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**AN EXPLORATION TEACHER LEARNING OF GRADE 12 LIFE  
SCIENCE TEACHERS IN A PROFESSIONAL LEARNING  
COMMUNITY IN A DISTICT CLUSTER**

**BY**

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## DECLARATION

Submitted in fulfilment/partial fulfilment of the requirements for the degree of Masters in Education, in the Graduate Programme in the College of Humanities, University of KwaZulu-Natal, Pietermaritzburg, South Africa.

I, Urica Mohan Heslop, declare that:

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\_\_\_\_\_

**Date**

\_\_\_\_\_

**Signature**

## DEDICATION

### **This thesis is dedicated:**

- To my father, Krishanlall Mohan, and my mother Sembaty Mohan, who has taught me the value of education and through dedication, determination and discipline anything, is possible. Thank you for instilling this in me.
- To my husband, Paul Heslop, and my sons, Raul Heselop and Dicanio Heslop for all their love support and understanding during this journey.

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## LIST OF ACRONYMS

<b>PLC</b>	<b>Professional Learning Community</b>
<b>PLCs</b>	<b>Professional Learning Communities</b>
<b>ISPFTEd</b>	<b>Integrated Strategic Planning Framework for Teacher Education and Development</b>
<b>CPD</b>	<b>Continuous professional development</b>

## ABSTRACT

Professional development and teacher learning within professional learning communities (PLCs) has been at the forefront of research to improve the quality of teaching and learning in schools. The aim of this research study was to explore teacher learning of grade 12 Life Science teachers in a professional learning community in a district cluster. In addition, this study aimed to examine how Grade 12 Life Sciences teachers learn in a PLC and how it contributed to their professional development. The study draws on Reid's quadrants of teacher learning and Desimone's framework of professional development, to understand and interpret teacher learning in PLCs and how it leads to teacher professional development.

The study adopted a qualitative research approach and was located within the interpretive paradigm. A case study research design was used in this study. Purposive sampling was used to select five life science teachers as the participants for this study. Data generation methods included semi-structured interviews with five life science teachers and observations of two PLC cluster meetings to triangulate the data. Data was analysed using thematic analyse.

The findings of the research study revealed that teachers learnt both individually and collaboratively in the PLC. The study showed that PLCs contributed to teachers' professional development, and enhanced their knowledge, skills, teaching strategies as well as their confidence, motivation and commitment. The study also revealed that insufficient time, conflict and unwillingness to learn were barriers to teacher learning in the PLC. The findings highlight that PLCs create spaces for teacher learning and contribute to professional development. The study also draws attention to the need for virtual teacher learning to take place to allow teachers to engage more often. The study recommended that teachers attend professional development workshops during the school holidays to overcome the challenges of time as these encouraged teacher collaboration and development.

## Table of Contents

DECLARATION .....	ii
DEDICATION .....	iii
ACKNOWLEDGEMENTS .....	iv
LIST OF ACRONYMS .....	v
ABSTRACT.....	vi
CHAPTER ONE .....	1
INTRODUCTION AND BACKGROUND OF THE STUDY .....	1
1.1. Introduction .....	1
1.2. Focus and purpose of the study .....	1
1.3. Background and rationale.....	1
1.4. Research questions .....	2
1.5. Literature review .....	3
1.5.1. Teacher professional development .....	3
1.5.2. School clusters .....	3
1.5.3. Professional learning community .....	3
1.5.4. Teacher learning .....	4
1.6. Conceptual framework .....	5
1.7. Research methodology .....	5
1.7.1. Interpretive research paradigm .....	5
1.7.2. Qualitative methodological approach .....	5
1.7.3. Case study research design .....	6
1.7.4. Sampling .....	6
1.8. Overview of dissertation .....	6
1.9. Conclusion.....	7
CHAPTER 2 .....	9
LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK .....	9
2.1. Introduction .....	9
2.2. Teacher professional development.....	9
2.3. School Clusters.....	10
2.4. The Purposes of Cluster .....	12

