AN EXPLORATION OF TEACHER PROFESSIONAL DEVELOPMENT EXPERIENCES OF NATURAL SCIENCES TEACHERS OF ONGOYE CLUSTER OF UTHUNGULU DISTRICT

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A dissertation submitted in partial fulfilment of the requirements for the degree of Master of Education in School of Education in the discipline Teacher Development Studies

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ABSTRACT

This exploratory study focuses on professional development experiences of Grades 8 and 9 Natural Sciences teachers within Ongoye cluster of UThungulu District. The methodological approach of this study is qualitative and the study is located within the interpretive paradigm. Data were collected through one on one semi-structured interviews with Grades 8 and 9 Natural Sciences teachers within Ongoye cluster of UThungulu District and two professional development workshops were observed. Data were analysed with the use of thematic content analysis and then grouped into categories and further into themes to develop an explanation of what is learnt, and how Natural Science teachers learn in professional development workshops. The analysis of data is drawn on Illeris's professional life phases as well as Desimone's conceptual framework of continuing with professional development.

The key finding of this study highlights that Grades 8 and 9 Natural Sciences teachers learn a variety of pedagogical knowledge at professional development workshops such as pedagogical content knowledge as well as content knowledge. In addition, Grades 8 and 9 Natural Sciences teachers indicated that professional development activities were useful because they acquired and learned different methods of teaching different topics in Natural Sciences. This finding suggests that teacher learning involves parts of information and understanding which must trigger the progress of a wide-ranging and coherent theory construction. In professional development workshops Grades 8 and 9 Natural Sciences teachers gain the knowledge and skills that enable them to impart the knowledge more effectively. This highlights an incentive dimension where professional development workshops provide and guide the intellectual energy that is necessary for the learning process to take place. It comprises of elements such as emotions, feelings and motivation.

Most of the Grades 8 and 9 Natural Sciences teachers in Ongoye cluster of UThungulu District agreed that they learn pedagogic content knowledge as well as content knowledge through sharing information with one another in professional development workshops organised by DoE and Jika iMfundo. The findings echo what has been done by other researchers. This study highlighted that content, pedagogical content and curricular knowledge are gained in professional development activities.

DECLARATION

This thesis is submitted in fulfilment of the requirements for the Masters in Education in the Graduate programme in the College of Humanities in the University of KwaZulu-Natal, Pietermaritzburg, South Africa.

I, Mornica Phumzile Ngema student number: 210545705 declare that:

1. The research reported in this thesis, except where otherwise indicated, is my original research;

2. This thesis has not been submitted for any other degree or examination at any other University;

3. This thesis does not contain other person's data, pictures, graphs or other information unless specifically acknowledged as being sourced for other persons;

4. This thesis does not contain other persons' writing, unless specifically acknowledged from other researchers. Where other sources have been quoted then: Their words have been re-written but general information attributed to them has been referenced; and where their exact words have been used then their writing has been placed in italics and inside quotation marks and referenced.

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Student Signature Date

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Name of Supervisor: Dr Jaqueline Naidoo

Signature Date

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ETHICAL CLEARANCE CERTIFICATE

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Miss MP Ngema
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Dear Miss Ngema

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"AN EXPLORATION OF PROFESSIONAL DEVELOPMENT EXPERIENCES OF NATURAL SCIENCES TEACHERS IN ONGOYE CLUSTER OF UTHUNGULU DISTRICT",** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 01 January 2016 to 31 January 2017.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Connie Kehologile at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report / dissertation / thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

UThungulu District

Nkosinathi S.P. Sishi, PhD
Head of Department: Education
Date: 30 November 2015

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My heartfelt gratitude also goes to the Natural Sciences teachers who participated in this study. You are certainly the unsung heroes in the classrooms carrying out your duties with passion and humility over and above contextual factors. You willingly gave me your precious time and the knowledge for this study. Without your voluntary willingness to participate, this research would not have been possible. Your honesty, sincere and rich responses were immensely valuable for this study.I truly admire each and every one of you.

SPECIAL DEDICATION

I am dedicating this thesis to everyone who showed interest, love and support in different ways.

A special dedication goes to my daughters Nomcebo, Amahle and Anelile. I know some days were not normal when my focus was on the computer and you wanted to share some stories with me. Not to mention the days when I promised Amahle and Anelile to assist them with their homework and assignments then I would arrive home very late when they were fast asleep.

I also dedicate this thesis to my mother Nomthandazo Mthethwa, your love and support meant a lot to me.

ABBREVIATIONS

ACE	Advanced Certificate in Education
B Ed	Bachelor of Education
B Paed	Bachelor of Paedagogics
B Sc	Bachelor of Science
CAPS	Curriculum and Assessment Policy Statement
DoE	Department of Education
LTSM	Learning and Teaching Support Material
NCS	National Curriculum Statement
OBE	Outcome Based Education
RNCS	Revised National Curriculum Statement
SSTD	Senior Secondary Teachers Diploma
STD	Secondary Teachers Diploma

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CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The aim of this study is to explore professional development experiences of Grades 8 and 9 Natural Sciences teachers when attending professional development or cluster workshops. This study was conducted at Ongoye cluster of UThungulu District. This chapter presents the rationale, background and the context of Natural Sciences education in Ongoye cluster of UThungulu District which mainly focuses on professional development activities of Natural Sciences teachers. The research questions are outlined and finally the layout of the dissertation is presented.

1.2 PURPOSE AND RATIONALE OF THE RESEARCH STUDY

This study focuses on professional development experiences of Natural Sciences teachers for Grades 8 and 9 in Ongoye cluster of UThungulu District. The purpose of this study is to explore Natural Sciences teachers' experiences on professional development workshops that are organised by departmental officials in order to understand what Natural Sciences teachers learn during professional development activities. In addition, this study aims to examine the knowledge and skills Natural Sciences teachers gain in these workshops to assist them in their Natural Sciences teaching.

The Department of Education (DoE) organises a number of professional interventions as well as professional development activities in order to assist teachers. This form of study has been conducted in many areas, but it has not been conducted in Ongoye cluster of UThungulu District and the results obtained will also differ. In this study Natural Sciences teachers narrate stories of their experiences on professional development as well as their professional learning as a result of attending Natural Sciences professional development workshops.

The rationale for conducting this study stems from my involvement in the teaching of Natural Sciences and Life Sciences for many years. I have chosen Natural Sciences because it forms the foundation of other science subjects like Physical Sciences, Life

Sciences and Agricultural Sciences. Most of the learners are not doing well in these science subjects. My experience as a Life Sciences teacher is that some learners find it difficult to cope with the content of the science subjects which suggests that it could be because certain topics in Natural Sciences were not taught well or sometimes the topic was not taught at all. I am also aware that some Natural Sciences teachers do not conduct experiments due to lack of resources. Therefore this study aims to examine professional development experiences of Natural Sciences teachers and the knowledge and skills they acquire at workshops.

Borko (2004) further defines teacher learning as the process of developing involvement in practice of teaching, and through this involvement, a process of becoming informed in and about teaching. Teacher professional development should play a vital role in informing teachers about the work that was supposed to be covered in the previous grades as well as the work that would be expected from the learners in the next grades. This should enable teachers to cover work that learners need to know for the next grades, if such content is not covered that will create a content gap.

Guskey (2009) argues that schools can never be better if the teachers do not develop themselves, therefore professional development is the key to the growth in pedagogical and content knowledge. He further contends that no improvement effort in the history of education has ever done well without the planned and well-implemented professional development workshops aimed to develop teachers' knowledge and skills. Darling-Harmond, Chung, Andree, Richardson and Orphanus (2009) agree with Borko (2004) that effective professional development activities have an influence on teacher learning and that teacher learning also influences their professional development.

Darling-Harmond et al. (2009) further argue that professional development is utmost effective when it addresses the tangible daily challenges involved in teaching and learning explicit academic subject matter, rather than focusing on abstract educational moralities or teaching methods taken out of context.

Day (2015) maintains that continuing professional development is the process of pursuing as well as supporting the abilities, knowledge and experience that Natural Sciences teachers obtain formally and informally as they work beyond any initial training. Day (2017) further ascertains that transformational workshops highlight vision

and encouragement, focusing upon creating structures and cultures which develop the quality of teaching and learning, setting directions and developing Natural Sciences teachers. Therefore this study is important, since results of this study will provide insight on what is taking place in Natural Sciences professional development workshops.

This study will also allow the voices of Natural Sciences teachers to be heard as they will be commenting on professional development experiences from different Natural Sciences workshops they have attended.

1.3 BACKGROUND TO THE STUDY

South Africa has undergone a number of reforms in the education system over the last few decades. To mention a few during the apartheid era there was NATED 550 where learners were doing General Science. Then there was Outcomes Based Education (OBE) where General Science changed to Natural Sciences. Then there was National Curriculum Statement (NCS) which also changed to Revised National Curriculum Statement (RNCS) and now there is Curriculum and Assessment Policy Statement (CAPS).

Ramey-Gassert, Shroyer and Staver (1996) argue that teachers' confidence that they have the capability to teach Natural Sciences excellently has an emotional impact on learner accomplishment. Cerbin and Kopp (2006) contend that many professional development workshops and some interventions have been conducted, but there is no improvement in teacher development.

Meyer and Lloyd (2011) assert that there is a strong relation between some sorts of effective professional development and the improvement in teacher learning, content knowledge and pedagogic content knowledge. Petri and McGee (2012) contend that teacher professional development is acknowledged as a fundamental vehicle through which to develop teacher performance and it is also a way to be acquainted with curriculum and pedagogical reforms. This is supported by Spaull (2013) who argues that statistics show that 25% of learners perform well in the National senior certificate

whereas 75% of learners perform extremely poorly in Physical Sciences and Life Sciences.

Mudaly and Ismail (2013) agrees with Spaull (2013) that changes in the classroom practices were necessitated by the transformation of vision and the modification from National Curriculum Statement (NCS) to curriculum and assessment policy system (CAPS). Dudu (2014) argues that for the subject Natural Sciences, the CAPS stipulate the teaching times, content, skills, learning and teaching support materials (LTSM) required for the assessment weightings and prescriptions. Nevertheless a great deal of learning on the part of teachers is required if changes of this magnitude are to be a success.

However, the literature suggests that finding a direct connection between professional development opportunities and teacher learning is somewhat challenging. Day (2015) ascertains that continuing professional development can play a role in meeting the challenges experienced by Natural Sciences teachers. He further suggests that closing the attainment gap necessitates a grouping of Natural Sciences teachers with basic curriculum knowledge, qualities and classroom skills, development of committed and competent Natural Sciences teachers.

This study explores professional development experiences of Grades 8 and 9 Natural Sciences teachers in Ongoye cluster of UThungulu District of the province of KwaZulu-Natal where there is a lack of research on this topic. Schools in Ongoye cluster of UThungulu District may be catergorised into two; most of the schools that are situated in deep rural areas and few school situated in semi-urban areas where there are substantial challenges facing Natural Sciences teaching and learning process, including the lack of teaching material, under qualified teachers, schools with high learner enrolment and schools with very low learner enrolment. Nevertheless of the locality of these schools and their related difficulties Natural Sciences has to be taught in grades 8 and 9 just like in any other schools in South Africa.

Natural Sciences teachers attend a number of professional development workshops. Ono and Ferreira (2010) contend that a lot of studies have been conducted on workshops. However, the results of these studies show that there is no improvement in teacher development. This study will be based on the Ongoye cluster of UThungulu district.

1.3.1 TEACHER PROFESSIONAL DEVELOPMENT AND TEACHER LEARNING

Rock and Levin (2002) are of the opinion that effective professional development means that teachers must be provided with chances to reflect analytically on their practice to create new knowledge and principles about content and pedagogy. Day and Sachs (2004) contend that all ordinary teacher learning experiences and those conscious and strategic activities which are proposed to be a direct or indirect advantage to Natural Sciences teachers, add to the excellence of Natural Sciences education in the classroom. Learning experience is the process by which, along with others, the teachers evaluate, restart and outspread their commitment as agents of change for moral determinations of teaching. Teachers attain and develop content knowledge and pedagogic content knowledge.

Kelly (2006) defines teacher learning as the process by which novice teachers' move towards proficiency and a difference is made between teacher knowing and teacher identity; in this context teacher learning occurs in both novice and expert teachers where they will learn different approaches in their field of specialisation. Teacher learning also involves development of content knowledge as well as pedagogic content knowledge and also affords development of expert teachers with instrumental teacher confidence, which is those who adopt instrumental stances in their working lives.

Guskey (2009) contends that teacher professional development remains important to teachers' advancement and professional growth. Guskey (2009) further asserts that effective professional development could stem not from a single list of "best practices" but as an alternative from a collection of fundamental elements that needs to be adapted to the single contextual features of a particular school. No professional development practice, strategy, approach, method or activity works well under all conditions.

Avalos (2011) contends that teacher professional learning is the process which necessitates cognitive and emotional contributions of teachers independently and cooperatively. It is crucial to determine the ability and preparedness where each one stands in terms of view and beliefs and the checking and presentation of proper changes for improvement. Avalos (2011) further argues that teachers work under

challenging environments where they have limited opportunity to renew inspirationally their teaching through collaborative work among themselves.

Dhurumraj (2013) contends that there could be a variety of factors that may lead to underperformance of teachers like lack of resources, lack of content knowledge from the teachers or teachers not participating in the professional development activities; in some cases the school may have lower enrolment where the teacher has to teach different grades with grades 8 and 9 Natural Sciences including Grade 12 together and the teacher would give Grade 12 much of their time and neglect Grades 8 and 9.

Spaull (2013) maintains that even the better performing part of the South African system may not be achieving at a comparable level with developed countries. In this study I want to get more information from Grades 8 and 9 Natural Sciences teachers' professional development experiences and what assists them when attending professional development workshops. Zientek (2014) contends that professional development raises links between community culture and school culture and has the potential to help learners to feel invested in the curriculum.

1.3.2 PROFESSIONAL DEVELOPMENT INTERVENTIONS

Harwell (2003) contends that the quality of programmes has been varying and there has been no consensus on what creates quality of these professional development activities. Borko (2004) contends that in professional development activities teachers should gain pedagogical knowledge as well as content knowledge. Hanzicke (2010) argues that professional development should provide teachers with opportunities to share problems, concepts and perspectives, and work together towards improving teacher performance.

Avalos (2011) argues that research over the past few years reported on research on interventions designed for teachers, with teachers and by teachers aimed at their professional learning, with perceptiveness on their influence on teachers. Khosa (2013) argues that the South African government has organised a number of interventions trying to improve the performance of the science subjects but the problem seems to be continual. This study explores the professional development experiences of Natural Sciences teachers for Grades 8 and 9 in Ongoye cluster of

uThungulu District where the focus is on the Natural Sciences workshops that are organised by the departmental officials.

1.3.3 PROFESSIONAL DEVELOPMENT ACTIVITIES

Harwell (2003) argues that professional development is the continuous process of acquiring new knowledge and skills that are related to the subject that the teacher is teaching. She further contends that professional development activities constitute teacher knowledge aiming at the improvement of content knowledge; keeping up with developments in the individual fields, and in education generally; creating and contributing new knowledge to the profession as the curriculum in South Africa keeps on changing; contribute in increasing the ability to monitor learners' work in order to provide helpful feedback to learners and appropriately redirect teaching.

Avalos (2011) argues that effectiveness of professional development of teachers consider some systems that impact on teacher professional development on the teacher and content knowledge, together with effects on teacher performance, while some set out clearly to explore the efficiency of programmes on individual changes of teachers' perception, beliefs and practices to change teacher satisfaction. This implies that for teacher learning and teacher professional development to occur, the teacher should be ready to receive any form of change otherwise the teacher may attend such professional development activities, but there will be no teacher learning that takes place.

1.3.4 PROFESSIONAL DEVELOPMENT EXPERIENCES

Cerbin and Kopp (2006) argue that teachers carefully think through what they want learners to know and what kinds of skills and personal potentials they should develop. As teachers carefully plan their lessons their objectives could be achieved. It is for this reason Cerbin and Kopp (2006) report that some teachers hardly ever start with learning goals as the foundation of their teaching and experience. This could

contribute towards learners under performance if teachers go to class without having learning goals.

Guskey (2009) also contends that schools cannot improve if teachers work on their own without collaborating with others, and professional development remains important to teachers' progress and professional growth. He further argues that no progress effort in the history of education has ever been successful without considerately planned and well implemented professional development activities designed to improve teachers' knowledge and skills. Dewey (2015) defines experience as the knowledge or skills that Natural Sciences teachers acquire through involvement in professional development workshops. Dewey (2015) further argues that experiential learning offers Natural Sciences teachers for grades 8 and 9 hands-on, collaborative learning experiences, which benefits them to learn new skills and knowledge that they can use in their Natural Sciences classrooms.

1.4 CRITICAL RESEARCH QUESTIONS AND OBJECTIVES

This study will be guided by the following research questions:

1. What do Grades 8 and 9 Natural Sciences teachers in Ongoye cluster at UThungulu learn from professional development workshops?
2. How do Grades 8 and 9 Natural Sciences teachers learn during professional development workshops?
3. To what extent does teacher learning influence their teaching practice?

The objectives of the study are therefore to:

1. examine what Grades 8 and 9 Natural Sciences teachers in Ongoye cluster at UThungulu learn from professional development workshops;
2. explore how Grades 8 and 9 Natural Sciences teachers learn during professional development workshops; and

3. examine the extent to which teacher learning influences their teaching practice.

