physical Sciences learners because Physical Science is a high priority area in South Africa. The DBE invests a lot of money for the funding of the teaching of Physical Sciences.

Educators need to put extra effort in improving their relational experiences with learners. Even in this small sample, it is a concern that a significant number of the participants revealed that their educators were uncaring, disrespectful and de-motivating. Some learners even sought to avoid relational interactions with these educators. Lived experiences of the learners are highly affected by teacher characteristics and therefore schools need to design programmes and rules designed to control such an experience. It would be beneficial if a similar research was conducted in a geographical area where the participants speak different home languages or within a rural area. It would also be important to assess the role gender might play in the way which learners perceived their lived experience.

6.5 Significance of the findings to science educators

The results of this phenomenological study provide an opportunity for Physical Sciences educators to reflect on their own teaching practice in order to improve the classroom experiences of learners. The backgrounds of learners are also captured in order to

encourage educators to think about how their own backgrounds may influence their teaching and learning environment. The results of this study create awareness that learners come into their classroom environment with their own understandings and perceptions that have been influenced by their background and culture. This awareness may encourage educators to consider whether the different backgrounds are being affirmed in their classrooms.

Understanding the different perspectives that learners bring into Physical Sciences classes and being able to include them into the teaching and learning experience is important. In addition, the educators' awareness of the influence of their own perspectives on the classroom environment and the experiences of students is important.

The language barrier that the learners in township schools may have must not be mistaken for lack of ability. The twelve students provided a description of their perceptions of their lived experiences in their Physical Sciences classrooms, it is anticipated that through these experiences teachers would be able to improve the experiences of learners.

6.6 Limitations of the study

This study was conducted in three schools governed by Metro North Education District of Cape Town and involved only 12 learners and three educators. The numbers of the participants were small. Therefore the findings show the perceptions of a small cohort of learners. It was not possible to involve more than 12 learners in the study because there was need to allow each participant enough time. Time and finances were a major constraint. The schools are located in dangerous areas and learners have to walk home in groups for safety purposes, therefore it was very difficult to get time for interviews. The participants who agreed to take part did so on their own terms as far as time was concerned.

Some of the participants wanted to see the interview questions before the interview itself in order for them to prepare their answers. I used the phenomenological approach in this study because I wanted to illuminate the lived experiences of learners. The phenomenological research method is the most appropriate method to illuminate how participants' experience and make sense of their world in relation to the phenomena of learning Physical Sciences (Smith & Osborn 2003).

6.7 Conclusion

This study was a phenomenological investigation that focused on accurately capturing the lived experiences of Grade 12 Physical Sciences learners in 3 township schools in Cape Town. With the use of Phenomenology as both a theoretical framework and a research methodology, I interviewed twelve Grade 12 Physical Sciences learners from three different

schools. Each learner was interviewed twice. Each interview question was aimed at answering the research question. Through the explication of the interview transcripts, five central themes emerged. In Chapter 5, I discussed the findings in conjunction with the literature. In chapter 6 I looked at limitations of the study and then suggested possibilities for further research, as well the implications for educators and principals. During this study, I also used figures and tables to help present the evidence and interpretations of the results.

6.8 Summary

This study was a phenomenological study that focused on describing the lived experiences of Grade 12 Physical Sciences learners in 3 township schools in Cape Town. Using Phenomenology as both a theoretical framework and a research methodology, I interviewed twelve Grade 12 Physical Sciences learners from three different schools. Each learner was interviewed twice. Each interview question was aimed at answering the research question. Through the explication of the interview transcripts, five central themes emerged. In Chapter 5, I then discussed the findings in relation with the literature. In chapter 6 I looked at limitations of the study and directions for further research were discussed, as well as future implications for educators and principals. During this study, I also used figures and tables to help present the evidence and interpretations of the results.

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APPENDIX A: UNIVERSITY ETHICS CLEARANCE

APPENDIX II: FACULTY OF EDUCATION ETHICS FOR ORIGINAL RESEARCH

This form is to be completed by the student, member of staff and other researchers intending to undertake research in the Faculty. It is to be completed for any piece of research the aim of which is to make an original contribution to the public body of knowledge.