2.5. Professional Learning Communities .....	13
2.6. Characteristics of PLCs.....	14
2.7. Teacher Learning.....	14
2.7.1. Acquisition metaphor and participation metaphor .....	15
2.7.2. Cognitive and socio-cultural approach to teacher learning .....	16
2.8. Models of Professional Development .....	17
2.8.1. Training model .....	17
2.8.2. Award-bearing model.....	18
2.8.3. Cascade model.....	18
2.8.4. Coaching/mentoring model .....	18
2.8.5. Community of practice model .....	19
2.9. Linear approach and the complexity approach .....	19
2.9.1. Professional development activity.....	21
2.10. Conceptual framework .....	23
2.10.1. Reid’s quadrants of teacher learning .....	23
2.10.2. Desimone’s framework of teacher professional development .....	24
.....	25
.....	25
.....	25
Figure 2: showing 4 steps of PD (Desimone, 2011) .....	25
2.11. Conclusion.....	25
<b>CHAPTER 3 .....</b>	<b>26</b>
<b>RESEARCH DESIGN AND METHODOLOGY .....</b>	<b>26</b>
3.1. Introduction .....	26
3.2 Interpretive research paradigm.....	26
3.3. Qualitative methodological approach.....	28
3.4. Case study research design.....	30
3.4.1. Defining a case study.....	30
3.4.2. Types of case studies .....	30
3.4.3. Strengths and weakness of case study research design .....	31

3.5. Research questions .....	32
3.6. Research context .....	32
3.7. Sampling procedure.....	33
3.8. Data generation methods.....	34
3.8.1. Observations .....	34
3.8.2. Semi-structured interviews .....	35
3.9. Data analysis .....	36
3.10. Ethical issues .....	37
3.11. Limitations of the study .....	37
3.12. Trustworthiness .....	38
3.13. Conclusion.....	39
CHAPTER 4 .....	40
DATA PRESENTATION AND ANALYSIS .....	40
4.1. Introduction .....	40
4.2. Biographical profiles of participants .....	40
4.2.1. Participant 1: Sarah.....	41
4.2.2. Participant 2: Jane.....	41
4.2.3. Participant 3: Nadia .....	42
4.2.4. Participant 4: Melissa .....	43
4.2.5. Participant 5: Zoey.....	43
4.3. Life Sciences teachers understanding of a “Professional Learning Community” .....	44
4.4. Teacher learning within a professional learning community .....	47
4.4.1. Individual teacher learning .....	47
4.4.2. Collaborative teacher learning.....	52
4.5. PLC contribution to professional development of teachers .....	63
4.5.1. Enhances knowledge, skills and teaching strategies .....	63
4.5.2. Enhances confidence, motivation and commitment.....	66
4.6. Barriers to learning in a PLC.....	68
4.6.1. Insufficient time.....	68
4.6.2. Conflict and unwillingness to learn in the PLC.....	69

4.7. Chapter summary .....	70
DISCUSSION OF FINDINGS, RECOMMENDATION AND CONCLUSION OF THE STUDY .....	71
5.1. Introduction .....	71
5.2. Summary of findings .....	72
5.2.1. Teachers learnt both individually and collaboratively in the PLC .....	73
5.2.2. PLCs contribute to professional development.....	74
5.2.3. Insufficient time, conflict and unwillingness to learn were barriers to teacher learning in the PLC.....	74
5.3. Limitations of the study.....	75
5.4. Recommendations .....	75
5.5. Conclusion.....	76
References.....	77
APPENDICES .....	88
APPENDIX A: Permission: Department of EducationKwaZulu-Natal.....	88
APPENDIX B: Ethical Clearance: University of KwaZulu-Natal.....	89
APPENDIX C: Letter to the Subject Advisor .....	90
APPENDIX D: Letter to the participants .....	92
APPENDIX E: Semi-structured Interview Schedule .....	94
APPENDIX F: Observation Schedule .....	95
APPENDIX G: Sample to show how data was analysed.....	96
APPENDIX H: Turnitin certificate .....	98
APPENDIX I: Language editing certificate.....	99

## **CHAPTER ONE**

### **INTRODUCTION AND BACKGROUND OF THE STUDY**

#### **1.1. Introduction**

In this introductory chapter, an overview of the study exploring teacher learning and teacher professional development in a Grade 12 Life Sciences cluster as a PLC is presented. The study is premised on the realisation that although research on professional development and teacher learning within a professional learning community (PLC) abounds, not much has been undertaken on how teachers learn in a PLC (Lomos, Hofman & Bosker, 2011; Vescio, Ross & Adams, 2008), but has more recent studies have proofed contrary. The key aim of the study was to explore how Grade 12 Life Sciences teachers learn in a PLC organised around a district cluster.