1.5 CONCEPTUAL FRAMEWORK

Day and Gu (2007) contend that teacher learning is influenced by the teacher's professional life phase and outline seven professional life phases. This research study will adopt a conceptual framework of teacher learning and teacher professional development, drawing on Day and Gu (2007) and Desimone (2009). Desimone (2009) argues that teacher professional development is critical, because if effectively planned, it can be an inspiration to teachers' learning, the method and practice of teaching and student learning. Imenda (2014) argues that a conceptual framework refers to the end results of bringing together the number of concepts to clarify or predict a given event and give a wider understanding of the phenomenon of concern or the research problem.

1.6 METHODOLOGICAL APPROACH

This study adopted the narrative method. Schwarz (2001) contends that narrative research is an example of a qualitative approach. In this study Grades 8 and 9 Natural Sciences teachers narrated stories about their learning experiences at professional development workshops or cluster meetings. Natural Sciences teachers helped each other in developing content knowledge as well as pedagogic knowledge, knowledge about the teaching of Natural Sciences and acknowledge diverse voices in education at these workshops that are either organised by the teachers themselves or by the Department of Basic Education (DoBE). In these workshops teacher narratives could be one of the means of offering teachers with professional development opportunities for ongoing school improvement. Schwarz (2001) further argues that narrative research can help build a professional community and add to the growth of teachers. Natural Sciences teachers communicate what they require in communal and how much they still need to learn. As I realised from the pilot interview that some of the

teachers shared some experiences in these workshops even though the sharing did not have the slot in the workshop.

Polkinghorne (2005) argues that qualitative research aims to describe and clarify teachers' lives. Researchers using qualitative methods gather data that serve as signals for their explanation. A qualitative approach is relevant to this study, because teachers will be talking about their experiences and teacher learning that takes place in the workshops. Krause (2005) contends that qualitative research is constructed on a relativistic, constructivist ontology that suggests that there is no neutral authenticity. Rather, there are various authenticities created by human beings who experience a phenomenon of interest.

Eight Natural Sciences teachers who are teaching Grades 8 and 9 were interviewed; in order to find out the realities of what happens in the professional development workshops they are involved in. The form of data that were collected were primarily in the form of spoken or written language. Semi-structured interviews were conducted and recorded with the audio recorder and then they were transcribed. Data were collected through observations of professional development workshops.

Piage, Chartres and Kenyon (2008) contend that it is an effective approach to use verbal histories to derive quality education practice. They further argue that they are subjective and that verbal histories could be used in other situations to expose educational practice. In this study it is envisaged that teachers will share pedagogical knowledge and skills for different topics in Natural Sciences that they acquired during professional development workshops.

1.7 STRUCTURE OF THE THESIS

Chapter 1 focuses on the purpose, background and rationale of the study elaborating on professional development; collaborative learning and teacher learning that occur in professional development workshops. It also describes the content knowledge as well as pedagogical knowledge that could be gained in professional development workshops. This form of knowledge should contribute towards improving the level of

performance in teachers. The research questions, conceptual framework, methodological approach and structure of the thesis are also outlined.

Chapter 2 discusses the literature review on teacher learning, collaborative learning and teacher professional development. The conceptual framework underpinning teacher learning, collaborative learning; teacher professional development as well as teacher experiences in relation to teacher knowledge, content knowledge and pedagogical knowledge are outlined. Day and Gu's (2007) framework on professional life phases is also described. Desimone's (2009) conceptual framework consists of the following core features; content focus, active learning, coherence, duration and collective participation.

Chapter 3 explains the qualitative methodological approach and narrative research design used to collect data. It also outlines the data collection instruments namely, semi-structured interviews and observations. The purposive sampling technique used in this study is explained. The data analysis procedure, namely, thematic analysis is discussed, and issues related to trustworthiness and ethical considerations are also discussed.

Chapter 4 presents the results of thematic analysis of transcribed data and presents the findings. The results are presented thematically according to research questions of the study.

Chapter 5 discusses the findings and conclusions and the extent to which the research questions are addressed. Recommendations for further research are suggested.

1.8 CONCLUSION

This chapter discussed the background and rationale of this study and briefly outlined key issues related to professional development; collaborative learning and teacher learning. The research questions, conceptual framework and methodological approach are also discussed. This chapter also presents an outline of the different chapters.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter discussed the purpose and rationale for this study and outlined background information and the research questions. This chapter presents the literature review and conceptual framework adopted in this study. This literature review discusses the concepts of teacher learning; collaborative learning, teacher professional development and teaching context. Teacher professional development experiences and teacher knowledge are also outlined. Next, Desimone's theory of continuing professional development and Day and Gu's professional life phases are described as the conceptual frameworks adopted in this study.

2.2 CONCEPTS

2.2.1 TEACHER LEARNING

Authors define teacher learning differently. Johnson and Golombek (2003) argue that teacher learning includes internalisation where they consider the external factors that could have an influence on what they are discussing; this can be mediated by other teachers, cultural artifacts or sometimes the books that could influence pedagogical change

Borko (2004) defines teacher learning as the process of growing in the participation of the practice of teaching through a process of becoming well-informed in and about teaching. Borko (2004) further explains that teacher learning occurs in many different phases of practice including their classrooms, their school societies and professional development workshops. Borko (2004) further ascertains that teacher learning in workshops explores features of professional development programmes such as the establishing and maintenance of communication norms and confidence as well as the collaborative relations where teachers share goals of improving learning and teaching Natural Sciences.

Kennedy (2005) refers to this form of learning as the transitional learning strategy where professional development activity serves a dual purpose. Natural Sciences teachers are involved in interesting and stimulating activities where they work together in social groups while at the same time learning is individual. Knowledge is not delivered to teachers but they share knowledge and experiences.

Teacher learning is the movement of teachers from marginal to full participation in the precise working practices and their related ways of knowing and thinking which define particular school situations. In this case Natural Sciences teachers have their challenging topics and therefore, they make an effort to ensure that they deliver the relevant information to class (Kelly, 2006). Kelly (2006) describes learning as an on-going progression where teachers move towards knowing better. Similarly, Kelly (2006) asserts that teacher learning encompasses teachers engaging in the development of knowing in practice so as to allow their full participation in classroom activity.

Day and Gu (2007) maintain that teacher learning occurs at three different levels, namely, for individuals, for communities and for organisations. Teacher learning for individuals occur when the form of teacher learning involves and contributes to their daily practices; for communities it occurs when teachers improve in their practices and ensure new generations of members and for organisations where the form of teacher learning develops an issue of supporting the consistent communities of practice among the Natural Sciences teachers. Day and Gu (2007) further assert that teacher professional learning will improve teacher knowledge base, develop their teaching practices, and enrich their self-efficacy and assurance to quality of service. Goldschimidt and Phelps (2007) contend that content knowledge items require teachers to use the knowledge of understanding the context of teaching situations.

Illeris (2009) elaborates on the three dimensions of learning which are: the content dimension; the incentive dimension as well as interaction dimension. The areas of knowledge and understanding should inspire the growth of a broad and comprehensible theory building. These include all the psychological, biological and social conditions which are involved in any learning. The knowledge as well as the skills gained will bring about motivation that will make it easier for the teachers to share the knowledge as well as the skills gained. Psychological learning is that form of

learning that could lead to permanent change as result of the knowledge and skills that Natural Sciences teachers acquire after being involved in professional development workshops. Biological dimension provides Natural Sciences teachers with a long-lasting change in their classroom practices. Social dimension takes place in professional development workshops when Natural Sciences teachers learn through observation during professional development workshops.

Similarly, Illeris (2009) contends that teacher learning leads to a permanent change of character and agrees with Kelly (2006) that knowledge that is shared influences character change.

Bertram (2011) agrees with Kelly (2006) that teacher learning is the process that brings about change in professional knowledge, skills, attitudes and beliefs that will have an impact on teacher performance. Opfer and Pedder (2011) contend that teacher learning is organised concurrently in activity of autonomous entities (teachers), collectives (such as grade level subject group), and subsystems within impressive agreements (schools within school systems within sociopolitical educational contexts). These structures are associated with teacher learning and mutually support teachers. Teacher learning must consider the variety of local knowledge, problems, routines and ambitions form and are shaped by individual practices and beliefs.

Avalos (2011) describes teacher learning as the alteration of knowledge into practice for the advantage of the teachers' growth. This necessitates cognitive and emotional involvement of teachers' individual and jointly, the capacity and preparedness to examine where each one stands in terms of principle and beliefs and the checking and performing of suitable changes of improvement or change. Bertram (2011) asserts that the concept teacher learning specifies some kind of internal conceptual change which could either lead to an instant change in practice. Bertram (2011) further contends that teacher learning is the process that results in explicit changes in the professional knowledge, skills, attitude, beliefs or actions of teachers. Teacher learning occurs in various ways and therefore, influences the manner in which teachers do certain things.

Wilson and Berne (2012) contend that teacher learning should be on-going so as to bring about effectiveness in teacher performance. Mokhele (2013) describes teacher learning as the form of learning that increases teacher's knowledge and skills and

contributes to variations in their attitudes and beliefs, it also contribute in improving their approach to pedagogy.

2.2.2 COLLABORATIVE LEARNING

Lieberman (1995) argues that teachers learn best through dynamic involvement when they reflect on their teaching, share and apply what they have learnt during professional development workshops with their learners. Putman and Borko (2000) maintain that collaborative learning benefit teachers to have progress in the understanding of content knowledge, situative learning in meaningful contexts and generate learning communities in which teachers participate in rich discourse about significant concepts. Beijaard, Meyer, Morin-Dershinner and Tillema (2005) contend that coherence is provided by the collective concerns about learning and by arrangements in the form of professional development activities that allow Natural Sciences teachers to learn from one another and share new knowledge with other Natural Sciences teachers in other schools of Ongoye cluster. In such activities Natural Sciences teachers share content knowledge and pedagogic content knowledge in order to improve on their daily practice.

Darling-Harmond, Chung Wei, Andree, Richardson, and Orphanus (2009) acknowledge various types of collaborative professional learning activities which are peer observation of practice, analysis of student work and student data, cluster study and peer coaching. Ceana (2011) argues that collaborative learning can occur in two different ways where the idea of knowledge and learning is rooted in social contexts and experiences, and encouraged through interactive thoughtful exchanges; the assumptions that participation in collaborative learning or in professional learning communities leads to the transformation in teaching practices and improvement of teacher learning. Caena (2011) agrees with Day and Gu (2007) that teacher professional learning is based on two models; that is the idea of learning and knowledge as rooted in social context and experiences, and promoted through collaborating and contemplative conversations. The second assumption is that partaking in professional learning activities could lead to a change in teaching practices and improvement of teacher performance.

Wilson and Berne (2012) agree with Bell and Gilbert (1994) that collaborative learning could focus on the fundamental problems of the curriculum and instruction where the workshops conducted are often long enough to ensure enlightened improvement in knowledge, skills and assurance. It is also consistent with and adds to professional practices and norms of collegiality and experimentation.

Wall (2012) argues that teachers need to collectively engage in communal inquiry mainly in a decision-making process; collaboration also assures that communal insight outweighs individual and segmented group insight and also provides teachers with a delicate sense of cognisance about the various possibilities and improves connectedness with each other.

Brodie (2013) argues that collaborative learning is meant to support and challenge the existing thinking of teachers so as to develop new conceptual ideas in the subjects they are teaching. This form of learning transpires when two or more teachers come together with the purpose to learning something. Mudaly and Ismail (2013) and Illeris (2009) support Johnson and Golmbek (2003) that collaborative learning is influenced by the external features such as the learning space, societal and cultural conditions. These above-mentioned aspects help teachers to increase their confidence to bring about change and enhance their knowledge system by exceling acquainted pedagogical boundaries when they train to teach school science. Day (2017) maintains that in continual professional development activities could sustain the knowledge and skills required by Natural Sciences teachers to perform competently in their classrooms.

Wall (2017) ascertains that teachers who discuss new approaches and practice with their peers are more likely to implement these practices and feel a collective responsibility for accomplishment and innovation. Collaborative learning methods comprise of planning implementation of new instructional procedures or curricular resources in the classroom, practicing new skills, being observed by professional teachers, engaging in written work and discussions, applying new skills to learner work, and role playing.

2.2.3 TEACHER PROFESSIONAL DEVELOPMENT

Bell (1998) explains that in professional development activities, collaboration and interdependence occur so that professional change may occur. Wilson and Berne's (1999) study on teacher learning focused on Mathematics teachers who participated in workshops for part of the day or the whole day. Their findings indicate that there is a great improvement in teachers who constantly attend professional development activities. Wilson and Berne (1999), Evans (2002) and Darling-Hammond et al. (2009) argue that teacher professional knowledge and understanding occur when new structures and approaches for developing and sharing of knowledge for teaching occur as teachers come together with the aim of assisting each other in the subject that they teach. Professional development occurs regularly and on-going distribution of information through a widespread variety of formal and informal communication techniques e.g. workshops.

Sapovitz and Turner (2000) examine how professional development of teachers could influence the improvement of their performance in Science. They mainly focus on the subject matter knowledge as well as the context of the school. Evans (2002) argues that teacher development of primary school teachers should put emphasis on ideas for enlightening teachers and checking on their performance. Rock and Levin (2002) are of the opinion that effective professional development means that teachers must be provided with chances to reflect analytically on their practice to create new knowledge and principles about content and pedagogy. Harwell (2003) contends that workshops provide two of the most essential elements of effective professional development and provide participating teachers chances to practice what they have learnt over the comparatively lengthy period of time, and offer a perfect environment for collaboration among participants.

Day and Gu (2007) argue that for professional development to occur it should be influenced by the individual's life outside the school, professional position which is life within the school, and the situated which refers to the values, beliefs and interaction between these external policy agendas. Darling-Hammond et al. (2009) argue that teacher professional learning is done in collegial settings for instance these meetings could be the workshops that are organised by teachers themselves or they may be organised by the departmental official. The focus of this study is on the professional

development workshops that are organised by the departmental officials. Borko (2009) asserts that teacher professional development is essential to efforts to improve pedagogical knowledge and content knowledge, therefore effective professional development programmes and their impact on the content knowledge and pedagogical knowledge. Darling-Hammond et al. (2009) also contend that teacher professional development is built into the teachers' schedule learning activities that can be ongoing and sustained and can focus on a particular issue or problem over time. Borko (2009) agrees with Darling-Hammond et al. (2009) that the activities that are done in workshops should provide evidence that teacher professional development has a positive impact on teacher learning.

Petrie and Mc Gee (2012) contend that teacher professional development is the method that is used to familiarise teachers with curriculum change as well as to keep teachers up to date with new policies. They further assert that it is also the vehicle through which to improve teaching and in turn, to improve teacher performance in the classroom environment.

Heeralal (2014) focuses on the barriers experienced by Natural Sciences teachers in doing practical work in the primary schools. Dudu (2014) examines the changing roles of South African Natural Sciences teachers in an era of introducing a revised curriculum. Although such studies were conducted in South Africa they did not focus on teacher professional development experiences of Natural Sciences teachers. Natural Sciences have undergone a number of changes to mention a few there was NATED 550 where Natural Sciences was called General Science. When OBE was introduced the name of the subject changed to Natural Sciences, then NCS, RNCS and CAPS were also introduced. Amount of time and energy for professional development workshops that demanded new changes from Natural Sciences teachers, where some Natural Sciences find it difficult to cope with as new topics were introduced for example; Planet Earth and Beyond. Therefore this study is similar to Dudu's (2014) study since both focused on Natural Sciences teachers. However this study differs from Dudu's (2014) study since it focuses on professional development experiences of Natural Sciences teachers and not on their changing roles in response to the revised curriculum.

Day, Gu and Sammons (2016) argue that in professional development workshops, facilitators cascade information to Natural Sciences teachers attending 'training events' and then cascading, or distributing, information to Natural Sciences teachers. It is frequently engaged in situations where resources are limited. Wall (2017) argues that professional development content must be directly significant and applicable to Natural Sciences classrooms, be distinguished to Natural Sciences teachers' individual needs, and shape on teachers' previous knowledge and experiences.

This indicates that teacher professional development workshops for Natural Sciences teachers are necessary in order to equip the teachers with new skills and knowledge. Teacher professional development workshops give should give Natural Sciences teachers a better understanding of the new topics so that it could be easier to impart the knowledge to learners.

2.2.4 TEACHING CONTEXT

Dhurumraj (2013) contends that there could be a variety of factors that may lead to underperformance of teachers like lack of resources, lack of content knowledge; teachers not participating in the professional development activities. In some cases the school may have lower enrolment which results in the teacher having to teach different grades together. Mizzi (2013) argues that teaching context sets out to outline the challenges faced by Natural Sciences teachers when teaching Natural Sciences which outside their area of expertise and explore the strategies used by teachers in dealing with such situations. Insufficient background in the Natural Sciences subject knowledge is one of the main features that contributes to such challenges and will have an impact on the development of the teachers' pedagogical content knowledge as well as on the teachers' self-confidence and attitudes when teaching certain topics in Natural Sciences that are outside their area of expertise.