For students this type of work will also have educational goals and will be linked to gaining credit - it is the type of work that will be the basis for a Masters/Doctoral thesis or any research project for which ethical clearance is deemed necessary:

Name(s) of applicant	MKHUMBUZI JOE MABODOKO
Project Title	Student perceptions of their physical sciences teachers and their lived experiences in science classes.
Is this a staff research project?	NO
Degree	MEd
Supervisor(s)	Dr O. Koopman
Funding sources	Self

Attached: Information sheet ☐ Consent form ☐ Questionnaire ☐ Other (Specify)

Questions for Consideration in the Summary

(i) How will you recruit participants? Is there any possibility that participants might feel coerced to take part and if so how can you manage this issue? Will seek permission from their school and their parents. They will not feel coerced as I do not teach them.

(ii) How will participants be made aware of what is involved in the research [prior to, during and after data collection]? They will explicitly told. The researcher will explain every step to them.

(iii) How will you ensure that participants really do understand their rights? They can choose a person that they trust, who can be present when I explain to them what the research is all about.

(iv) Attach your instrument for data collection (if applicable).

(v) Is there a risk of harm to participants, to the participants' community, to the researcher/s, to the research community or to the University? If so how will these risks be managed? There is NO risk of harm.

(vi) **What plans do you have for managing the confidentiality and anonymity of participants in this study?** The participants will be given pseudonyms. All transcripts will be kept safely.

(vii) **Are there any potential conflicts of interest for you in undertaking this study?** No.

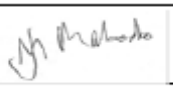
(viii) **How will the findings be used on completion of the study?** To publish a paper

(ix) **Does this work raise any other ethical issues and if so, how will you manage these?** Yes, the participants will be told that they are involved in a research project.

(x) **What training or experience do you bring to the project or will enable you to recognize and manage the potential ethical issues?**

Research Checklist:		**Yes**	**No**
1:	Does the study involve participants who are unable to give informed consent? Examples include children, people with learning disabilities, or your own students. Animals?	✓	
2:	Will the study require the co-operation of a gatekeeper for initial access to the groups or individuals to be recruited? Examples include students at school, members of self-help groups, residents of nursing homes — anyone who is under the legal care of another.	✓	
3:	Will it be necessary for participants to participate in the study without their knowledge and consent at the time — for example, covert observation of people in non-public places?		✓
4:	Will the study with the research subject involve discussion of sensitive topics? Examples would include questions on sexual activity or drug use.		✓
5:	Will the study involve invasive, intrusive, or potentially harmful procedures of any kind (e.g. drugs, placebos or other substances to be administered to the study participants)?		✓
6:	Will the study involve prolonged or repetitive testing on sentient subjects?	✓	
7:	Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?		✓
8:	Does your research involve environmental studies which could be contentious or use materials or processes that could damage the environment? Particularly the outcome of your research?		✓

Signatures:

Researcher/Applicant:		Supervisor/Senior investigator (if applicable):
Date:	26/06/2014	Date:

Please note that in signing this form, supervisors are indicating that they are satisfied that the ethical issues raised by this work have been adequately identified and that the proposal includes appropriate plans for their effective management.

Education Faculty Ethics Committee comments:

EFEC unconditionally grants ethical clearance for the study titled, **"Student perceptions of their physical**				
sciences teachers and their lived experiences in science classes." The certificate is valid for 3				
Years from the date of issue.				
Approved			 **Chairperson: Cina P Mosito**	**Date:5/8/2014**
Approval Certificate/Reference: EFEC 18-8/2014				

APPENDIX B: RESEARCH APPROVAL LETTER

Western Cape Government
Education

Directorate: Research

Audrey.wyngaard@westerncape.gov.za
tel: +27 021 467 9272
Fax: 0865902282
Private Bag x9114, Cape Town, 8000
wced.wcape.gov.za

REFERENCE: 20140813-34552
ENQUIRIES: Dr A T Wyngaard

Mr Mkhumbuzi Mabodoko
X166 Royal Maitland 1
Maitland
7405

Dear Mr Mkhumbuzi Mabodoko

RESEARCH PROPOSAL: INVESTIGATING THE LIVED EXPERIENCES OF PHYSICAL SCIENCES LEARNERS IN SCHOOLS IN A POOR URBAN SETTLEMENTS IN CONTEMPORARY SOUTH AFRICA

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **20 January 2015 till 30 June 2015**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

    The Director: Research Services
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000

We wish you success in your research.