#### **1.2. Focus and purpose of the study**

The study focused on teacher learning in a Grade 12 Life Sciences PLC in Umgugundlovu District. In this study, a district cluster which formally met at least once a term was construed as a PLC. The study proposed to understand teacher learning and professional development in a Grade 12 Life Sciences PLC.

#### **1.3. Background and rationale**

Avalos (2010, p.10) asserts that “professional development of teachers is studied and presented in the relevant literature in many different ways. At the core of such endeavours is the understanding that professional development is about teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students’ growth”. Although available literature argues that, teacher learning ultimately leads to increased learner achievement (Lomos, Hofman & Bosker, 2011; Vescio, Ross & Adams, 2008), it is concerning that within the South African context, and there has been little

improvement in matric results over the past few years. De Clercq and Phiri (2013), state that a PLC aims to improve collaboration between teachers teaching a particular subject and enhancing the quality of education. Mphahlele (2014) highlights the assumption that using clusters as learning communities would increase learner achievement and improve the value of education. She also draws attention to the assumption that although clusters were mainly for moderation of scripts, they can still be used innovatively as sites of teacher learning (Mphahlele, 2014). This study was significant since it aimed to examine the contribution of a Grade 12 Life Sciences PLC to the professional development of teachers while foregrounding how teachers learn in the PLC.

Reflecting on my personal experience as a Life Science teacher for 11 years, the PLC meetings that I have attended as a Life Science teacher have always been scheduled as a formal planned meeting by the subject advisor and sometimes by the cluster coordinator. I believe that clusters as PLCs are important for teachers to develop and learn from each other around the following aspects: moderation of learner's scripts to ensure that fair marking and assessments are conducted at schools, developing formal assessments and assessment tools that meet the requirement at national level, keep updated about the ever changing curriculum and assessment requirements, as well as sharing classroom experiences, teaching strategies and challenges. Teacher learning is important for both novice and experienced teachers. My views on PLCs are similar to Brodie and Borko (2016) who point out those PLCs afford teachers opportunities for learning through collaboration instead of learning in isolation. This study is a justifiable venture because it differs from existing research in its focus on the learning of Grade 12 Life Sciences teachers in a PLC within a cluster. Therefore, this study aimed to address this gap and examined how Life Sciences teachers learnt in a cluster PLC.

#### **1.4. Research questions**

The following research questions guided the study:

1. How do grade 12 Life Sciences teachers learn in a cluster as a professional learning community?
2. To what extent does a PLC in a cluster contribute to professional development of Grade 12 Life Sciences teachers?

## **1.5. Literature review**

### **1.5.1. Teacher professional development**

Desimone (2011, p.68), contends that a teacher's professional development should "increase teacher knowledge and instruction in ways that translate into enhanced student achievement". Avalos (2010) indicates that professional development (PD) can be used for a range of specific training, official education and advanced professional learning to assist managers within the educational realm. Time set aside for teacher learning is an essential part for teacher professional development as it allows for collaborative activities to take place assisting teachers to develop professionally (Avalos, 2010; Desimone, 2011; Guskey, 2000 and Opfer and Pedder, 2015). The use of teacher clusters is one way to improve teachers' classroom practices and professional development.

### **1.5.2. School clusters**

A school cluster is a group of schools in the same geographic area driven by the aim of improving education through collaboration, reflection, sharing and continuous learning among teachers (Chikoko, 2007 and Turkey, 2004 cited in Mphahlele and Rampa, 2014). On the other hand, Jita and Mokhele (2014) define a cluster as a group of teachers from different schools within the same geographical area, called a circuit. A school cluster acts as a pivotal point between central and local levels, where local decision making takes place expecting to improve standards and the value of teaching and learning in schools. On the other hand, Makaye (2015) refers to clusters as communities of practice and networks as systems of collaboration that are related amongst schools and teachers that embolden learning.