2.3.1 TEACHER EXPERIENCES ON PROFESSIONAL DEVELOPMENT WORKSHPS

Knight (2002) contends that teachers continuing professional development is significant so that the school may produce better results in Natural Sciences. Harwel

(2003) argues that it is important for Natural Sciences teachers to be involved in teacher professional development workshops as they influence change in teacher's classroom performance in various ways that would lead to the enhancement in learner performance. Dewey (2005) ascertains that Natural Sciences teachers acquire skills and content knowledge through involvement in professional development workshops. Natural Sciences learn through collaboration with other Natural Sciences teachers; and facilitators provide them with the necessary support needed in the Natural Sciences class. Harwel (2003) is supported by Petrie and Mc Gee (2012) that the influence of professional development workshops on Natural Sciences teachers when they acquire knowledge about teaching of Natural Sciences and how their involvement would have impact on their pedagogic knowledge.

Day and Sachs (2004) maintain that all ordinary learning acquired by Natural Sciences teachers would add to the excellence of content knowledge and pedagogic content knowledge. As Natural Sciences teachers become involved in professional development workshops they restart and expand their commitment of being agents of change for moral determinations of teaching. Natural Sciences teachers accomplish and develop critical knowledge and skills that are essential to good professional thinking, planning that will enhance their knowledge. In this study I want to explore professional development experiences of Natural Sciences teachers for Grades 8 and 9 in Ongoye cluster of UThungulu District, what they learn during professional development activities and what can best assist them in their professional development.

Robinson (2011) asserts that in professional development workshops a comprehensive group of Natural Sciences teachers, interested in common learning vision, support and work with each other, finding ways, inside and outside school, to make inquiries on their practice and together learn new improved approaches that will enhance in changing their teaching strategies. Jacobs (2012) argues that professional development workshops should be ongoing in order to sustain the development of teachers. He suggests that teacher professional development should equip teachers with the knowledge and skills to respond to changes in the curriculum as well as educational policies.

Brodie (2013) argues that teacher professional development workshops put more emphasis on teacher learning in and from practice and is more likely to result in long-lasting changes in their teaching practices. In these professional development workshops teachers support each other, share vision of what amounts for excellent teaching and learning and start to take mutual concern for the learners they teach.

Mokhele (2013) argues that teacher professional development is a way of changing teacher knowledge and the approaches to teaching Natural Sciences in schools. Therefore, professional development is the crucial factor in making sure that education transformations at any level are effective. The indication seems to recommend that progress of educational restructuring depends on Natural Sciences teachers and communal capacity of teachers and it associates with schools' wide promotion of the teachers' pedagogical knowledge and content knowledge. Dewey (2015) argues that learning experience for Natural Sciences teachers may increase the teacher's spontaneous skill in a specific direction and channel them towards good performance using the knowledge acquired.

2.3.2 TEACHER KNOWLEDGE

Schön (1987), drawing on the work of Dewey, developed a model to describe how professionals reflect on actions or experience. Schön (1987) distinguished between reflection-on action, which refers to professionals reflecting on an experience, action or incident that already occurred, and reflection-in-action, when professionals reflect 'in the moment' of the action or incident as it takes place. He further elaborated that through reflection-in-action professionals have tacit knowledge which he describes as knowing-in-action when they use knowledge and experience to respond to new situations or actions. Shulman (1987) ascertains that teacher knowledge is made up of general pedagogical knowledge, subject matter knowledge; pedagogical content knowledge and knowledge of the context. He further explains that content knowledge is an imperative asset for Natural Sciences teachers because it forms the basis of all other teacher knowledge. Grossman (1990) refers to content knowledge as the knowledge of the main realities or conceptions within Natural Sciences and relationships among subjects, pedagogic knowledge refers to the methods or skills

that Natural Sciences teachers use as they deliver the content to learners. Content knowledge is pedagogical knowledge which goes outside the knowledge of the subject matter to the dimension of the subject knowledge for teaching (Grossman, 1990).

Grossman (1990) further explains that there are four components of pedagogical content knowledge. Firstly there are the knowledge and beliefs about the determination for teaching the subject at different grades, secondly, the knowledge of learners' understanding, concepts, and misconceptions of a certain topic in a certain subject, thirdly, the curricular knowledge which comprises of the knowledge of curriculum facts available for teaching certain subject matter as well as knowledge about both horizontal and vertical curricular for a subject and lastly, the knowledge of instructional approaches and representations for teaching certain themes.

Day (1999) posits that teacher knowledge deals with the argument about what kind of knowledge Natural Sciences teachers need to acquire or have. Professional development activities allow them to interrogate different forms of knowledge. It also gives teachers the opportunity to participate actively and collaboratively in professional societies in a crucial component of high quality.

Day and Sachs (2004) identify three conceptions of knowledge associated with teacher learning namely: knowledge-for-practice, knowledge-of-practice and knowledge-in-practice. Knowledge-for-practice refers to the knowledge that teachers obtain outside the school environment that contributes in developing their skills of teaching. Knowledge-of-practice refers to the knowledge that teachers gain through systematic explorations about teaching learners and learning, subject matter and curriculum. Knowledge-in-practice refers to the practical knowledge produced through their own systematic inquiry, inspired by the questions raised regarding their own classroom efficiency.

Goldschimidt and Phelps (2007) contend that content knowledge items require teachers to use the knowledge of understanding context of teaching situations. Bertram (2011) argues that general pedagogic knowledge is a compound set, which comprises of knowledge of classroom organisation and management, different teaching approaches or methods, assessment strategies as well as understanding classroom communication and discourses.

Pedagogical content knowledge comprises the understanding of what makes the learning of a particular topic easy or difficult (Goldschimidt & Phelps, 2007). Pedagogical content knowledge can be developed through workshops, for example, about how learners come to know their specific subject, knowledge about how learners learn to read, developmental stages of reading and writing and the detailed forms of mistakes and misconceptions learners may have about certain concepts at particular developmental period of time (Bertram, 2011).

Van Driel and Berry (2012) agree with Grossman (1990) that pedagogic content knowledge is composed of knowledge and beliefs around the purpose for teaching specific themes and knowledge of curriculum material presented for teaching a particular subject.

Van Driel and Berry (2012) opines that the imperative forms of professional development for teachers are constructed on collaboration, collegial interaction and the nurturing of relationships. Van Driel and Berry (2012) further assert that pedagogical content knowledge is perceived as comprising knowledge approaches and illustrations for teaching certain topics and knowledge of students' understanding, conceptions and misconceptions of certain topics of a particular subject.

Day, Gu and Sammons (2016) ascertain that workshops equip Natural Sciences teachers with curriculum development, personalization and learner-centered learning; where a new curriculum was intended to meet a massive range of needs that Natural Sciences have in their schools, right from learners who can't cope in classrooms. They further explain that expansion and teacher learning of curriculum took place throughout the workshop had a powerful effect on learner achievement.

2.4 CONCEPTUAL FRAMEWORK

There are core features of effective teacher professional development which are content focus, active learning, coherence, duration and collective participation. Day and Gu (2007) framework of professional life phases will be adopted as a conceptual framework in this study. Day and Gu (2007) argue that there are six teachers' professional life phases namely; from 0-3 years involves learning which builds identity

and classroom competence; 4-7 years encompasses developing professional identity; 8-15 years involves defining work-life balance; 16-23 years describes managing work-life tension; 24-30 years encompasses adjusting to change; and 31 years and above involves sustaining commitment. However, this study will focus on four of these life phases namely: defining work-life balance, developing professional identity, managing work-life tension and adjusting to change.

Day and Gu (2007) argue that in the professional life phase of learning which builds identity and competence is when most of the teachers show a great level of commitment to teaching. In the professional life phase of developing professional identity, teachers show much interest in advancement and additional responsibilities and also show assurance and a sense of effectiveness in their teaching profession. In the professional life phase of defining the work-life balance is when most teachers start to face extra challenges in dealing with both their professional and personal lives. Managing work-life tensions, in this professional life phase teachers benefit from partaking more noticeably defined wisdom of professional identity. Adjusting to change, in this professional life phase teachers are able to face any extreme scenarios in the teaching environment. In sustaining commitment professional life phase, teachers show a positive teacher-learner relationship and their job satisfaction is learners' progress.

Desimone's (2009) four core features namely, content focus, active learning, coherence, and collective participation as a conceptual framework which will be used in the analysis of data. Desimone (2011) contends that teacher learning should be based on content knowledge and pedagogical content knowledge, and be constant with specific schools and district factors that shape teachers' work lives. Moreover, pedagogical content knowledge is the specialised knowledge that teachers need to efficiently convey content to learners such as the knowledge to select suitable models to clarify new concepts as well as knowledge of learners and their characteristics. Desimone's conceptual framework is suitable for this study, since it provides a clear description of what actually takes place in professional development workshops (Desimone, 2011).

2.5 SUMMARY

The literature review in this chapter discussed the concepts of teacher learning; collaborative learning, teacher professional development and teaching context. Teacher professional development experiences and teacher knowledge were also outlined. Desimone's theory of continuing professional development and Day and Gu's professional life phases were described as the conceptual frameworks adopted in this study. Chapter 3 will discuss the research methodology that will be adopted in this study.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

The aim of this study was to explore professional development experiences of Grades 8 and 9 Natural Sciences teachers within Ongoye cluster of UThungulu District, in order to gain an understanding of their professional development experiences when attending Natural Sciences workshops. This chapter begins with a discussion of the interpretivist paradigm, and next the qualitative, narrative inquiry methodological approach is described. This is followed by a description of the research context, data collection instruments, purposive sampling procedure and ethical considerations. This chapter concludes with a discussion of trustworthiness in this study.

3.2 RESEARCH PARADIGM

Glesne (1998) contends that the research paradigm governs the research methods, determination of the research and the role of the researcher. A paradigm arranges the way the knowledge is studied and understood and sets down the intent, enthusiasm and anticipations for the research. Methodology therefore describes how the researchers go about finding out the information and carrying out the research; it also looks at the process and procedures that are used in the research (Mackenzie & Knipe, 2006).

Cohen, Manion and Morrison (2007) argue that research methods in education cover the entire range of methods presently engaged by educational research at all five foremost parts which are the context of the educational research; planning educational research; styles of educational research; strategies for data collection; researching and data analysis.

The interpretive perspective foregrounds the meanings that individuals or communities assign to their experiences and allows for close interaction with the participants. They also maintain that the interpretive paradigm is characterized by concerns for the individual, and the essential principle of this paradigm is to recognize the individual domain of the Natural Sciences teachers' experiences (Cohen et al., 2007).

Creswell (2007) contends that a qualitative approach studies participants in their natural settings, and makes an effort to make sense of or understand phenomena in terms of meanings people bring to them. A qualitative approach is suitable for this study because teachers expressed themselves by telling the researcher about their experiences of professional development workshop. Creswell (2007) ascertains that narrative research is deep-rooted in different social experiences. Narrative research is relevant to this study because Natural Sciences teachers will be telling their stories on the experiences the have on professional development workshops.

Creswell (2009) argues that a research design reveals the researcher's rational position, strategies of inquiry, specific methods; it is a plan of how the research will be conducted. This study foregrounds the professional development experiences of Grades 8 and 9 Natural Sciences teachers in Ongoye cluster of UThungulu District. Therefore the qualitative methodological approach located within interpretivist paradigm is adopted this study.

Creswell (2012) further explains a narrative approach as attainment of information from the participants. A narrative approach is suitable for this study because Natural Sciences teachers narrated their stories about their experiences of professional development activities.

This study is guided by the following research questions:

1. What do Grades 8 and 9 Natural Sciences teachers in Ongoye cluster at UThungulu learn from professional development workshops in KwaZulu Natal?
2. How do Grades 8 and 9 Natural Sciences teachers learn during professional development workshops in KwaZulu Natal?
3. To what extent does teacher learning influence their teaching practice?

3.3 DATA COLLECTION

Interviewing is a way to collect data as well as well as to gain knowledge from individuals. Guba and Lincoln (1994) contend that knowledge is regarded as subjective and transactional and generated in the course of the interaction between the researcher and interviewee. Kvale (1996) describes the interview as the exchange

of opinions between two or more people on the topic of common interest, sees the consequence of human collaboration for knowledge production, and stresses the collective situatedness of the research data. The interviewees are able to discuss their insight perception and explanation in regard to their point of view. Interviews are not simply anxious with collecting data about life itself; its human embeddedness is inescapable (Cohen, Manion and Morrison (2000)).

Gillham (2000) contends that before the interview starts there is a preparatory stage where the interviewer gives the interviewee a clear understanding of the questions that would be asked during the interview; the purpose of the interview is clearly discussed as well as the length of the interview. The interviewee is also told that the interview will be audio-taped; the interviewer and the interviewee also agree on the date and time for the interview. The procedure of data collection was discussed with the participants.

Gray (2004) argues that there are certain reasons to use interviews as the form of data collection. Firstly, there is a need to accomplish highly personalised data; secondly, there are opportunities necessary for probing; thirdly, a good return rate is essential and lastly, respondents are not confident in the native language of the country/where they have difficulties with written language.

Polkinghorne (2005) is of the view that the purpose of data collection in qualitative research is to provide responses to the research questions. In this study semi-structured interviews (see Appendix 6) and professional development workshop observation schedules (see Appendix 5) were used for the collection of data. Interviews are not like observation and documents which are written sources of experiences; instead interviews provide first-hand explanations of experiences (Polkinghorne, 2005).

Hill (2012) posits that the main concern in qualitative research is selecting teachers that will be able to answer the research questions sufficiently. Creswell (2012) highlights that data collection for qualitative research by means of the framework of narrative question is grouped into a number of categories such as observation, document analysis and interviews.

Semi-structured interviews were conducted to generate expressions or stories from the point of view of Grades 8 and 9 Natural Sciences teachers. Eight Grades 8 and 9

Natural Sciences teachers (2 males and 6 females) whose schools are under Ongoye cluster were interviewed. Semi-structured interviews were conducted with the focus on the professional development experiences of Natural Sciences teachers who attended workshops. Open-ended questions were asked and the responses of teachers were audio-taped and later transcribed. Interview questions were catergorised into four. The first part concerns the biographical information for example, how long have you been teaching Natural Sciences?; the second part focused on professional questions for example, what professional development activities do Natural Sciences teachers engage in?; third part focuses on workshops as the form of professional learning for example, to what extent did you find these workshops useful?; and lastly the questions are based on professional development for example, what form of support do you gain from the workshops? Explain.

Professional development workshop observation schedules were used to observe two professional development workshops and it was noticed that the Natural Sciences teachers attendance was not the same, in the first workshop there were more teachers than in the second workshop.

3.4 SAMPLING PROCEDURE

Dawson (2007) describes sampling as a process of deciding on a smaller, more convenient number of participants to take part in the research. Connelly and Clandinin (1990) argue that the place where the interview will take place is very important when narrative inquiry is used, because it is where the inquiry or experience takes place and it becomes linked with the stories that are told of these experiences. Cohen *et al.* (2000) define purposive sampling as the deliberate choice of a participant due to the qualities that the participant possesses. In the case of this study participants were Natural Sciences teachers for Grades 8 and 9 and their schools were part of the Ongoye cluster, and the schools that were chosen out of the 12 secondary schools of Ongoye cluster were the schools that were of convenient to the researcher. The purposive sample in this study comprised eight Natural Sciences teachers who were teaching Grades 8 and 9 in schools that fall within the Ongoye cluster.

3.4.1 CHOICE OF SCHOOLS AND PARTICIPANTS

Ongoye cluster consists of twelve secondary schools but six schools that were part of Ongoye cluster and convenient for the researcher to travel to were selected for this study. From these six schools, only Natural Sciences teachers who attended professional development workshops were considered to form part of the sample of participants for this study.

The purposive sample comprised six Natural Sciences teachers who are teaching Grades 8 and 9 in schools which are part of Ongoye cluster (McMillan & Schumacher, 2001). Natural Sciences teachers selected also attended professional development workshops together; thus were suitable participants for this study who could provide substantial explanations of their experiences relevant to the focus of this study (Polkinghorne, 2005). Therefore, the professional development experiences of these Natural Sciences teachers would have taken place in the same context and examining these experiences will enrich understanding and contribute to knowledge of what happens at professional development workshops.

Sherrif-Uddin (2010) argues that selection of schools, not like other research could have been any school within the department of education, as this study revolves around teacher learning and professional development of Natural Sciences teachers. Teachers all over the country participate in workshops and engage in professional development activities and practices. Schools with higher enrolment had more than one Natural Sciences teacher and those with low enrolment had one teacher who teaches both Grades 8 and 9. The main concern in qualitative research is selecting teachers that will be able to sufficiently answer the research questions (Hill, 2012).

3.4.2 THE RESEARCH CONTEXT

Most of the schools in Ongoye cluster are in the deep rural areas and a few of them are in the semi-urban areas. Schools in semi-urban area have very high learner enrolment and have more than one Natural Sciences teacher. The schools with low learner enrolment have only one Natural Sciences teacher who teaches both Grades 8 and 9. In some schools there are teachers who teach Natural Sciences, although

they did not major in Natural Sciences, but majored either in Life Sciences or Physical Sciences or Agricultural Sciences which creates challenges for them when teaching Natural Sciences.

3.4.3 GAINING ACCESS TO SCHOOLS

Permission to conduct this research study was granted by the KwaZulu-Natal Department of Education. Principals of schools were contacted to arrange appointments to discuss the purpose of the study. Letters were given to the principals requesting permission to conduct the research study in their schools (see Appendix 2 and Appendix 3). The letters included my name, my contact details as well as the name and contact details of my supervisor (see Appendix 1). It was clearly explained to the principals and the Natural Sciences teachers that participation in this study was voluntary and they were free to withdraw at any time. The principals of schools that were contacted willingly granted me permission to conduct this study. Ethical approval was granted by the University of KwaZulu-Natal Research Ethics Committee (see Appendix 12 attached).