Kind regards.
Signed: Dr Audrey T Wyngaard
Directorate: Research
DATE: 13 August 2014

APPENDIX C: LETTER REQUESTING PERMISSION TO CONDUCT RESEARCH

Request for permission to conduct research at XYZ High School

11 June 2015

Title: **Investigating the lived experiences of physical sciences learners in schools in a poor urban settlement in contemporary south africa**

Dear Principal

I, Mkhumbuzi Joe Mabodoko am doing research with Dr O. Koopman, a .lecturer in the Faculty of Education of the Cape Peninsula University of Technology towards a Masters In Education (M Ed) at the University. I am requesting to interview 4 Grade 12 physical sciences learners.

The purpose of the study is to investigate the lived experiences of Grade 12 learners in a physical sciences class. The main research question is:

1.How do Grade 12 learners from selected schools in the Western Cape experience physical sciences as a school subject?

To do so, the study aims to critically investigate:

i) What are the learners' views of their physical sciences teachers delivering the subject?

ii) To what extent are the learners expectations met in the Physical Sciences classroom?

The following are potential benefits of the study:

- Through the voices of the learners, we will get deeper understanding of perceptions held by learners
- The study will give disadvantaged learners a voice to tell their stories, while on the other hand, it will give me the opportunity to understand physical sciences classrooms from learners' perspectives. This will also afford me the chance to understand the different world views that the learners bring into classrooms, so that we can understand the needs of the learners.
- The study will make educators aware that, they not only affect the learner's lived experience, but also have a responsibility to support the learners.
- This research will increase the understanding of the lived experiences of Grade 12 physical sciences learners. With more understanding of their lived experiences, teachers will be able to support them in a better way.

Your institution has/You have been selected because it suits the criteria of research topic.

In all cases the procedures should be clearly explained in understandable language. The interviews will be recorded and the participant will remain anonymous. Any information that is obtained in connection with this study and can be identified with your school will remain confidential and will only be disclosed with your permission. The learners' responses will not be linked to his or her name or your name or the schools name in any written or verbal report based on this study. Such a report will be used for research purposes only. There are no foreseeable risks to your learners or you institution by participating in the study Your school or learners will not receive direct benefit from participating in the study; however, the possible benefits to education are listed elsewhere in the letter. The learners and the school participation in this study is voluntary. You may decline to participate or to withdraw from participation at any time. The study will take place after regular classroom activities with the prior approval of the school.

The information gathered from the study and your school's participation in the study will be stored securely on a password locked computer in my locked office for five years after the study. Thereafter, records will be erased.

If you have questions about this study please ask me or my study supervisor,
Dr O. Koopman, Faculty of Education, Cape Peninsula University of Technology. My contact number is 073 733 2801 and my e-mail is mkhumbuzi@yahoo.com. The e-mail of my supervisor is koopmano@cput.ac.za. Permission for the study has already been given by Western Cape Education Department and the Ethics Committee of the Cape Peninsula University of Technology.

You may keep a copy of this letter.

Yours sincerely
Mkhumbuzi Joe Mabodoko>

APPENDIX D: LETTER REQUESTING PARENTAL CONSENT FOR PARTICIPATION OF MINORS IN A RESEARCH PROJECT

Dear Parent

Your <son/daughter/child> is invited to participate in a study entitled ; **Investigating the lived experiences of physical sciences learners in schools in a poor urban settlement in contemporary south africa**. I am undertaking this study as part of my **Masters in Education** research at the Cape Peninsula University of Technology. The purpose of the study is to investigate the lived experiences of Grade 12 learners in a physical sciences class. The main research question is:

1.How do Grade 12 learners from selected schools in the Western Cape experience physical sciences as a school subject?

To do so, the study aims to critically investigate:

i) What are the learners' views of their physical sciences teachers delivering the subject?

ii) To what extent are the learners expectations met in the Physical Sciences classroom?