### **1.5.3. Professional learning community**

Wenger (1998) refers to learning communities as clusters of teachers working collectively to adjust, change and develop their practice to meet the learning needs of their learners, and in developing collaborative work cultures for teachers. Similarly, Hord (2009) refers to a PLC as a cluster of teachers that meet regularly and share their expertise to expand their professional skills. In a similar way, Vescio et al. (2008) contends that PLCs allows teachers to work collaboratively and to participate in learning activities that enhance their teaching. Likewise, DuFour (2004) describes a professional learning community (PLC) as a place where a cluster

of teachers with an interest in education meet and share their views and generate a collaborative culture of learning to improve learner performance in schools. PLCs are essential for professional development, shifting teachers' views and approaches about continuous curriculum change initiatives and learners (Brodie & Borko, 2016).

#### **1.5.4. Teacher learning**

Researchers express various views on what constitutes teacher learning. Sfard (1998) refers to different metaphors that define learning, namely the *acquisition metaphor* and the *participation metaphor*. In the same vein, Kelly (2006) describes cognitivism as a theory where “individuals acquire skills, knowledge and understanding in one setting, often specifically designed for that purpose, and are subsequently able to use these skills, knowledge and understanding elsewhere” (p.506). According to Sfard (1998), knowledge is a possession of action, social cooperation, and identity from the experiences of interaction with the world. He adds that the words practice, discourse and communication show us that learners are seen as a “person interested in participation,” (Sfard, 1998, p. 6). Furthermore, Sfard (1998, p. 6) contends that learning is located in a specific setting where, “the ongoing learning activities are never considered separately from the context within which they take place in.” This occurs through interaction and socialising with others, becoming an active participant, similar to learning that takes place within the socio-cultural approach and the complexity theory. Kelly (2006, p.1) “argues that socio-cultural theories are more helpful, providing insights into teacher learning”. Teacher expertise in the socio-cultural theory is linked to context, similar to Sfard’s (1998) participation metaphor, which is also similar to Putnam and Borko (2000)’s view of situated learning. DuFour (2004) comprehensively views teacher learning as a product of such activities as observing the practice of peers; working collaboratively; individual research, learning from experience, and other formal structures like courses of study in universities and conferences or workshops. Kyndt et al. (2016) contend that teacher learning can be either formal, through planned learning processes done at a specific times or informally, through collaboration without control or monitoring.

## **1.6. Conceptual framework**

In order to shed light on the research findings the study made use of Reid's quadrants of teacher learning, which looks at learning from four perspectives namely; formal, informal, planned and incidental. Reid's quadrants of teacher learning were used to answer the first research question. The second research question was answered using Desimone's (2011) framework on teacher professional development which looks at teacher professional development.

## **1.7. Research methodology**

### **1.7.1. Interpretive research paradigm**

In order to generate knowledge on teacher learning within the context of a PLC, the interpretive paradigm was used in this study (Denzin & Lincoln, 2011 and Yanow, 2014 cited in Dean, 2018). The paradigmatic approach was useful as it highlighted the views of teachers generated from responses of semi structured interviews. This was in line with the view that "researchers do not aim to predict what people will do, but rather to describe and understand how people make sense of their worlds and how they make meaning of their particular actions" (Bertram & Christiansen, 2014, p.26). The interpretive paradigm augurs well with qualitative research approaches (Cohen et al., 2011).

### **1.7.2. Qualitative methodological approach**

The qualitative approach is based on subjective and interpretative data (Baxter & Jack, 2008; Creswell, 2009). Brynard (2014, p.39) contends that data produced "is descriptive data and generally the participants own written or spoken words". In order to discover and interpret the experiences of learning of Grade 12 Life Sciences teachers in a PLC, a qualitative research approach was adopted in this study. This approach allowed for a rich and detailed understanding of five Grade 12 Life Science teachers' who were interviewed to explore their experiences and personal views of how they learn in a cluster as a PLC. Data was collected from interviews and observations in PLC meetings. Therefore, this study relied on the Grade 12 Life Sciences teachers' views and experiences about how they learn in a cluster as a PLC and how this contributed to their professional development.

### **1.7.3. Case study research design**

A case study methodological design was used in this study. Cohen et al. (2018) state, that a case study can be defined in multiple ways. Though they accede to Yazin (2015)'s characterization of defining a case study as a contested terrain, their description of a case study emphasises the following key elements: a unique example of real people in real situations; boundaries can be drawn around a case; many variables operating in a single case which provide an opportunity for using multiple data gathering tools to unravel phenomenon; capacity to describe, explain, illustrate and enlighten; provide opportunities for in-depth understanding of phenomenon; and can also explain cause and effect in real life contexts (Cohen et al., 2018. p.376). The Grade 12 Life Sciences cluster in Umgungundlovu District as a PLC is the case study. I observed two PLC meetings in addition to interviews with five participants to obtain a detailed understanding of the case and to examine data in a precise context (Bertram & Christiansen, 2014; Zainal, 2007).