It was clearly explained to Natural Sciences teachers that their names would not be revealed as well as the names of their schools; it was also explained that the data collected would only be used for this study. Natural Sciences teachers were given the informed consent and declaration forms to sign (see Appendix 4 attached).

3.5 CHALLENGES ENCOUNTERED IN THE DATA COLLECTION

This study adopted a narrative approach. Collection of data was not easy as I thought it would be. Firstly, I made arrangements with the first participant (Sindi) and handed out the interview schedule so that participants could go through the questions before the interview so that time would not be wasted on the agreed date and time. I found that she had answered all the questions on the paper and she just submitted this to me. This incident changed my mind and I decided not to leave the interview schedule with the other participants as I wanted to interview them.

Secondly, Sizakele and Sibongile are Natural Sciences teachers in the same school. Sizakele teaches Natural Sciences in Grade 8 and Sibongile teaches Grade 9. Sibongile was the first Natural Sciences teacher to be interviewed in Zikude Secondary School. Sizakele decided to pull out after explaining what was going to take place during the interview. She indicated that she only had one month's experience of teaching Natural Sciences and has never attended Natural Sciences workshops and Sibongile who attended the workshop did not give her any information from the workshop. Sibongile, indicated that they share material from the workshops.

Thirdly, another participant Scelokuhle who agreed to meet with me at a particular date and time to conduct the interview, unfortunately had other commitments and therefore the interview was not conducted.

Fourthly, in Zakwethu secondary school I had to wait from 12h00 to 15h00 to see Sizwe to conduct the interview. The above mentioned incidents highlight the challenges to make appointments with participants, but I was bound by the research ethics to make appointments with Natural Sciences teachers. As I arrived at schools I received a warm welcome from the principals and they allowed me to talk to Natural Sciences teachers and make the appointment.

3.6 DATA ANALYSIS

Dey (1993) argues that thematic analysis is one of the utmost common procedures of analysis in qualitative research. It highlights, pinpointing, probing and recording themes within data. Themes are patterns through data sets and are linked to a specific research question. Qualitative analysis of data is a very demanding process, which includes working with textual data collected.

Sorting the data in a manner that suits the research questions, comparing, synthesising, making meaning to suit the terminology that is used in the study and discovering what is important and what is to be learnt (Hoberg, 1999). After the collection of data I transcribed the semi-structured interviews. Thereafter, I read and re-read the transcripts. Member checking was also used where I checked with the

participants after I transcribed their interviews if the transcripts accurately reflected their responses.

Boeije (2010) defines data analysis in qualitative studies as the process of breaking the information collected into fragments and brings together the fragments again into coherent whole. Transcribed data from semi-structured interviews were analysed and categorised according to research questions as indicated in appendices (9, 10 and 11).

3.7 ETHICAL CONSIDERATIONS

Before the collection of data, I applied for permission to conduct this research study from the KwaZulu-Natal Department of Education (see Appendix 13). In my proposal the purpose of the study was clearly stated, the name of the researcher, supervisor and the contact details were included as well as the data collection instruments. The KwaZulu-Natal Department of Education granted permission to conduct this study in schools in Ongoye cluster under UThungulu district. I also applied for permission to conduct this study from the UThungulu District office. After receiving permission, I then started contacting the principals of schools telephonically to ask for the permission to arrange appointments with Natural Sciences teachers. Permission to conduct this study was also granted by the University of KwaZulu-Natal Research Ethics Committee (see Appendix 12).

Orb et al. (2000) contend that there are three principles that should be adhered to when conducting qualitative research. The three principles are autonomy, beneficence and justice. They assert autonomy refers to the integrity of the informed consent, which entails that participants use their right as autonomous persons to voluntarily agree or refuse to participate in the study. Secondly, they contend that beneficence refers to confidentiality and anonymity which could be applied by the use of pseudonyms. And thirdly, Orb Eisenhauer, and Wynaden (2000, p. 95) contend that justice refers to “equal share and fairness.”

Participants were informed verbally and in writing of their rights to confidentiality and anonymity and about voluntary participation. It was clearly stated that they could

withdraw from the project at any time. I made sure that they understood these ethical issues. All the information they provided would be treated with utmost confidentiality and respect. I personally conducted all the interviews to ensure the quality and all the questions were clarified and probed where necessary.

Before the interviewing process started the participants were given informed consent forms to sign, the three principles of conducting research were clearly explained to them and when they agreed with the principles they signed the consent forms. This was done in order to encourage honesty and openness. It was also explained to participants that the information that they would give would only be used in this study and not for any other purposes. I informed the participants that interviews would be audio-recorded. All participants signed the informed consent forms. After transcribing the interviews the transcripts were given to participants to validate what the researcher has transcribed.

3.8 TRUSTWORTHINESS

I maintained a good relationship with the participants. Guba and Lincoln (1994) contend that participants would share information such that they communicated their emotional state, perception and experiences without feeling anxious or inadequate to censor what they shared.

Cohen, Manion and Morrison (2007) highlight that one needs to be clear, courteous, non-threatening, pleasant and friendly when conducting interviews. Seven interviews were recorded except for one that was not recorded, because the participant preferred to respond in writing. Maree (2007) argues that transferability refers to the extent to which the findings can be applied to another situation. Maree (2007) argues that there is a close link between credibility and dependability where the researcher can repeat the questions again and again to check whether same results can be obtained. After transcribing the interviews participants were given their transcribed interviews to check what was transcribed is what was said by the participant.

Maree (2010) explains that collecting and analysing data concurrently encourage a mutual interaction between what is known and what one needs to know. Maree (2010)

argues that trustworthiness in a qualitative study can be improved by sustaining high credibility of independence. He further contends that trustworthiness is all about establishing credibility, transferability, dependability and confirmability. He explains that credibility refers to the level of assertiveness of the qualitative researcher in probing the truth of the research findings. I also attended two Natural Sciences workshops where I used the observation schedule (see Appendix 5) in order to record what was said by the participants and to collect the data. The information that Natural Sciences teachers gained in workshops can be applied in their classroom situation. Maree (2010) asserts that confirmability is about the steps that must be taken to ensure as far as possible that the findings are the outcomes of the experiences and concepts of the participant, rather than the characteristics and views of the researcher.

3.9 CONCLUSION

In this chapter I have discussed and explained the following methodological issues: an interpretive research paradigm, a qualitative methodological approach, narrative research design, purposive sampling procedures, data collection techniques, data analysis and trustworthiness. I have also outlined challenges encountered as well as the ethical issues adhered throughout the study. Qualitative research was adopted so that the researcher could get the first-hand information from the participants that would answer the research questions. In the next chapter I will present the data and discuss the findings of the study.

CHAPTER 4: PRESENTATION OF FINDINGS

4.1 INTRODUCTION

The aim of this study was to examine professional development experiences of Grades 8 and 9 Natural Sciences teachers within Ongoye cluster of UThungulu District. This chapter presents the results and findings of the data obtained through semi-structured interviews and two lesson observations from eight Grade 8 and 9 Natural Sciences teachers who participated in professional development activities organised by the department of education. Direct quotations were used to indicate participants' voices in order to display how their experiences are similar or different. Interviews were audio-recorded and transcribed and common issues were identified in the teachers' responses to identify themes. Thematic content analysis was used to analyse the data.

This chapter presents the findings according to the following research questions:-

1. What do grades 8 and 9 Natural Sciences teachers in Ongoye cluster at UThungulu District learn from professional development workshops?
2. How do Grades 8 and 9 Natural Sciences teachers learn during professional development workshops in KwaZulu Natal?
3. To what extent does teacher learning influence their teaching practice?

Brodie (2013) argues that effective teacher professional development is believed to lie in support of teacher collaboration in order to produce communal understanding, put more emphasis on curriculum and coaching, and being of adequate duration to certify progressive improvements in knowledge. Desimone (2011) argues that during professional development workshops, Natural Sciences teachers learn from one another. Natural Sciences teachers share their experiences, ideas and the methods they use when conducting Natural Sciences lessons. Illeris (2009) argues that the information that teachers obtain in these professional development activities adds to on the information that they already have. The concept elucidates professional development to refer to the scheduled opportunities planned for teacher learning in Natural Sciences workshops so as to improve in their daily practices (Kelly, 2006).

4.2 BACKGROUND INFORMATION AND TEACHERS' EXPERIENCE IN NATURAL SCIENCES

The teachers' background information is presented in the table below and pseudonyms are used to protect anonymity of teachers. Background information also includes the reasons why teachers became Natural Sciences teachers as well as the challenges they experience in the teaching of Natural Sciences. The table below shows the qualifications of Natural Sciences teachers and their teaching experience.

Table 4.1: Participant details

TEACHER Psuedonym	GENDER	QUALIFICATIONS	GRADES TAUGHT	MAJOR SUBJECTS	Teaching experience
1. Sne	F	STD, B.Ed (honours) and ACE	8 and 9	Biology (Life Science), Hospitality Studies and Home Economics	15 years
2. Sindi	F	STD and ACE	9	Agricultural Sciences and Biology(Life Sciences)	14 years
3. Sibongile	F	B.Ed.	9	Physical Sciences and Technology	6 years
4. Sizwe	M	SSTD and B.Paed.	8 and 9	Agricultural Sciences and Biology(Life Sciences)	13 years
5. Sazi	M	B.Sc (microbiology) and PGDE	8	Physical Sciences and Biology (Life	20 years

				Sciences)	
6. Sanele	F	B.Paed.	8	Zoology and Pedagogics	31 years
7. Siphokazi	F	B.Paed.	9	Mathematics and Physical Sciences	9 years
8. Sphe	F	B.Ed.	8	Mathematics and Physical Sciences	4 years

Table 4.1 represents biographical details of participants' teachers' qualifications, major subjects and NS teaching experience.

4.2.1 PARTICIPANT 1 – SNE

Sne is a female teacher who has been teaching for 15 years and she has taught Natural Sciences in Grades 8 and 9 for 5 years. She has a Secondary Teachers' Diploma (STD) where her major subjects were Life Sciences, Hospitality Studies and Home Economics and also has Advanced Certificate in Education (ACE) and she majored in Educational Management.

Sne mentions the reason why she became a Natural Sciences teacher, she says:

> *I wanted to study something that is realistic and also something that is happening in my body. I had an interest while I was still young, doing Biology during our times, and in General Science I liked the part that deals with nature.*

The challenges that Sne has in teaching Natural Sciences, according to her are:

> *The work that is allocated for term 4 poses challenges. Where there are planets, there is no time for teaching Grades 8 and 9 as we mostly concentrate on Grade 12 moderation where we move in and out of school with Grade 12 work.*

4.2.2 PARTICIPANT 2 – SINDI

Sindi is a female teacher who has been teaching for 14 years and she has only had 3 years' experience of teaching Grade 9 Natural Sciences. She has a Secondary Teachers' Diploma (STD) which she obtained at Esikhawini College of Education, and her major subjects were Agricultural Sciences and Life Sciences. She also has the Advanced Certificate in Education (ACE) where she majored in Natural Sciences.

Sindi's reason for becoming a Natural Sciences teacher, is:

> *It is because I like to work with chemicals, equipment and conducting experiments.*

When I asked Sindi whether she has a challenging topic, she said:

> *The topic on Energy and Change: the topic is electric cells where I am unable to understand the formulae and am unable to measure the voltage and the current in series.*

4.2.3 PARTICIPANT 3 – SIBONGILE

Sibongile is a female teacher with 6 years of teaching experience and has taught Grade 9 Natural Sciences for 6 years. She has a Bachelor of Education degree with majors in Physical Sciences and Technology. The meeting occurred at school during the lunch break and we were allowed to use the principal's office.

Sibongile's reason for teaching Natural Sciences, is:

> *For the love of science and nature that interest me.*

In this school there are two Natural Sciences teachers and the second teacher withdrew.

Sibongile said:

> *The challenging part is that of a body system and mostly reproductive system where learners enjoy that part, but sometimes they don't get too serious but they end up joking a lot and making funny jokes and somewhere somehow it can be sensitive. Sometimes you really don't know how to explain it. Some learners, as we live in a rural area you know, live with their brothers and sisters*

who are infected with HIV & AIDS then we have to teach about it. And as a teacher you don't want to hurt those who are infected and affected. You are embarrassed to discuss sensitive information as it can upset them.

4.2.4 PARTICIPANT 4 – SAZI

Sazi is a male teacher who has been teaching for 20 years and he has been teaching Grades 8 and 9 Natural Sciences for 9 years. He has a Bachelor of Science in microbiology as well as the Post graduate Diploma in Education; his major subjects are Physical Sciences and Biology. The meeting occurred in his school during the sports session.

When I asked him the reasons for teaching Natural Sciences, he says:

I didn't choose to be a Natural Sciences teacher, as subjects are allocated by the SMT, I majored with Biology (Life Sciences) and Physical Sciences. So it was relevant for me as Natural Sciences is the combination of Physics and Biology as they are my major subjects. They only looked at relevancy of the qualifications versus the subject that needs to be taught.

Sazi does not find any challenging topic in Natural Sciences as he says:

Natural Sciences is the combination of both Physical Sciences and Life Sciences which are my major subjects.

4.2.5 PARTICIPANT 5 – SIZWE

Sizwe is a male teacher who has been teaching for 13 years, but he has taught Grade 9 Natural Sciences for only 2 years. He has a Bachelor of Paedagogics degree and Senior Secondary Teachers Diploma where he majored in Agricultural Sciences and Biology. The Head of Department allowed us to use his office for our meeting.

Sizwe highlighted this in his reason of becoming a Natural Sciences teacher:

I don't want to answer that as I was given the load while we were doing the duty load. I didn't choose.

Sizwe mentioned if facilitators for Natural Sciences can put more focus on experiments it would help. He said:

> *More experiments need to be done if they can put more focus on them as they are challenging to me. Even if you wish to do certain experiments, but then it becomes challenging due to lack of resources. Sometimes you even leave that work just because there are no resources. In one experiment I ended up buying a candle for an experiment and it was time-consuming using that candle.*

He further said:

> *Whenever I ask for certain material like copper the Physical Sciences teacher would say it was there; that makes it difficult for me especially because the subject is new to me as I don't even know where to find certain apparatus.*

Opfer and Pedder (2011) contend that some teachers encounter difficulties in their classroom practices and the lack of content knowledge could be the case as Sizwe the Natural Sciences teacher highlighted that the subject was given to him as part of his duty load.

4.2.6 PARTICIPANT 6 - SANELE

Sanele is a female teacher who has been teaching for more than 30 years, but she has only taught Grade 9 Natural Sciences for one year. She has the Bachelor of Paedagogics where she majored in Zoology and Paedagogics. Our meeting occurred in her school during lunch time. Sanele' reason of becoming a Natural Sciences teacher is as follows:

> *It is part of Life Sciences which I've been teaching all the time.*

Sanele's challenging topic in Natural Sciences, was shared as follows:

> *It's human reproduction, as Grade 8 and 9 learners are still small children some of them haven't reached puberty. It makes you uncomfortable to explain a topic that they cannot fathom at their age yet.*

4.2.7 PARTICIPANT 7 - SIPHOKAZI

Siphokazi is a female teacher who has been teaching for 9 years, but she has taught Natural Sciences in Grade 8 for 5 years. She has a Bachelor of Education degree, she majored in Mathematics and Physical Sciences. She has taught Natural Sciences for 5 years. Our meeting occurred in her school during lunch time.

The reason for Siphokazi to become a Natural Sciences teacher was explained as follows:

> *Because it's a nice subject which deals with something that is more practical.*

When I asked her about the challenging topic she said:

> *Its planet earth and beyond. I use different books, I use google or sometimes ask my colleagues if there is something when I don't understand*.

4.2.8 PARTICIPANT 8 - SPHE

Sphe is a female teacher who has been teaching for 4 years but she has taught Grade 8 Natural Sciences for two years. She has a Bachelor of Education degree and she majored in Physical Sciences and Mathematics. Our meeting occurred after school in her school. Sphe's reason of becoming a Natural Sciences teacher, was:

> I*t's part of Physical Sciences which is my major subject even though there are challenging topics.*

Sphe's challenging topic, was explained as:

> *It's 'Life and Living' where I ask Life Sciences teacher certain things that I don't understand and sometimes I even ask the teacher to do the topic for me."*

Teacher learning involves a personal aspect which is evident in their responses of Natural Sciences teachers, as they were expressing themselves by giving their own personal reasons for becoming Natural Sciences. Bell (1998) argues that interest and motivation play a vital role in whether or not Natural Sciences teachers take up the opportunities of attending professional development activities.

4.3 PARTICIPANTS' TEACHING EXPERIENCES AND THEIR PROFESSIONAL LIFE PHASES.

Day and Gu (2007) as mentioned before argue that there are six teachers' professional life phases namely; from 0-3 it's learning which builds identity and classroom competence; 4-7 which refers to years developing professional identity; 8-15 years which is the phase when the teachers define work-life balance; 16-23 years which is the phase of managing work-life tension; 24–30 years which is the time teachers adjust to change; and 31 years and above which is when they sustain commitment.