The following are potential benefits of the study:

- Through the voices of the learners, we will get deeper understanding of perceptions held by learners
- The study will give disadvantaged learners a voice to tell their stories, while on the other hand, it will give me the opportunity to understand physical sciences classrooms from learners' perspectives. This will also afford me the chance to understand the different world views that the learners bring into classrooms, so that we can understand the needs of the learners.
- The study will make educators aware that, they not only affect the learner's lived experience, but also have a responsibility to support the learners.
- This research will increase the understanding of the lived experiences of Grade 12 physical sciences learners. With more understanding of their lived experiences, teachers will be able to support them in a better way.

I am asking permission to include your child in this study. I expect to have 12 other children participating in the study. If you allow your child to participate, I shall request him/her to in an interview

In all cases the procedures should be clearly explained in understandable language. The interviews will be recorded and the participant will remain anonymous. Any

information that is obtained in connection with this study and can be identified with your child will remain confidential and will only be disclosed with your permission. His or her responses will not be linked to his or her name or your name or the schools name in any written or verbal report based on this study. Such a report will be used for research purposes only.

There are no foreseeable risks to your child by participating in the study. Your child will receive no direct benefit from participating in the study; however, the possible benefits to education are mentioned elsewhere in the letter. Neither your child nor you will receive any type of payment for participating in this study. Your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. Withdrawal or refusal to participate will not affect him/her in any way. Similarly you can agree to allow your child to be in the study now and change your mind later without any penalty.

The study will take place after regular classroom activities with the prior approval of the school and your child's teacher. In addition to your permission, your child must agree to participate in the study and you and your child will also be asked to sign the assent form which accompanies this letter. If your child does not wish to participate in the study, he or she will not be included. The information gathered from the study and your child‟s participation in the study will be stored securely on a password locked computer in my locked office for five years after the study. Thereafter, records will be erased.

If you have questions about this study please ask me or my study supervisor, Dr O. Koopman, Faculty of Education, Cape Peninsula University of Technology. My contact number is 073 733 2801 and my e-mail is mkhumbuzi@yahoo.com. The e-mail of my supervisor is koopmano@cput.ac.za. Permission for the study has already been given by Western Cape Education Department and the Ethics Committee of the Cape Peninsula University of Technology.

You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow him or her to participate in the study. You may keep a copy of this letter.

Sincerely

Researcher‟s name (print): _____

Researcher‟s signature: _____

Date: _____

_____

Name of child: _____

Parent/guardian‟s name (print): _____

Parent/guardian‟s signature:_____

Date: _____

APPENDIX E: LETTER REQUESTING ASSENT FROM LEARNERS IN A SECONDARY SCHOOL TO PARTICIPATE IN A RESEARCH PROJECT

Title of study: **Investigating the lived experiences of physical sciences learners in schools in a poor urban settlement in contemporary South Africa**

Dear ….

I am doing the above mentioned study on as part of my studies at the University of South Africa. Your principal has given me permission to do this study in your school. I would like to invite you to be a very special part of my study. The following are potential benefits of the study:

- Through the voices of the learners, we will get deeper understanding of perceptions held by learners
- The study will give disadvantaged learners a voice to tell their stories, while on the other hand, it will give me the opportunity to understand physical sciences classrooms from learners' perspectives. This will also afford me the chance to understand the different world views that the learners bring into classrooms, so that we can understand the needs of the learners.
- The study will make educators aware that, they not only affect the learner's lived experience, but also have a responsibility to support the learners.
- This research will increase the understanding of the lived experiences of Grade 12 physical sciences learners. With more understanding of their lived experiences, teachers will be able to support them in a better way.

This will help you and many other learners of your age in different schools.

This letter is to explain to you what I would like you to do. There may be some words you do not know in this letter. You may ask me or any other adult to explain any of these words that you do not know or understand. You may take a copy of this letter home to think about my invitation and talk to your parents about this before you decide if you want to be in this study.