### **1.7.4. Sampling**

This research study was conducted in a cluster as a PLC in the Umgungundlovu District, using Grade 12 Life Sciences teachers only. The five participants of the study were chosen using purposive sampling. The use of purposive sampling enabled me to determine who should be my research participants (Bertram & Christiansen, 2011). The criteria for the choosing the participants, were that they had to be members of the district cluster; Grade 12 Life Sciences teachers; and a willingness to participate in the study irrespective of their years of teaching experience.

## **1.8. Overview of dissertation**

This research study is presented in five chapters.

Chapter 1 is a foundational presentation of the study which addresses the rationale and purpose of the study; the research questions that the study sought to answer; a brief discussion of the background to the study; and an introductory review of literature focusing on teacher learning and professional development in PLCs; and the conceptual framework which is derived from Reid (as cited in Fraser et al., 2007) and Desimone (2011). The methodology

used in the study is also introduced in chapter 1. The first chapter concludes with an outline of the structure of the study.

Chapter 2 immerses the study into the body of existing scholarship and unpacks key concepts related to teacher learning and professional development. To this end, Chapter 2 presents a detailed review of literature addressing concepts related to PLCs, teacher learning and professional development of teachers. The concepts which framed the study drawn from Reid (as cited in Fraser et al., 2007) and Desimone (2011) are also articulated to bring the chapter to its conclusion. This conceptual framework focuses on quadrants of teacher learning and a framework for teacher professional development by Reid (as cited in Fraser et al., 2007) and Desimone (2011) respectively.

Chapter 3 focuses on the methodological dimensions of the study. This entailed unpacking the philosophical and methodological assumptions of the interpretive paradigm, the qualitative research approach and a case study research design. The discussion of the research paradigm, research approach and design is accompanied by justifications for their use in this study. The research questions, research context, sampling procedures, data generating methods and methods of data analysis are also identified and/or explained in this chapter. The chapter concluded with addressing ethical issues and trustworthiness

In Chapter 4, I present the findings from the in-depth interviews and observations of two PLC meetings. The research findings are articulated within the boundaries of Reid's quadrants of teacher learning, Desimone's (2011) framework of professional development and ideas drawn from the literature which was reviewed in Chapter 2. The research participants are given a voice in this chapter through extracts from the interview transcripts.

Chapter 5 discusses the findings that emerged in response to the research questions. In addition to the findings, this chapter outlines the limitations of the study and concludes with suggesting recommendations and drawing conclusions based of the findings. The discussion of the findings in this chapter is organized according to the two research questions.

## **1.9. Conclusion**

The purpose of this chapter was to introduce the research study on teacher leaning in a Grade 12 Life Sciences within a cluster as a PLC. This chapter discussed the focus and purpose of this study, background information and the key concepts underpinning this research study. The research questions, conceptual framework and methodological approach were also discussed. Finally, the chapter presents an overview of the five chapters that make up the study.

## CHAPTER 2

### LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

#### 2.1. Introduction

In chapter 1 the study on teacher learning and professional development in a Grade 12 Life Sciences PLC in a district cluster was introduced. In this chapter, a detailed review of literature is presented under the following headings: teacher professional development, focusing on how teachers develop through learning; school clusters are outlined as professional learning communities; and theories and models of teacher learning. This chapter ends with a discussion of the conceptual framework that was used in the study.

#### 2.2. Teacher professional development

According to Avalos (2010), professional development (PD) can be used with regard to a range of specific training, official education and advanced professional learning that is projected to aid educational managers, which aids teachers to improve their professional knowledge, skills, competency and effectiveness. Desimone (2011, p.68) asserts that teacher professional development should “increase teacher knowledge and instruction in ways that translate into enhanced student achievement”. Guskey (2000), Desimone (2011) and Opfer and Pedder (2015) argue that professional development requires time for it to be effective. Similarly, Avalos (2010) asserts that time set aside is an essential part of the combined collegiate discussion; it allows collaborative activities which include planning, co-teaching, modelling and reflecting, allowing teachers to develop professionally. According to Rogers (2008), teachers have to reflect on who they are, that is, their identity, to see if they are willing to learn. Teachers’ willingness to learn is vital to their professional development. Teachers learn and gain professional knowledge in different ways. According to Kelly (2006) and Sfard (1998) learning can take place through acquiring knowledge or by participating in activities, through cognitivism and socio-culturally.