Natural Sciences teachers are categorised according to their teaching experience. Sne has been a teacher for 15 years which places her in 8-15 years professional phase defining work-life balance. Siphokazi has been teaching for 9 years and therefore, Sne and Siphokazi are in the same professional life phase of defining work-life balance. Sne and Siphokazi highlighted that their challenging topic was Planet Earth and Beyond.

Sne said:

> *This topic is taught in the fourth term so it becomes difficult for me to teach this topic as there is no time for teaching when I am busy with matric moderation.*

Although Sne has been teaching for 15 years she also have the challenging section in Natural Sciences; and she is teaching in a school with low learner enrolment. Sne highlighted that it becomes difficult to teach the topic because it has to be taught during the last term of the year where her focus is mostly on grade 12. The time allocated for Planet Earth and Beyond does not give the teachers much time to look at the topic. If there was another Natural Sciences teacher they would share the work so that learners may not suffer because the teacher is giving much attention to grade 12.

This is affirmed by Day and Gu (2007) as mentioned before who argue that most teachers had started to face extra pressure in managing both their professional and personal lives, as illustrated by Sne who experienced challenges with Grade 8 Natural

Sciences as she preferred Grade 12 content topics. Similarly, Mizzi (2013) argues that inadequate background in the subject knowledge is one of the key factors that contributes to such challenges which is evident in Sne's response that she has difficulty teaching the section Planet Earth and Beyond in Natural Sciences and instead focuses on teaching grade 12. This influences the development of the teachers' pedagogical content knowledge as well as the teachers' self-confidence and attitudes when she is teaching topics outside her area of expertise. Planet Earth and Beyond covers Geography work which was a challenge to Sne.

Siphokazi said:

> *I use different books; I google and ask my colleagues if there's something that I don't understand.*

Siphokazi is not the only Natural Sciences teacher, as she teach in a school with high learner enrolment. She therefore gives herself time to look for the information that is not quite clear to her and she even ask her fellow colleagues for clarity.

Day and Gu (2007) as mentioned previously contend that that professional and individual support and care within the internal and external workplace focus on educating self-efficacy, self-confidence and emotional comfort are of particular value. This could explain why Siphokazi made attempts to get all the relevant information that could be used in the Natural Sciences class. Results in this study is similar to Mizzi's (2013) study which found that teachers mainly reads textbooks, teachers' resource packs and work schedule that would give them numerous ideas of lesson plans and activities and also use the internet to link different lessons and topics. This was evident in this study as Siphokazi sought help and advice from Geography colleagues who are subject specialists in the topic so that it would be easier for her to teach the topic.

Sindi's teaching experience is 14 years which places her in the same category as Sne that is the 8-15 years professional life phase of defining work-life balance. In her 14 years of teaching she still experienced challenging topics such as Energy and Change. This topic is still giving her a challenge even after specialising in Natural Sciences in her Advanced Certificate in Education. She also asserts that the subject that she likes the most is Agricultural Sciences.

Sindi says:

> *My challenging topic is Energy and Change especially electric cells where I am unable to measure the voltage and current when cells are connected in series.*

Sindi found it necessary to do advanced certificate in education and she specialized in Natural Sciences because she wanted to gain more confidence in various topics of Natural Sciences that gives her challenge. But the topic on Energy and Change is still giving her a challenge. Sindi did not do Physical Sciences she only did Agricultural Sciences and Biology. Sindi indicated that she also gets assistance from the Physical Sciences teacher. This result is similar to Mizzi's (2013) study which found that support from school is the most common approach to help Natural Sciences teachers deal with their weaknesses in subject matter.

Sibongile has been teaching for 6 years and also has 6 years of teaching Natural Sciences which means she is in the 4-7 years professional life phase and is in the process of developing her professional identity. It was clear that Sibongile was developing her professional identity when she said:

> *As a Natural Sciences teacher you need to know what is happening in your surroundings or just around you.*

She also highlighted that if you are a good Natural Sciences teacher you must learn new facts every day. Day and Gu (2007) as mentioned before argue that other responsibilities had started to play a substantial role in teachers' enthusiasm, commitment, and sense of effectiveness, she even stated that:

> *As a Natural Sciences teacher you should be someone who is willing to know more.*

Mizzi (2013) contends that confidence is influenced by many factors such as school and individual experiences and the nature of professional development workshops. Results of this study is similar to Mzizi's (2013) study as Sibongile said that she acquired knowledge that helped her to overcome the pressure of curriculum overload, received support from Natural Sciences teachers and used material resources obtained from professional development workshops which improved her confidence. This finding also relates to Borko's (2004) assertion that teacher learning takes place

in professional development workshops where teachers share goals to improve learning and teaching which improves their confidence and collaborative relations, as was mentioned by Sindi and Sibongile.

Sazi had been teaching for 20 years which placed him in the 16 - 23 years professional life phase, therefore he was involved in managing work-life tension.

Sazi says:

> *I feel comfortable with Natural Sciences because the curriculum includes both Physical Sciences and Biology. I'm unlike someone who majored in Life Sciences only or Physical Sciences only. Those who majored in Life Sciences will leave the Physical Disciplines part just, because he/she is not comfortable with that part and those who majored in Physical Sciences will also do the same in Life Sciences part.*

Day and Gu (2007) as mentioned before assert that teachers in this professional life phase benefited from partaking more clearly in a defined sense of professional identity, this is evident as Sazi argues:

> *I wish we could have a workshop that will tell you something that you don't know; something that you never come across. But, if you were to conduct a workshop like tell me about the periodic table rather tell me the easiest way of teaching it that is different from what I know. Then it would be interesting to me.*

Schmidt (2010) contends that presentation or explanation of teaching concepts, through coaching, peer teaching, and other teaching skills in the form of practical demonstrations was useful for both Natural Sciences teachers and learners. Sizwe has been teaching for 13 years which places him in the 8-15 year professional life phase of defining work-life balance. Sizwe revealed that he knew what he wanted that would make him teach Natural Sciences better.

He posited that:

> *I need more knowledge on experiments as well as the section on electricity that is done in term 3. I don't feel comfortable in doing that topic. I do teach the topic just because I had to though it is challenging*.

Day and Gu (2007) as mentioned before contend that professional learning opportunities, therefore, need to address professional needs of teachers and support them to improve their role and effectiveness as Natural Sciences teachers.

Sanele has been teaching for 30 years which means she is in the 24–30 years professional life phase and adjusting to change. Day and Gu (2007) assert that teachers' identity had an important role to play in enhancing their motivation and commitment and empowering them to teach at their best.

Sanele said:

> *The brochure they gave Natural Sciences teachers who attended the workshop also had some clues and some ways and little skills on how to approach human reproduction, like always use English, because sometimes our own language had got that thing you know that is not very palatable*.

Sanele had fears of teaching young girls about human reproduction. She was thinking of her own professional identity and how she would teach the topic as learners are of different ages. Some learners had already reached puberty and other learners had not reached the stage.

Sphe has been teaching for 4 years therefore, she was in the developing professional identity career phase and had taught Natural Sciences for 2 years so she was keen on learning what factors built her professional identity and classroom competence.

Dewey (2015) argues that the two principles of continuity and interaction cannot be separated from each other. For the principle of continuity shared information is carried over from the previous workshop to later workshops. A variety of teaching conditions that Natural Sciences teachers discuss with one another may be applied to another environment. Similarly, in this study, Natural Sciences teachers shared information and discussed their experiences when they attended professional development workshops. From responses of Natural Science teachers in this study it is also evident that there was continuity between professional development workshops.

4.5 NATURE OF PROFESSIONAL DEVELOPMENT WORKSHOP

The views of Natural Sciences teachers are presented on the nature of professional development workshops that they attended.

Sne said:

> *Workshops are very useful, because when you look at these trackers that they have introduced you find something that you do not know and now you get used to it before you go to class and by that time you know exactly what needs to be covered at that particular time.*

Sazi says:

> *These workshops are very useful for instance they are relevant to what needs to be done on that particular term. Facilitators do not combine the work for the whole year when conducting workshops. If it's the first term they workshop us on the work that is relevant to the tasks that should be covered during term 1.*

There is correspondence in what was said by Sne and Sazi. Desimone (2011) argues that there is coherence in professional developments as they are constant in improving teacher learning that is in line with the understanding of the government policies. Two Natural Sciences teachers also indicated that the workshops that they attended were in line with the CAPS document.

Avalos (2011) argues that professional development workshops necessitate knowledgeable and responsive participation so that there could be a change in the daily activities. Natural Sciences teachers participate in professional development workshops that are organised by the departmental officials. Natural Sciences teachers mentioned that they acquired content knowledge and pedagogical content knowledge in professional development workshops. This supports the view of Johnson and Golombok (2003) who argue that teacher learning that occurs in professional development workshops could influence pedagogical change.

Results of this study revealed that professional development workshops enhanced Natural Sciences teachers' confidence and inspiration, improves their teaching approaches and their willingness to work with others. Similarly, Day (2015) contends that effective professional development workshops greatly influences the affective features of professional learning as well as teaching.

Sibongile argues:

> *I learn a lot from workshops, since as a teacher you really can't know everything. Other Natural Sciences teachers can help me in some topics that I don't understand, and I can also help others in the topics that I understand better so there is that interaction that makes things better.*

Steiner (2004) argues that professional development workshops focus on both content knowledge and pedagogical content knowledge and taking into consideration how learners learn a particular subject matter. In this case Natural Sciences teachers who have their challenging topics and therefore, they make an effort to ensure that they acquire knowledge and skills that would enable them to deliver the relevant information to class (Kelly, 2006).

Guskey (2009) contends that teacher knowledge is an intermediating variable between professional development and teacher learning in the context, since effective professional development does not only shape teaching practice, but also teachers' knowledge. Guskey (2009) agrees with Illeris (2009) in his learning theory argues that learning involves the combination of two different processes that are collaboration a process between the Natural Sciences teachers and their social, cultural/material environment and an internal psychosomatic process of elaboration and acquisition of content knowledge and pedagogical content knowledge. This enable Natural Sciences teachers to implement curriculum changes.

Desimone (2011) posits that active learning refers to the extent to which professional development provides chances for teachers to be engaged in the exploration of teaching and learning where Natural Sciences teachers learn from one another as they discuss various topics in Natural Sciences.

These professional development workshops aim to promote a better understanding of teacher knowledge and the use of specific teaching strategies in Natural Sciences. Siphokazi says:

> *Different things, different ways of tackling of how to approach a particular topic, or how to introduce a certain topic all pose unique challenges.*

Sindi says:

In workshops we get a chance to network with other Natural Sciences teachers where they use their teaching experience in explaining. I gained certain practical knowledge in the topics that are challenging.

Siphokazi's response resonates with Desimone's (2011) view of collective participation which is defined as the extent to which various Natural Sciences teachers from the same cluster share in the similar learning opportunities. Sanele and Siphokazi teach in the same school and they also highlighted that in their school they also had other professional development workshops that were either organised by the principal or the departmental heads. Workshops that were organised by the principal were attended by all teachers in the school, but those that were organised by departmental heads were only attended by the teachers in that particular department. Responses by Sibongile, Siphokazi and Sindi also relate to Darling-Harmond et al. (2009) who assert that teachers engage in various collaborative professional learning activities during professional development workshops. Results of this study also highlighted that participants had common concerns and shared new knowledge. Similar results were found in Beijaard et al.'s (2005) study which suggested that participants learn from one another.

Sazi mentioned that he is comfortable teaching the Natural Sciences curriculum since his content knowledge in Physical Sciences and Biology is good. This illustrates Wall's (2017) view that Natural Sciences teachers who already had strong Natural Sciences content knowledge and felt more prepared to teach various Natural Sciences content areas were more likely to participate in sustained, content-focused professional development than teachers with weak content knowledge**.** He further argues that professional development workshops must be directly relevant and applicable to teachers' Natural Sciences classrooms, to teachers' personal needs, and draw on teachers' previous knowledge and experiences.

Therefore in this study, Natural Sciences teachers for grades 8 and 9 indicated that professional development workshops were very useful as they prepared them with the skills and knowledge that needed to be taught to the learners.

4.5.1 NATURAL SCIENCES TEACHERS LEARN CONTENT KNOWLEDGE AND PEDAGOGICAL CONTENT KNOWLEDGE

The findings presented in this section address the first research question which says; what do Grades 8 and 9 Natural Sciences teachers in Ongoye cluster at uThungulu District learn from professional development workshops? The responses given by Natural Sciences teachers suggest that they have different views in what they learn in professional development activities.

Natural Sciences teachers also highlighted that in workshops they learn both content knowledge as well as pedagogical content knowledge. They also asserted that as they attended workshops they also helped each other with different methods or alternatives of approaching different topics. Sometimes they could even share the resources that they had in their schools.

Sne and Sindi agreed that they learnt the content of Natural Sciences for Grades 8 and 9 in professional development workshops. Sne explained that:

> *This year during the second term the workshop we had was on Energy and Change; and Matter and Material*. *The workshop that I attended covered these topics: atomic number, mass number, the groups and the periods as they are found in the periodic table as well as arrangement of elements in the periodic table*.

Sazi and Siphokazi concur that they learn both content knowledge and pedagogical content knowledge of Natural Sciences for Grades 8 and 9. Sazi said:

> *I learnt different methods of* presenting *a lesson to learners that can make it easy for them to understand. In workshops learning how to do some of the experiments, can be very tricky.*

Sibongile, Sanele and Sphe mentioned that the information that they received in workshops is not the same in all workshops; for instance the workshop attended in term one only covered the work that needed to be covered during term one and in term two they would be workshopped on work covered in term two.

Natural Sciences teachers' responses support the view of Darling-Hammond et al. (2009) that professional development workshops put emphasis on improving teachers'

knowledge on how to engage in specific kinds of content that needs to be delivered to learners. Teachers also showed collaboration and collegiality as they were able to assist other Natural Science teachers when the facilitator was unable to answer certain questions. This results is similar to results of Hunzicke (2010) that professional development workshops promote collaboration and collegiality as they emphasise both active and interactive learning that Natural Sciences teachers acquire as they become involved in various activities.

Desimone (2011) argues that professional development workshops focus on pedagogic content knowledge or a specific knowledge that Natural Sciences teachers need to efficiently convey to learners. Such knowledge enables Natural Sciences teachers to choose appropriate apparatus that may be used to explain new concepts as well as knowledge to learners. Results in this study highlighted that Natural Sciences teachers shared various strategies on class management as well as content knowledge in professional development workshops. Desimone (2011) refers to this as general pedagogical knowledge evident when Natural Sciences teachers shared their ideas on classroom management and organization across the content areas. Similar results were found in Mizzi's (2013) study that Natural Sciences teachers acquire more knowledge which assists in building their self-confident when teaching topics that are outside their subject specialism. Brodie (2013) argues that collaborative learning was meant to support and challenge the existing thinking of teachers so as to develop new conceptual ideas of Natural Sciences as the subject that they are teaching.

Wall (2017) argues that professional development workshops should be continual and it should not be a classified activity. Since professional learning is fixed within practice, it becomes part of daily speech, shared thoughts about learner learning and learner products, as well as more formalized mentoring and coaching, gatherings, educational groups, and examination of evidence from inquiry cycles**.**

4.5.2 TEACHERS LEARN THROUGH COLLABORATION

This section addresses the second research question: how do Grades 8 and 9 Natural Sciences teachers learn during professional development workshops? Natural Sciences teachers shared different views on how they learnt during professional

development workshops. As the Natural Sciences teachers were doing activities in their groups they were learning from one another, and they also shared different skills of conducting experiments and how to explain some concepts to learners.

Sindi says:

> *In workshops we discuss important information as well as how to teach a particular topic so that it can be easily understood by learners where we assist each other.*

Sne says:

> *Facilitators bring material and they do some practicals for us and we also do them for presentation. Sometimes they also give us some activities and we do some presentations based on a certain topic that enables us to know or to gain experience on how to handle certain topics that you don't understand.*

Sizwe also highlighted:

> *In workshops I learn some of the things, as they don't teach everything they just highlight some of the things. They don't do a topic in details, especially on the parts that involves experiment. In general I can say I do gain some information*.

Lieberman (1995) argues that Natural Sciences teachers learn best through dynamic involvement such as thinking about and uttering what they have learnt and even repeating what they have done with their learners. Day (1999) argues that teacher knowledge deals with the argument about what kind of knowledge Natural Sciences teachers need to acquire or have. Professional development activities allow them to interrogate different forms of knowledge. Harwel (2003) argues that professional development activities sharpen teacher knowledge of Natural Sciences and it also deepens the teaching skills. Results in this study were similar to results of these studies mentioned above as Natural Sciences teachers in this study indicated that they acquired different forms of knowledge such as content knowledge, pedagogic content knowledge and general pedagogic knowledge.

Kennedy (2005) highlights continuing professional development models using simulations through which teachers learn in relation to their ability for supporting

professional individuality and transformative practice of teachers along a variety from transmissive, to transitional and towards transformational learning. These professional development activities enable Natural Sciences teachers to change the manner in which they impart the knowledge to learners. Kennedy (2005) further argues that the purpose of continuing professional development and how professional development activities are organised and structured help to understand the nature of professional knowledge and professionalism that Natural Sciences teachers acquire.

Opfer and Pedder (2011) argue that teachers need time to develop, absorb, discuss and practise new knowledge. As Natural Sciences teachers attend a one-day workshop and the workshop covers the work for both Grades 8 and 9, this time is not enough for them to be developed and be able to absorb the content knowledge as well as to practise the knowledge given to them.