I would like to record your interview about how you feel about learning Physical Sciences. The interview questions are general and will be given to you before hand. Your name will not appear anywhere on the final report. I will not share your interview results with your teachers or parents. There are 2 parts of the interview ans they will not take you more than 1 hour. I will write a report on the study but I will not use your name in the report or say anything that will let other people know who you are. You

do not have to be part of this study if you don‟t want to take part. If you choose to be in the study, you may stop taking part at any time. You may tell me if you do not wish to answer any of my questions. No one will blame or criticise you. When I am finished with my study, I shall return to your school to give a short talk about some of the helpful and interesting things I found out in my study. I shall invite you to come and listen to my talk.

If you decide to be part of my study, you will be asked to sign the form.If you have any other questions about this study, you can talk to me or you can have your parent or another adult call me at 073 733 2801. Do not sign the form until you have all your questions answered and understand what I would like you to do.

Researcher: M.J. Mabodoko: .....

Do not sign written assent form if you have any questions. Ask your questions first and ensure that someone answers those questions.

****

WRITTEN ASSENT

I have read this letter which asks me to be part of a study at my school. I have understood the information about my study and I know what I will be asked to do. I am willing to be in the study.

Learner's name (print): _____

Learner's signature Date: _____

Witness's name (print) _____

Witness‟s signature Date: _____

(The witness is over 18 years old and present when signed.)

Parent/guardian‟s name (print) _____

Parent/guardian‟s signature: _____

Date:_____

Researcher‟s name (print): _____

Researcher‟s signature:_____

Date: _____

APPENDIX F: INTERVIEW 1 QUESTIONS

INTERVIEW SCHEDULE

The following interview questions were adapted from Kuzmak, (2010) research on persistence in women engineering and the structure was influenced by Smith's (2008) guidelines. The questioning begins broad in order to capture the interviews story and is followed by direct and necessary questions to collect the details.

INTERVIEW 1

SOCIAL CONDITIONS AND LEARNER'S PERCEPTION OF SELF

1. Tell me more about your parents, what type of work do they do, describe the conditions in which you stay?
2 Tell me about your brothers and sisters? … what do they do?
3. What language do you speak at home?
4. How do you feel about English as a language of instruction? … Are you confident speaking English or you struggle?
5. Why did you choose to do physical sciences at FET? …Who was your inspiration?
6. How would you describe yourself as a person? ... How would you rate your self-esteem and self-confidence in the subject, physical sciences as you entered the FET phase in Grade 10?
7. When you enrolled for the subject physical sciences, what were your expectations? …… Did you expect to do more practicals?
8. Do you think that your expectations have been met? …Are you happy that you chose the subject?
9. Could you give me a brief history of your academic experience in physical sciences from grade 10 to your current grade? ……. Were you taught by the same teacher or you changed teacher?
10. In your own view, what do you think made you to remain doing physical sciences and not dropout?
11. What do you plan to study after leaving school?

APPENDIX G: INTERVIEW 2 QUESTIONS

INSTITUTIONAL EXPERIENCES

Educator - interactions

1 Has your self-esteem changed through the years? What role did your teacher play in this transformation?

3. How have you developed into the science student you are today? What role did your teacher play?

4. In your personal experience, to what extent has your teacher's characteristics influenced the way you have developed as a physical sciences learner? What makes your teacher different?

5. What advice do you have, for teachers to engage their students better and to make the subject more interesting, enjoyable, and fun? …… Can you describe the physical sciences classroom climate? Is it friendly? Competitive? Frustrating? Satisfying? Fair? Please provide a specific example to prove your point.

6 What role has your physical sciences teacher played in your persistence in the subject?

7 Describe your social and affective experiences with your physical sciences teachers with me.

8 How do you feel during these lessons?

9 What would you say your physical sciences teacher means to you?

10 Describe the best science teacher you had/have and why he/she is so great? ……. Do you have any examples of unsuccessful interactions with a physical sciences teacher?

11 Practical work, excursions and Extra-classes: What have you been involved in and has it helped? …… How? ……Do you feel it is important to be involved in extra-curricular activities? ……What activity would you like to see added?

12 What is your academic experiences in physical sciences classroom interactions like? … How would you describe the effectiveness of the lessons?.....To what extent do the lessons motivate you?

13. How do you feel when you are working with your physical sciences teacher? …… Prompt: physically, emotionally, and mentally.