Natural Sciences teachers highlighted that in workshops they are given material to use during the workshop and they are also divided into groups where they shared information on the topic given. They also indicated that they learn from one another. This result resonates with Ndemuweda's (2011) study which found that teachers learn best with participation and involvement where Natural Sciences are involved in discussions, sharing ideas, doing experiments and even trying out new teaching strategies and interact with other Natural Sciences teachers. Similarly, Wall (2017) contends that according to Natural Sciences teachers, ultimate collaborative professional development is motivating, compassionate, and uses active learning techniques that are hands-on.

4.5.3 OBSERVATION OF PROFESSIONAL DEVELOPMENT WORKSHOPS

The discussion below summarises my observations during the first workshop on Matter and Materials and second workshop on Energy and Change.

More than 20 Natural Sciences teachers attended the first workshop. Most of the teachers who attended the workshop on Matter and Material also teach Grade 12 Life Sciences and there was a clash on the date of the workshop. On their arrival they reported that they need to be excused at 12 o'clock so that they could attend

moderation. This affected the manner in which the workshop was planned. The facilitator explained to teachers that he would have to explain some of the things first so that all the teachers may benefit and experiments would be done afterwards. Most of the content knowledge was explained and the facilitator also involved Natural Sciences teachers in the discussion of certain concepts using different teaching skills.

Natural Sciences teachers who were attending moderation for Grade 12 were given material with activities and Natural Sciences teachers that remained behind were then given the activities to do in groups. Teachers enjoy talking about material relevant to what they are going to do in Natural Science class observation of professional development workshops in this study were similar to the observations by Wilson and

Berne (1999) argues that Natural Sciences teachers show interest in the activities that they engage-in in professional development workshops and they highlighted that they would give similar activities to their Natural Sciences learners. Teacher learning includes internalisation where they consider the external factors that could have an influence on what they are discussing (Golombok, 2003).

Avalos (2011) asserts that teacher professional learning is the process which involves cognitive emotional participation of Natural Sciences teachers independently and in collaboration with other Natural Sciences teachers. It deals with the capacity and preparedness to observe where each one stands in terms of opinion, principles and checking and presentation of appropriate alternatives for improvement and change of content knowledge and pedagogical content knowledge.

In the first professional development workshop the facilitator displayed what Ndemuweda (2011) refers to as transmissive learning strategies where the facilitator was involved in conveying the knowledge. Therefore, learning occurred through the transmissive approach and it was mainly individualistic. Natural Sciences teachers were given knowledge to complement and relate it to what they already know.

In the second workshop on Energy and Change, there were 8 Grades, 8 and 9 Natural Sciences teachers who attended the workshop. The facilitator and the subject advisor were worried about the poor attendance and they asked the teachers on how they got information about the workshop. Most of the teachers mentioned that they did not receive the invitation for the workshop. Some teachers only heard about the workshop in the morning on the day of the workshop.

Levin (2002) asserts that effective professional development workshop is when Natural Sciences teachers are provided with chance to reflect critically on their daily practice to create new knowledge and principles about content and pedagogy. Teachers were given material to use when conducting experiments with the facilitator and the subject advisor moving from group to group explaining some concepts and checking whether they were experiencing any difficulties. Natural Sciences teachers in their groups were also explaining to one another what was happening in the experiment and they were also learning from each other.

Opfer and Pedder (2011) assert that Natural Sciences teachers learn efficiently when professional development workshop necessitate them to engage with the material; and when the pedagogy of professional development is enthusiastic and requires teachers to learn in ways that reflect how they should teach learners. Similarly, in this study, through collaboration in their groups Natural Sciences teachers changed their attitudes and beliefs towards a particular topic which they are professionally developed in to such an extent that they changed their teaching methods.

Ndemuweda (2011) argues that learning by doing experiments is important as it enhances self-confidence in Natural Sciences teachers. Likewise, in this study Natural Sciences teachers were given material to carry out the experiments, some teachers were using the trial and error method before they actually did what was expected of them. This improved teacher confidence as they were motivated to conduct experiments in their classrooms.

The facilitator further informed Grades 8 and 9 Natural Sciences teachers that they can affiliate in the Science center in Richards Bay where they can borrow different forms of apparatus that can assist them to conduct experiments in their schools.

Day, Gu and Sammons (2016) as mentioned earlier on argue that in professional development workshops, facilitators cascade information to Natural Sciences teachers attending ‘training events’ and then cascading, or distributing, information to Natural Sciences teachers. Wall (2017) contends that when Natural Sciences teachers can discuss new techniques and practice with one another, they expected to implement new techniques in their classrooms. Additionally, collaboration can contribute to a “communal responsibility” for learner achievement amongst a school or district, which can be of assistance to sustain the implementation of changes and new practices and

contribute to overall success. Results of these study mentioned are similar to results in this study as observations of professional development workshops revealed that facilitators cascaded information about new techniques and Natural Sciences teachers collaborated to improve their teaching and learner achievement.

4.6 CHALLENGES ENCOUNTERED BY NATURAL SCIENCES TEACHERS

Natural Sciences teachers for Grades 8 and 9 in Ongoye cluster of UThungulu District mentioned a variety of challenges that they encountered in teaching the subject. Goldschimidt and Phelps (2007) contend that content knowledge items require teachers to use the knowledge of understanding context of teaching situations. Dhurumraj (2013) is of the opinion that there could be a variety of factors that may lead to underperformance of teachers like lack of resources, lack of content knowledge, teachers' un-involvement and their apathy when it comes to professional development activities; in some cases the school may have fewer enrolments and then the teachers have to teach different grades.

Natural Sciences teachers experience various challenges, like the shortage of resources, lack of content knowledge in some topics that were not covered by their major subjects. There are teachers who teach Natural Sciences in Grades 8 and 9 who neither majored in Physical Sciences nor Life Sciences, which creates problems in certain topics in Natural Sciences. One teacher who withdrew from the study highlighted that the teacher who attended the workshop did not give her information about the workshop whereas the teacher said they share information with other teachers.

4.6.1 SHORTAGE OF RESOURCES AND CHALLENGING TOPICS

Mizzi (2013) ascertains that Natural Sciences teachers felt that they lack knowledge about handling certain apparatus when conducting experiments as well as safety precautions in working with certain chemicals. She further explains that Natural Sciences teacher show anxious about how to deal and explain unexpected or wrong results due to their lack of confidence in certain topics of Natural Sciences.

Experienced teachers show concern about their ability to relate between the different areas of Natural Sciences work schedule due to their lack of knowledge and resources. She further argues that having an in-depth knowledge of the subject matter helps Natural Sciences teachers to provide alternative clarifications or use various approaches to enable learners to understand complex scientific concepts.

Day (2015) argues that collaboration of Natural Sciences teachers during workshops nurture self-esteem, social, individual and emotional self-assurance as well as sense of responsibility. Some Natural Sciences teachers highlighted that in their schools they had a shortage of resources as Sazi states that:

> *Even if you wish to do certain experiments, it becomes challenging due to lack of resources*.

Sizwe contends that as teachers attend professional development activities they share information. Sometimes they even tell one another the alternatives of some other things that can be used.

Sizwe says:

> *Teachers say I cannot conduct certain experiments, because of the shortage of resources, in workshops. They can tell that you don't need something expensive to conduct a particular experiment. Sometimes you can use the household substances e.g. testing acids and bases. You don't need expensive chemicals since you can use beetroot or red cabbage when you don't have bromothyl blue indicator.*

Sazi also highlighted that he was given Natural Sciences as a subject to teach even though he is not familiar with it. He added:

> *I need more knowledge experiments as well as the section on electricity that will be done in term 3; I don't feel comfortable in doing that topic. I don't teach the topic just because I had to teach it is challenging. I prefer life and living as it forms part of Life Sciences as it is my major subject.*

Teachers also pointed out that there are times when they attended workshops and found that the facilitator did not meet their expectations.

Sazi points out that:

I didn't learn anything on that Jika iMfundo workshop, because the facilitator was unable to answer our questions.

Sne agrees with Sazi as he points out that:

I like workshops when they bring somebody who knows how to present, not just the old retired person. This time I enjoyed the Jika iMfundo workshop, because they brought Mr X, who was very good at presentation and we do not want that old lady from Durban.

Sazi further highlighted that he was not comfortable with the subject that was given to him. He mentions that:

Since I was given the subject that I'm not comfortable to teach, when doing my lesson preparation I always ask my fellow colleague about certain things that I'm not clear about. Then they will explain them to me and sometimes they even give me certain ways that can make a topic easier to learners. I always worry much about the things that I don't know.

Day (2015) further explains the benefits of professional development workshops that they develop a positive approach to Natural Sciences teachers as they improve their skills of dealing with challenging topics. What is experienced by Natural Sciences teachers is what Day and Gu (2007) refer to as dimensions that are not static. They further explain that at any given time Natural Sciences teachers experience variation of different strengths in Natural Sciences. Other topics such as Planet Earth and Beyond; Energy and Change; as well as human reproduction are challenging to Natural Sciences teachers in such a way that they only gain strength when they attend these professional development workshops.

He also ascertains that effective meta- cognitive strategies are those that are well planned and accompanied by passionate professional development and support for Natural Sciences teachers.

Natural Sciences teachers have various challenges but as they attend professional development workshops their load become easier as they gain different skills and solutions of dealing with their challenges.

4.7 RESOURCES FROM PROFESSIONAL DEVELOPMENT WORKSHOPS

Teachers considered the material obtained in professional development workshops as being useful and relevant to teaching Natural Sciences classes. This finding provides responses for the third research question: to what extent does teachers' learning influence their teaching practice? Teachers showed much interest in the activities that were done during the professional development workshops and they even highlighted that they would use them in their classrooms.

Sanele highlighted that the workshops helped her to manage her work properly; she indicated that workshops taught her how to plan, record and to keep proper records for learners. Sne, Sindi, Sibongile, Sizwe Siphokazi and Sphe mentioned that with the information obtained in workshops it becomes easier for them to teach the topic in class and the activities are also used in class and learners also enjoy doing the activities.

Leu (2004) asserts that professional development workshops facilitate Natural Sciences teachers to become empowered professionals, which results in active and participatory learning where teachers learn from one another. Kelly (2006) argues that in professional development workshops teacher-knowing is combined with knowledge-in-practice and therefore Natural Sciences teachers gain the understanding of the content knowledge as well as various pedagogic content knowledge.

Petrie and Mc Gee (2012) contend that teacher professional development is the method that is used to familiarise teachers with curriculum change as well as to keep teachers up to date with new policies. The teachers' responses concur with Mokhele (2013) who refers to the coherence between professional development workshops and class activities; she further states that Natural Sciences teachers do similar topics dealt with in workshops in their Natural Sciences classrooms and put focus on activities which stimulate teachers' professional development.

Mizzi (2013) contends that there is integration of content knowledge and pedagogic content knowledge acquired by Natural Sciences teachers who are constantly involved in professional develop workshops where they share teachers' objectives and come up with different criteria of assessment that would be useful. It inspires professional communication among teachers. What I observed in both workshops is that when

doing activities teachers were afforded a chance of sharing their ideas. They even explained to one another some of the things that were not clear to them.

Generally, Natural Sciences workshops that are organised by Jika iMfundo and the department of education take only one day where teachers are provided with tea and lunch. The timing of the workshop is very good as teachers are developed on the work that is covered in that term and they are supported with the material as well as the skills that will enable them to teach well various content that is covered during that specific term.

Teachers also stated that during professional development activities they learn through collaboration from one another as they share different teaching strategies of different topics in Natural Sciences. Kennedy (2005) refers to this form of learning as the transitional learning strategy where professional development activities serve a dual purpose. Natural Sciences teachers are involved in interesting and stimulating activities where they work together in social groups while at the same time learning is individual. Knowledge is not delivered to teachers, but they share knowledge and experiences. Feldman and Fataar (2014) posit that through interaction within a group of Natural Sciences teachers there is a potential to invade and shift the pedagogical habitus of the teacher to adapt insight and certainty systems that have been adopted and structured through socialisation within Natural Sciences as a subject. They seem to agree with Steiner (2004) that a developing consent has appeared in the field of professional development that designers need to change teachers towards a new concept of teaching in which collaboration and mutual inquiry are the norms. Teachers also highlighted that the knowledge gained in workshops is easily implemented in class.

Illeris (2009) argues that content dimension is about what is learnt in professional development workshops. Sibongile said:

> *In workshops it is where we meet teachers that might give you the idea that will help you, maybe if my learners were failing to understand me on matter and material then the idea or information from other educators may assist me and change my method of introducing that lesson. My learners can then understand the topic and perform better.*

In the same vein, Sazi maintains:

I learn different methods of presenting a lesson to learners that make it easy for them to understand. Normally we say there is an element called sodium chlorine, forgetting this is an element they come across on a daily basis like copper which is used in their homes that transport water to tanks, then you would ask your learners if they have seen that kind of pipe. Then the learners will know and also think of the people that steal copper.

Teachers highlighted that they learnt content knowledge and pedagogic content knowledge. The incentive dimension provides and guides the intellectual energy that is essential for the learning process to occur where it consists of components such as feelings, emotions, motivation and decision; and lastly interaction affords the desires that initiates the learning process. Illeris (2009) further argues that interaction may occur in the form of perception, transmission experience, imitation activity or participation.

Bell (1998) asserts that individual progression comprises of being aware and compliant of the need for professional growth, by attending to the approaches and concerns of performing differently in professional development activities, shifting ideas about what it means to be a Natural Sciences teacher and managing the feeling associated with change. This highlights what Natural Sciences teachers said in their interviews that the resources they obtained during workshops are very useful in their classrooms.

Illeris (2009) defines learning as any process that leads to permanent ability to change and which is not exclusively due to natural development or progress. Feldman and Fataar (2014) assert that the key elements to changing one's professional pedagogic habitus, is having a nature for ongoing learning to familiarise one's pedagogy to meet changes in education that suits specific perspectives. This is supported by the responses that the participants gave during the interviews. Sibongile explains that the resources obtained in professional development activities are very useful, she says:

There were lots of activities that we did of which they were very important and we also came back and shared them with the learners and they enjoyed doing them as they are relevant. It's the same information that we give the learners. The most interesting part about our workshop is that they stick to the point. We did exactly what we have to teach the learners, so it makes things easier.

Sibongile states that they share the material that they obtain in professional development workshops with other Natural Sciences teachers who did not attend the workshop. Sizwe agrees with Sibongile as he says:

> *They provide us with pamphlets/documents as well as other books from the publishers that explain certain topics in different ways.*

Siphokazi agrees with Sibongile and Sizwe when she says:

> *They normally give us documents, some previous question papers and their memos.*

Sanele highlights that the resources that teachers obtained in workshops are being shared by teachers in schools when she says:

> *According to the brochure that I received from the teacher who attended a workshop; they had some clues and some ways and some little skills on how to approach that topic, like always using English, because sometimes our own language has got that thing that is not palatable.*

The brochure that she was referring to was on human reproduction. Desimone (2009) argues that professional development refers to the methods and activities, planned preparation of instruction and the learning outcome of learners. Material obtained put more emphasis on the content that is equivalent to the age of Natural Sciences learners. Sanele did not attend the workshop but using the material obtained she can easily work or teach Natural Sciences like teachers who attended the workshop.

4.8 TEACHER ACTIVITIES

Desimone (2009) argues that active learning refers to the extent to which professional development provides chances for teachers to be engaged in the analysis of teaching and learning. In the first workshop the facilitator had to change his strategy of conducting the workshop, because he wanted to accommodate the teachers that were to leave the workshop earlier. Most of the activities were demonstrated by the facilitator and he kept on asking questions to the teachers to ensure that they were participating in the workshop. What was done by the facilitator was one of the steps

that were mentioned by Desimone (2009) in his conceptual framework. The facilitator used his experience to ensure that professional development activities are beneficial to all Natural Sciences teachers. As he changed his strategy he also ensured that he empowered Natural Sciences teachers with the necessary skills.

In the second workshop on Energy and Change, the facilitator and subject advisor brought material to conduct experiments on electricity. Teachers were divided into groups and they were given apparatus to conduct experiments. Each group had its own apparatus to conduct an experiment that was different from other groups and each group had to present what they did and their findings. Desimone (2009) also highlighted that in professional development activities teachers use their knowledge and skills to improve their pedagogic content knowledge as well as content knowledge. Similar results were observed in this study as Natural Sciences teachers indicated that they acquired new knowledge and skills which improved their content and pedagogic content knowledge.

Wall (2017) argues that professional development workshops become productive when they allow teachers to acquire the concept in various and dynamic ways, which was evident in the results of this study as well.

4.9 TEACHER PARTICIPATION

Desimone (2009) argues that there are two conceptual frameworks; firstly distinguishing a set of critical features that explain operative professional development and secondly, creating an operational theory of how professional development improves Natural Sciences teachers' and learners outcome. Desimone (2011) argues that professional development activities have motivational and attitudinal outcomes where they improve eagerness and motivation to implement the ideas received during professional development activities. Teachers showed much interest in the activities given to them and they said some questions that they had on electricity were answered. The facilitator also advised the teachers that there is a CASME center where they can borrow material so that they can conduct experiments in their schools. The facilitator also emphasised that teachers should conduct experiments prior so as to avoid disappointments.

Desimone (2009) and Guskey (2002) contend that what attracts Natural Sciences teachers in professional development activities is the belief that it will increase their knowledge and skills, add to their progress and improve their teaching. Desimone (2009) asserts that a conceptual framework recommends a classification of procedures from professional learning activities to changes in knowledge, beliefs and attitudes, to changes in practice, and then to achieve learner improvement. Other teachers mentioned that they enjoyed workshops that are facilitated by people who know their content well. Sometimes workshops are facilitated by people who do not have knowledge of the subject where you could find more teachers leaving the workshop before the end of the session.

Teachers also highlighted that the resources that they get in these professional development activities make it easier for the teachers to teach the topic in class; and the activities on these handouts are very helpful since they facilitate learning in the classroom.

Similar results were evident in Wall's (2017) study who found that Natural teachers who participate in Natural Sciences workshops get the chance to increase opportunities to discuss concepts, skills, and problems that arise during their professional development experiences; also increase opportunities to share common curriculum materials, that the workshop is offerings, and various forms of assessment in various topics.

4.10 CONCLUSION

This chapter presented the data collected from the eight participants through semi-structured interviews and two observations of professional development workshops.

Four teachers were in the professional life phase of defining work-life balance. They were being challenged by their competences to manage their roles as Natural Sciences teachers and they also had challenging topics in Natural Sciences. Two teachers were in the professional life phase of developing professional identity. They showed commitment and effectiveness in their teaching. One teacher was in the professional life phase of managing work life tension. These teachers did not have

challenging topics in Natural Sciences and they also showed much enthusiasm in his work. One teacher was in the process of adjusting with change; it was easy for this teacher to work with material that was obtained from professional development workshops as the material was given to her by the teacher that attended professional development workshop.

Grades 8 and 9 Natural Sciences teachers highlighted that in professional development workshops they learnt through collaboration; they shared their experiences, skills of teaching different topics in Natural Sciences. They learnt content knowledge as well as pedagogic content knowledge. Some Natural Sciences teachers were challenged by the shortage of resources and others were challenged by certain topics in Natural Sciences due to the fact that they were either majored in Physical Sciences or Life Sciences and Agricultural Sciences. All participants agreed that the activities they did in professional development workshops were very useful and they were easily implemented in their Natural Sciences classes. The following chapter outlines the summary, conclusions and recommendations.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This study aimed to explore teacher professional development experiences of Natural Sciences teachers for Grades 8 and 9 in Ongoye cluster of UThungulu District. The focus is on professional development experiences of Natural Sciences teachers for Grades 8 and 9 in Ongoye cluster of UThungulu District. The purpose of this study is to explore Natural Sciences teachers' experiences on professional development workshops that are organised by departmental officials in order to understand what Natural Sciences teachers learn during professional development workshops.

In addition, this study aims to examine the knowledge and skills Natural Sciences teachers gain in these workshops to assist them in their Natural Sciences teaching. Data was collected from eight Grade 8 and 9 Natural Sciences teachers. Qualitative data was generated by means of semi-structured interviews and observations of two professional development workshops.

The findings discussed in Chapter 4 addressed the three research questions and were analysed drawing on Desimone's conceptual framework and literature. The limitations as well as the strengths of the study were also confirmed.

Data were presented and analysed according to the following research questions:

1: What do grades 8 and 9 Natural Sciences teachers in Ongoye cluster at UThungulu learn from professional development workshops in KwaZulu- Natal?

2: How do grades 8 and 9 Natural Sciences teachers learn during professional development workshops in KwaZulu Natal?

3: To what extent does teacher learning influence their teaching practice?

5.2 DISCUSSION OF FINDINGS

In this section the key findings of this study are discussed. The main issues are as follows: Natural Science teachers learn a variety of pedagogical knowledge and content knowledge; support one another through collaboration; and dealing with challenging topics as well as challenging contexts.

5.2.1 NATURAL SCIENCES TEACHERS LEARN A VARIETY OF PEDAGOGICAL KNOWLEDGE AND CONTENT KNOWLEDGE

The data collected addressed the first research question: What do Natural Sciences teachers in Ongoye cluster at UThungulu District learn from professional development workshops? In professional development activities Natural Sciences teachers conduct experiments where they acquire different skills and content knowledge. This finding supports Shulman (1987) and Grossman (1990) as they maintain that it is mainly content, pedagogical content and curricular knowledge that are gained in professional development activities. The findings are also supported by Mizzi (2013) when she argues that Natural Sciences teachers for grades 8 and 9 gain more self-confidence when teaching after being involved in professional development workshops.

The key finding of this study highlights that Natural Sciences teachers learn a variety of pedagogical knowledge and pedagogical content knowledge as well as content knowledge. This affirms Day and Gu's (2007) argument that there is no one technique, time or place for learning which is best. Grades 8 and 9 Natural Sciences teachers indicated that they like professional development workshops, because they gain and learn different methods of teaching different topics in Natural Sciences. This finding relates to Illeris's (2009) views that teacher learning refers to parts of information and understanding which must trigger the progress of a wide-ranging and coherent theory construction. In workshops Grades 8 and 9 Natural Sciences teachers gain the knowledge and skills that enable them to impart the knowledge better than before. Illeris (2009) refers to this as an incentive dimension where it provides and guides the intellectual energy that is necessary for the learning process to take place. Natural Sciences teachers learn a variety of information that relates to content knowledge,

planning and assessment of Natural Sciences. Facilitators and subject advisors; and other Natural Sciences teachers share information through explanations and group discussions. This is supported by Robinson (2011) who contends that professional development is a lifelong, collaborative learning process that nurtures the development of Grades 8 and 9 Natural Sciences teachers. Professional development workshops develop and meet the teaching and learning needs as well as clearly focuses on improving teacher performance. Natural Sciences teachers also highlighted that they learn different styles of assessing learners as well as the weighting of different tasks. Ndemuweda (2011) asserts that content knowledge, skills and experiences in either content or pedagogy for improved practices are acquired in professional development activities that are organised by departmental officials.

Day et al. (2016) argue that new observed evidence of how successful Natural Sciences teachers directly and indirectly promote improvement over time through linking both transformational and instructional teaching strategies. The findings indicate that Natural Sciences teachers' ability to improve and sustain effectiveness over the long term is the result of being involved in professional development workshops and understanding the content of the subject as well as the context of their schools.

Most of the Grades 8 and 9 Natural Sciences teachers in Ongoye cluster of UThungulu District agreed that they learn pedagogic content knowledge as well as content knowledge through sharing information with one another in professional development workshops organized by DoE and Jika iMfundo.

5.2.2 TEACHERS SUPPORT ONE ANOTHER THROUGH COLLABORATION

Illeris (2009) defines teacher learning as the process that leads to permanent capacity change which is not solely due to biological maturation or ageing. Another finding of this study is that Natural Sciences teachers for Grades 8 and 9 acquired knowledge from professional development workshops that they attended. Natural Sciences teachers for Grades 8 and 9 affirmed that after attending professional development workshops they changed from what they normally do in their classes and adopted new pedagogical content knowledge gained in professional development workshop.

Grades 8 and 9 Natural Sciences teachers argued that these professional development workshops are continual in such a way that each term has a different workshop which is presented by different facilitators who use different strategies of approaching different topics in Natural Sciences. Desimone (2009) asserts that in professional development workshops Natural Sciences teachers for Grades 8 and 9 learn through structural features such as active learning; duration and active participation of Natural Sciences teachers.

This qualitative research study used semi-structured interviews and observation schedule of professional development workshops in the collection of data. Desimone's conceptual framework of continual professional development was used. During teacher professional development workshops that Grades 8 and 9 Natural Sciences teachers attended, teacher learning took place where they learned through collaboration; and they learned content knowledge and pedagogic content knowledge. Desimone (2009) argues that teacher professional development facilitators construct from what teachers already know and the skills and knowledge that they acquire are applicable to the grades they are teaching. Desimone's (2009) theory focuses on the coherence of professional development workshops. Desimone (2009) further contends that professional development workshops inspire and support continual professional communication amongst teachers who are working to improve their teaching.

Grades 8 and 9 Natural Sciences teachers reveal that the knowledge acquired in professional development workshops is applicable in their Natural Sciences classes which affirms Desimone's (2009) theory of professional development which focuses on coherence. Natural Sciences teachers for Grades 8 and 9 also highlight that when they attend professional development workshops they become revived and go back to their schools to implement what they have gained in workshops.

With regards to the research question that enquired: to what extent does teacher learning influence their teaching practice? Grades 8 and 9 Natural Sciences teachers maintain that the activities completed during professional development workshops are important and useful, because they even apply them with their learners. Their learners enjoyed doing such activities. This view of Natural Sciences teachers is also supported by Illeris (2009) who argues that Natural Sciences teachers are supposed to be paying attention during the workshops and possibly asking questions to be sure

that they have understood what was explained clearly. It becomes easier for their Grades 8 and 9 Natural Sciences learners to do the activities that were clearly explained to their teachers. This also concurs with Desimone's (2009) theory of professional development that focuses on coherence of professional development workshops and suggests that these should be aligned with the nationwide state and provincial standards, assessments curriculum and other changes. Natural Sciences teachers highlighted that the activities they were engaged in were in line with the CAPS document. Facilitators also put more emphasis on the number of formal activities that should be done by Grades 8 and 9.

In these workshops teachers learn from one another when they present what has been discussed in groups. Mokhele (2013) contends that in workshops teachers gain innovative knowledge through sharing information with other Grades 8 and 9 Natural Sciences teachers. In professional development workshops Grades 8 and 9 Natural Sciences teachers form small groups where they share content knowledge and pedagogical content knowledge under the facilitator's or subject advisor's or Natural Sciences experts' support. Wall (2017) asserts that Natural Sciences teachers who get constant coaching after attending a Natural Sciences workshop are more effective at implementing new teaching practices than teachers who only attended a workshop.

5.2.3 CHALLENGING TOPICS

The findings show that most of the teachers do not have Natural Sciences as their major subject, which creates some gaps in their teaching of the subject Natural Sciences. Out of the eight Natural Sciences teachers there is only one teacher who had Natural Sciences as a major subject while seven teachers either majored in Biology (Life Sciences) or Physical Sciences. This shows that Natural Sciences teachers need professional development workshops that would cover the topics that do not form part of their major subject so that it could be easier for them to teach different topics. Avalos (2011) argues that over the past years articles were published that reported on research and interventions designed for teachers, with teachers and by teachers aimed at their professional learning, with perceptiveness on their influence on teachers.

Out of eight Natural Sciences teachers interviewed, only one teacher highlighted that he did not have a challenging topic because he majored in Life Sciences and Physical Sciences. Seven Natural Sciences teachers mentioned that they had challenging topics such as Planet Earth and Beyond, Matter and Material as well as Energy and Change. Natural Sciences teachers stated that professional development workshops helped them to deal with the challenging topics and they asked other teachers who knew the subject better. Robinson (2011) contends that professional development workshops provide job-embedded preparations or other methods of assistance to support the transmission of new content knowledge and skills to Natural Sciences classroom. Mizzi (2013) argues that inadequate background in the subject Natural Sciences is one of the main factors that contributes to the challenges and have an impact on the development of Natural Sciences teachers' pedagogical content knowledge as well as on the teachers' self-confidence.

5.2.4 CHALLENGING CONTEXT

Three Natural teachers also mentioned that it was difficult for them to conduct experiments, because their schools did not have resources. Sizwe highlighted that he once used his money to buy a candle so that he could conduct the experiment. Sazi also mentioned that workshops gave them options to use when conducting experiments. Harwell (2003) contends that the value of programmes is varied and there has been no agreement on what creates quality of these professional development workshops. Natural Sciences teachers attend professional development workshops organised by DoE together with the NGO called Jika iMfundo.

Avalos (2011) asserts that the South African government has organised a number of interventions trying to improve the performance of the science subjects, but there are teachers who do not attend professional development workshops and have various reasons of not attending workshops. Sizwe indicated that he did not attend the workshop because he also had another workshop to attend on the same date. Sizwe also highlighted that in one workshop that he attended, he did not gain anything just because the facilitator was unable to answer questions from the teachers. What was experienced by Sizwe in the workshop is what Desimone (2011) refers to as an

affective outcome where there is an emotional experience inherent in the professional development activity. Desimone (2011) also highlighted that research revealed some examples of negative effective outcome and in this case Sizwe felt demoralised by the manner in which the workshop was conducted.

The findings also show that there are teachers who love teaching Natural Sciences and there are teachers that indicated that Natural Sciences was given to them and they are not comfortable with the subject. Other teachers stated that they love Natural Sciences even though they have challenging topics where they need to be developed. Robinson (2011) argues that in professional development activities a wide-ranging group of Natural Sciences teachers share their teaching styles, they support, and work with each other in finding ways inside and outside their schools, to inquire on their practice and together learn new and better approaches that will enhance all Natural Sciences teachers that attend the workshops. Mizzi (2013) further contends that Natural Sciences teachers' lack of confidence when teaching topics outside their area of knowledge is expressed in different ways such as when preparing lesson plans, choosing activities and apparatus needed for the lesson aid learners' learning, answering learners' questions, setting up laboratory experiments, applying various concepts. This applies more often when teachers do not have the necessary resources.

Two Natural Sciences teachers from the same school indicated that they have been involved in professional development workshops that were organised by their principal and departmental heads. Professional development workshops organised by the principals involve all teachers in the school and those organised by departmental heads involve all teachers within the same department such as Physical Sciences; Life Sciences; Mathematics as well as Natural Sciences. Workshops that are organised by schools are not based on content knowledge and pedagogical content knowledge. I therefore, regard such workshops as being based on self-learning and general pedagogical knowledge.

5.3 LIMITATIONS OF THE STUDY

Firstly, I realised that there is a limited number of studies in this field of study locally and internationally. This study may have been richer if there had been input from other researchers within the same context.

Secondly, there was a limitation with respect schools used in this study. Ongoye cluster have 12 secondary schools and the study was conducted in six schools. The schools may have unique features which may not be present in other schools. Three of these schools are at the distance of less than one kilometer. This made the findings to be more or less the same even though the school context differs. This does not prevent readers from extracting those elements of the findings that they find to be transferable and extend these to other settings.

Thirdly, the research was carried out on a small range of Grades 8 and 9 Natural Sciences teachers. Most of the schools had only one teacher that teaches both grades. This study would have been richer if each school had 2 or 3 Natural Sciences teachers. Four of these Grades 8 and 9 Natural Sciences teachers were in the same professional life phase and there were other professional life phases that were not represented.

5.4 STRENGTHS OF THE STUDY

Mitchel and Mitchel (2005) argue that professional development workshops allow teachers to learn from other teachers by sharing their concerns that can assist in improving their classroom performance. Firstly collection of data was not an easy activity, there were lots of challenges but teachers were able to voice their feelings about attending professional development workshops. Secondly the cooperation, trust and sense of safety of participants were built. There were consent letters that were signed by participants. Eight Natural Sciences teachers were interviewed to ensure trustworthiness of the information given by participants. But the teacher that withdrew from the study mentioned that they did not share information obtained from professional development activities whereas the other teacher said that they shared information obtained from professional development activities.

Participants revealed their feelings about professional development workshops and that they were very happy to participate in this study. This study forms the knowledge base within the South African context and it will add to the body of knowledge nationally. Findings accurately express the teacher learning experiences of Natural Sciences teachers. Personally I am empowered by this learning experience as I was researching and reflecting on the factors affecting Natural Sciences teachers.

5.5 RECOMMENDATIONS FOR FUTURE CHANGES IN PROFESSIONAL DEVELOPMENT ACTIVITIES

Analysis and discussion of the findings highlight the following recommendations for effective education transformation teacher learning and professional development perspective.

5.5.1 COHERENT, CONTINUOUS AND LIFE LONG TEACHER LEARNING AND PROFESSIONAL DEVELOPMENT WORKSHOPS

Teacher learning and professional development must not be perceived as the event that only discusses work that needs to be covered during that particular term. Rather Grades 8 and 9 Natural Sciences should be guided and more emphasis should be out on setting common activities that should form part of school based continuous assessment. This emanates from the findings that learners enjoy doing the activities that Natural Sciences teachers receive in professional development workshops. The approach of conducting workshops should not be similar every term. If the first workshop was on content knowledge and pedagogic content knowledge, other workshops should focus on assessment of various topics in Natural Sciences.

Natural Sciences teachers highlighted that they loved attending professional development workshops, but they became bored when the facilitator was not clear in his/her content knowledge. Sne mentioned that:

> *I like attending workshops, only when they bring someone who know their story not just the old retired person.*

This statement was also confirmed by Sizwe when he said:

The presenter had a problem as she was unable to answer some of the questions and she was even assisted by colleagues I don't want to lie. I didn't learn anything in that Jika iMfundo workshop.

Natural Sciences teachers revealed certain topics that they needed to be developed on such as Energy and Change; Planet Earth and Beyond. I will therefore recommend that before conducting a professional development workshops the department together with Jika iMfundo must examine which topics are covered in class to make a contribution to their existing knowledge.

5.5.2 DATES FOR PROFESSIONAL DEVELOPMENT WORKSHOPS

On the first Natural Sciences professional development workshop for grades 8 and 9 more teachers attended the workshop compared to the second workshop. There was moderation for Grade 10-12 work in the same venue and some teachers in different times. Natural Sciences professional development workshop started at 9 o'clock and the moderation started at 12 o'clock. Few teachers started in the workshop and reported to the facilitator that they had moderation to attend while others did not attend.

Subject advisors should check during the first workshop how many teachers teach Grades 10-12 and avoid setting the dates that coincide with moderation. This creates a problem where teachers have to choose whether to attend the workshop or moderation.

5.6 AREAS FOR FUTURE RESEARCH

I have carefully analysed and presented professional development workshops for Natural Sciences teachers for Grades 8 and 9 on the form of development they gain when attending professional development workshops. It is hoped that these findings will add a valuable contribution to the field of study.

The findings show that most of Natural Sciences teachers did not major in Natural Sciences; they either majored in Life Sciences or Physical Sciences. This creates a challenge in making a good foundation for Physical Sciences and Life Sciences in Grades 8 and 9. The teacher taught the Natural Sciences strand of her major subject efficiently. For example a Natural Sciences teacher who majored in Life Sciences would teach well in 'Life and Living', and the teacher who majored in Physical Sciences was good at teaching 'Energy and Change'; and 'Matter and Material'. 'Planet Earth and Beyond' was a challenge to most of the teachers; some teachers highlighted that they did not even cover this strand as it was the last section to be taught when schools were busy with external examinations. Natural Sciences teachers are also expected to invigilate in national senior certificate examinations.

Some Grades 8 and 9 Natural Sciences teachers highlighted that their challenging topic as 'Planet Earth and Beyond'. This topic was taught during the fourth term when other Grade 8 and 9 Natural Sciences teachers were busy with Grade 12 moderation in the subjects they were also teaching. Teachers had to attend moderation meetings while leaving the work for Grades 8 and 9 Natural Sciences learners. The topic could be in the form of professional development where Grades 8 and 9 Natural Sciences teachers could not feel the pressure of attending moderation for Grades 10-12 that they were also teaching. Being compelled to divide their attention and leaving some work for Natural Sciences learners especially in schools with low learner enrolment, was not conducive to effective teaching.

5.7 CONCLUSION

This has been an empowering journey where I learnt about Grades 8 and 9 Natural Sciences teacher's learning experiences of professional development activities. Natural Sciences teachers at Ongoye cluster were interviewed and they were able to share their experiences about professional development activities. Teachers highlighted that collaborative teacher learning occurs during professional development activities where teachers learn from one another. Teachers also indicated that in professional development activities they gained content knowledge as well as pedagogic content knowledge. The professional development activities that they

attended were organised by the department of education in conjunction with Jika iMfundo.

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APPENDIX 1

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

School of Education

Research Project: An exploration of professional development experiences of Natural Sciences teachers in Ongoye cluster of UThungulu District.

Researcher: M.P. NGEMA

Research Office email: mohunp@ukzn.ac.za

INFORMED CONSENT LETTER

Dear Participant

My name is Phumzile Ngema, I am a student at the University of KwaZulu Natal. I am currently doing Master's in teacher development studies at Pietermaritzburg campus. I would like to ask you if you will be willing to participate in this research study.

The purpose of my study is to explore professional development experiences of Natural Sciences teachers for Grade 8 & 9 in one of the clusters of UThungulu District.

I would like to use the following data collection instruments: semi-structured interviews and observation. I request your permission to tape record your interview.

If you agree to participate, you will be interviewed about this topic. Please note the following:

This study involves other Natural Sciences teachers who are teaching Grade 8 and 9 in Ongoye cluster within UThungulu District

I will facilitate the interview and the interview will be structured around a set of carefully predetermined questions

Each participant in the focus group will be given the opportunity to provide an answer to the questions. Please answer the questions as thoroughly and honestly as possible. There is no right or wrong answer, only different point of view. The interview will be audiotaped.

Your participation is entirely voluntary and you are free to withdraw from the study at any phase, should you wish to do so.

Your confidentiality and anonymity will be assured, as the pseudonym will be used when writing up the report.

The duration of the interview should be about 1 hour, at a time and place convenient for you.

The data collected will be used for the purpose of this research only.

This study has been sent for ethical review and approval by the UKZN Humanities and Social Sciences Research Ethics Committee.

If you have any further questions/concerns or queries related to this study, please contact the researcher at 083 741 4904 or ngemaphumzile6@gmail.com

If you have any questions/concerns about your rights as the study participant, or any other concern about an aspect of the study or the researchers please contact UKZN Humanities & Social Science research Ethics administration:

Email: HSSREC@ukzn.ac.za

You can also contact the Research Office through: P. Mohun

HSSREC Research Office, email: mohunp@ukzn.ac.za

My supervisor is Dr J. Naidoo who is located at the School of Education, Pietermaritzburg campus of the University of KwaZulu Natal.

Email: naidooj@ukzn.ac.za Telephone: 033 260 5867

APPENDIX 2

School of Education

Research Project: An exploration of professional development experiences of Natural Sciences teachers in Ongoye cluster of Uthungulu District.

Researcher: M.P. NGEMA

Research Office email: mohunp@ukzn.ac.za

Dear Sir/Madam

I am a fieldworker participating in a research project which is entitled: *An exploration of professional development experiences of Natural Sciences teachers at Ongoye cluster of uThungulu district*; under the supervision of Dr Jacqui Naidoo.

In South Africa we have realised that teachers are involved in many professional development activities that differ from subject to subject. The aim of my study is to explore professional development of Natural Sciences teachers; the form of teacher learning that take place as well as the effectiveness of workshops that Natural Sciences teachers are involved in.

I am seeking for your permission to conduct the study with two Natural Sciences teachers employed at your school.

The study requires the participation of Natural Sciences teachers to be interviewed once. The interview will take place after school hours. There will be no aspect of the research that will interfere with normal running of the school.

As a researcher I will ensure that no one will be able to identify participants as well as the school they work in. To protect their identities I will ensure that I ask them to use pseudonym when doing the interview. The participants will be free to withdraw from the research at any stage without negative or undesirable consequences. The information that will be gained will only be used for the study. All the data recordings and the transcripts will be stored in a locked cabinet in the leader's office.

If you have any questions/concerns about the study, or any other concern about an aspect of the study or the researcher please contact UKZN Humanities & Social Science research Ethics administration:

Email: HSSREC@ukzn.ac.za

You can also contact the Research Office through: P. Mohun

HSSREC Research Office, email: mohunp@ukzn.ac.za

My supervisor is Dr J. Naidoo who is located at the School of Education, Pietermaritzburg campus of the University of KwaZulu Natal.

Email: naidooj@ukzn.ac.za Telephone: 033 260 5867

Yours faithfully,

Phumzile Ngema.

APPENDIX 3

School of Education

Research Project: An exploration of professional development experiences of Natural Sciences teachers in Ongoye cluster of Uthungulu District.

Researcher: M.P. NGEMA

Research Office email: mohunp@ukzn.ac.za

Informed Consent Form: Masters Research Project

Date: ……..

I, (name and surname) ……., the principal of ……., give permission for the researcher to interview Natural Sciences teachers for grades 8 and 9. I confirm that I understand the nature of the project, and that I can withdraw teachers' participation at any time if found that this study infringes human rights and the rights for the learners due the disturbances during learners contact time.

Signature of the Principal

……

School stamp

For any information about this research project, please contact my supervisor at the School of education, University of KwaZulu-Natal

Dr. Jacqui Naidoo (033 2605867)

APPENDIX 4

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

School of Education

Research Project: An exploration of professional development experiences of Natural Sciences teachers in Ongoye cluster of Uthungulu District.

Researcher: M.P. NGEMA

Research Office email: mohunp@ukzn.ac.za

CONSENT

I_____ (full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

_____ _____

Signature of Participant Date

APPENDIX 5

School of Education

Research Project

Researcher: M.P. NGEMA

Research Office email: mohunp@ukzn.ac.za

OBSERVATIONAL SCHEDULE

Date: Grades: 8 & 9

Subject: Natural Sciences Topic:

Prompts and comments: what knowledge and skills, interactions of Natural Sciences teachers, PCK, do Natural Sciences teachers participate in during the workshop

CRITERIA	How would you rate the level of knowledge gained in workshop? Comment	
A. Invitation to workshop	**5**	**Excellent**
	4	**Very good**
	3	**Reasonable**
	2	**Poor**
	1	**Very bad**
B. Teacher attendance	**5**	**Excellent**
	4	**Very good**
	3	**Reasonable**
	2	**Poor**
	1	**Very bad**
C. Introduction	**5**	**Excellent**
	4	**Very good**
	3	**Reasonable**
	2	**Poor**
	1	**Very bad**
D. Presentation	**5**	**Excellent**
	4	**Very good**
	3	**Reasonable**
	2	**Poor**
	1	**Very bad**
E. Teachers' participation	**5**	**Excellent**
	4	**Very good**

3 Reasonable

2 Poor

1 Very bad

Are there any comments on the workshop observed?

APPENDIX 6

INTERVIEW SCHEDULE FOR NATURAL SCIENCE TEACHERS

A. BIOGRAPHICAL QUESTIONS

1. How long have you been teaching?

2. How long have you been teaching Natural Sciences?

3. Why did you choose to be a Natural Sciences teacher?

4. Which grades do you teach Natural Sciences?

5. How many learners in each class?

6. What Natural Science resources are available in your school?

7. What are your qualifications?

8. Where did you study?

9. What are your major subjects?

10. Tell me about your experiences of teaching Natural Sciences

B. PROFESSIONAL QUESTIONS

11. What professional development activities do Natural Sciences teachers engage in?

12. How many Natural Sciences workshops have you attended in the last two years?

13. How do they differ from each other?

14. What did you learn (content/method) from these workshops? Explain.

15. Explain how the workshops were facilitated.

16. What do you think makes a good Natural Sciences teacher in terms of the important knowledge they need to know?

17. What skills do Natural Sciences teachers need?

18. What forms of values and attitudes should Natural Sciences teachers possess?

C. QUESTIONS ABOUT WORKSHOPS AS THE FORM OF PROFESSIONAL LEARNING

19. To what extent did you find these workshops useful?

20. How does teacher learning for Natural Sciences happen in professional learning workshops?

21. Were there any activities arranged to assist Natural Sciences teachers to familiarise with some topics? Elaborate.

22. Did you find the activities useful? Explain.

23. Which topic in Natural Sciences do you find it challenging to teach? Why?

24. How do you deal with that topic?

25. What do you learn from colleagues during the workshops? Elaborate

26. How do you share the information gained from the workshops with your colleagues at your school?

27. What forms of challenges do you share with other Natural Sciences teachers during the workshop?

28. Is there time allocated for Natural Sciences teachers to share the challenges they encounter in teaching Natural Sciences? Elaborate

D. QUESTIONS ABOUT PROFESSIONAL DEVELOPMENT

29. How do Natural Sciences teachers experience professional development activities?

30. What form of support do you gain from the workshops? Explain

31. What do you like the most about the Natural Sciences workshops? Elaborate

32. Was there any part of the workshop that you did not like that needs to be improved? Elaborate.

33. How was the knowledge gained from the workshop relevant and applicable to your classroom? Explain.

34. How was the implementation of knowledge that you gained from the workshop in your classroom situation? Elaborate.

35. Were there any follow up sessions organised by the facilitators to assist you in implementing.

36. In your own opinion what is the purpose of the workshop?

37. To what extent was the purpose met?

38. What knowledge and skills need to be focused on more at professional development workshops?

APPENDIX 7

Sne	Sindi	Sibongile	Sazi Sizwe	Sanele		Siphokazi
I wanted to study something that is realistic and also something that is happening in my body. I had an interest while I was still young doing biology during our times general science so I liked the nature side of the things in Natural Sciences	*It is because I like to work with chemicals, equipment and conducting experiments*	*For the love of Science, I had interest on it.*	*I didn't choose to be a Natural Sciences teacher, as subjects are allocated but I majored in Life Sciences and Physical Sciences. So it was relevant for me as they are my major subjects. They only looked at relevance of the qualification versus the subject that needs to be taught.*	*I don't want to answer that as I was given the load while we were doing the duty load, I didn't choose.*	*It is part of Life Sciences which I have been teaching all the time.*	*Because it's a subject which with something more practical.*

The table represents the reasons participants became Natural Sciences teachers

APPENDIX 8

Challenges encountered by Natural Sciences teachers

Sne	Sindi	Sibongile	Sazi	Sizwe	Sanele	Siphoka
The work that is allocated for term 4 where there are planets, there is no time for teaching its only moderation where we move in and out of school with the grade 12 moderation.	*The topic of Energy and Change: the topic is electric cells where I am unable to understand the formulae, unable to measure the voltage and current in series circuit.*	*The challenging part is that of body systems and mostly reproductive system where learners enjoy that part but sometimes they don't get too serious but they end up joking a lot and making funny jokes and somewhere somehow it can be sensitive sometimes you really don't know how to explain it because some learners as we live in a rural area you know most of the parent of children they live with brothers and sisters who are infected with HIV & AIDS then we have to teach about this thing and you don't want to hurt those who are infected or may be like making example of them so it's a bit challenging sometimes.*	*There is no challenging topic*	*All I can say I need more knowledge on experiments as well as the section on electricity that will be done in term3. I don't feel comfortable in doing that topic, I do teach the topic just because I had to teach the topic just because to do it though it is challenging I prefer Life and Living as it form part of Life Sciences as it is my major subject.*	*Reproduction in human where I have to teach learners of different ages, others have reached puberty and others have not reached.*	*Planet e , in ord topic I books ,a and als relevant internet*

APPENDIX 9

Research question 1. What are learning experiences of grades 8 and 9 Natural Sciences teachers during professional development workshops

Sne	Sindi	Sibongile	Sazi	Sizwe	Sanele	Siphokazi
Workshop taught me how to handle content for grades 8 & 9	*I have learnt about the elements found in the periodic table e.g. The atomic number – number of protons* *Mass number – number of protons and neutrons in the nucleus of the atom.* *The groups and periods found in the periodic table.* *The elements are arranged in the periodic table according to their properties.* *The facilitator gave us all the technicalities and the dynamics of the content based and practical based and the transfer of knowledge into practical understanding of a learner.*	*We learn about what we are going to do that term so the information differs every term* *We learn a little bit of method but mostly it's content.*	*Both content and method on how to convey the content to learners in a way that they could easily understand*	*I didn't learn anything from that workshop the facilitator was unable to answer questions she was even assisted by fellow colleagues*	*Workshops just give us the platform to view how teaching goes with Natural sciences. Sometimes we discuss questions and strategies on how to approach certain topics.*	*Both method content experiments*

APPENDIX 10

Research question 2. What do grades 8 and 9 Natural Sciences teachers learn during professional development workshops?

Sne	**Sindi**	**Sibongile**	**Sazi**	**Sizwe**	**Sanele**	**Siphoka**
Facilitator brings equipment and we do some practical activities in groups thereafter we do presentations. These presentations enable teachers to know and again experience on how to handle certain portion that you don't understand in the syllabus	*Interacting with other Natural Sciences teachers. Sharing the experience that we encounter in our school and mostly how to solve those challenges.*	*We share information and to activities together*	*Through presentation, by distribution of pamphlets and doing experiments and some of those experiments are prescribed for learners during that particular term*	*I learnt some of the things as in workshops they don't teach everything they just highlight some of the things*	*We share our experiences and strategies as to how to approach certain topics therefore we get informed about Natural Sciences*	*You find teachers, you eng them, a questions is somet don't un We lea each oth*
			They take place in the form of presentation, discussions, group works and providing extra teaching material that you can use as a teacher.	*I always ask my colleagues certain things that I'm not clear with, they explain them to me and sometimes they even give me certain ways that can make a topic easier to learn.*		

APPENDIX 11

Research question 3. How do grades 8 and 9 Natural Sciences teachers learn during professional development workshops?

Sne	Sindi	Sibongile	Sazi	Sizwe	Sanele	Siphokazi
With the material obtained from workshop it becomes easy for me to implement the knowledge gained in class and learners were very happy	*It helped me to improve my learners' performance as well as the understanding of the subject.*	*Workshops are very useful because the information that we learn about is the same information that we do in the classroom so it's what we are teaching learners at that particular time it becomes relevant to us because we come back with information and then it to learners.*	*Workshops are useful for instance they are relevant to what needs to be done on that particular term. The tasks that are done give you the necessary skills that need to be applied in the classroom situation.*	*It makes the work easier for teachers sometimes after attending workshop I come back with a lot of energy it's like I was being revived. What was learnt make it easier to handle the topic in class.*	*I must say workshops taught me to plan the work, how to record the work so that at the end of the day you don't find yourself with no proper records*	*Most of knowledge gained from workshop relevant to w we are curre doing in clas*
					Knowledge gained in workshop is very relevant especially in topics like reproduction where learners are of different ages in the same class others have already reached puberty and others haven't so it helped me a lot to make my learners to be in the same level	

APPENDIX 12

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

5 February 2016

Miss Monica Phumzile Ngema 210545705
School of Education
Pietermaritzburg Campus

Dear Miss Ngema

Protocol reference number: HSS/1834/015M
Project Title: An exploration of professional development experiences of Natural Sciences teachers in Ongoye cluster of Uthungulu District

Full Approval – Expedited Application

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

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

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

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

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

Yours faithfully

.....

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

/pm

Cc Supervisor: Dr Jacqui Naidoo
Cc Academic Leader Research: Professor P Morojele
Cc School Administrator: Ms T Khumalo

Humanities & Social Sciences Research Ethics Committee
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