Opfer and Pedder (2015) and Petrie and McGee (2012) indicate that the teaching profession allows teachers to continue their own journey as a student, which requires continuous

education for them to develop professionally. Teachers are lifelong learners, in and out of their classrooms. It is very important for a teacher to be a lifelong learner and to adopt a lifelong learning mind-set to help one grow and to be the best they can be in their profession. King (2016, p.574) argues that as PD occurs “as the growth of teacher expertise leading to a change in practice that results in improved student outcome”. Likewise Vescio, Ross and Adams (2008) as well as Lomos, Hofman and Bosker (2011) believe that teachers who are lifelong learners enhance and encourage their own learners by developing new techniques and strategies to enhance one’s own teaching, this also allows teachers to become more confident and gain more understanding in their subject.

In the same way, Allender and Allender (2006) maintain that lifelong learning for teachers is about how they embark on the kind of enquiry for themselves in techniques that can benefit their continuous growth and creative ways. This, in turn can encourage creative qualities, inventiveness and responsiveness leading to flexibility in their practice. In the same vein Mitchell & Webber (1998) assert that a teacher’s lifelong learning journey starts from as young as a child and moulds teachers into whom they have become. However, Kelly (2006) suggests that teachers need to understand education within their society in their specific schooling context to become expert teachers. Lave and Wenger (2009) emphasise situatedness in a specific context and argue for an expert teacher, who contributes a range of expertise in a community of practice.

Darling-Hammond et al. (2009, p.49), express the view that, for effective teacher professional learning, teachers should “learn by engaging in continuous dialogue and examination of their practice and student performance, and to develop and implement more effective instructional practices”. Teachers need to understand their learning and must engage in effective instructional practices. The use of teacher clusters is one way to improve teachers’ classroom practices and professional development.

### **2.3. School Clusters**

Giordano (2008) contends that as far back as the 1960s in Latin America, clusters were important for pedagogical and administrative reasons. Jita and Ndlalane (2009) assert that in recent years, clusters have developed and have taken on different names. Jita and Ndlalane (2009), add that in the South African context, clusters remain fairly new in the field of

continuous professional development (CPD) and are viewed as being further suited to assisting teachers change their understanding and practices. A school cluster is an amalgamation of schools located in a specific area driven by educational and administrative aims (Chikoko, 2007; Turkey, 2004 cited in Mphahlele & Rampa, 2014). Jita and Mokhele (2014) and Giordano (2008) equate clusters with administrative and educational sites and circuits, bound by geography, which aim to enhance the quality and value of education. They further contend that a cluster acts as a pivotal point between central and local levels, where local decision making takes place expecting to improve standards and the quality of teaching in addition to learning in schools (Jita & Mokhele, 2014). Similarly, Dittmar (2005) defines school clusters as a group of schools that are near and accessible to each other. However, Makaye (2015) refers to clusters as communities of practice and networks as systems of collaboration that are related amongst schools and teachers that embolden learning. Spring (2011) thinks of them as groups of schools that are placed collectively by comparable standards. Globally, Jita and Mokhele (2014) contend that clusters are commonly called networks, núcleos, zones and school learning cells. Furthermore, they suggest that the cluster may be made up of primary and/or secondary schools.

According to Jita and Ndlalane (2009) and Mokhele (2011) working together for the purpose of improving teachers' learning and learners' achievement takes different forms and names, subject to the context. Wenger (2002) points out that in other places and contexts these teacher groupings are called teacher networks or teacher communities of learning. In the United Kingdom and other European countries these appellations, namely; networks, federations and clusters are viewed as related concepts (Spring 2011). For Delpont and Makaye (2009), voluntary informal groups with fairly wide links between institutions or teachers are what constitute networks. Atkinson et al. (2007) acknowledges that networks are the most commonly adopted form of collaboration. For the Swedes and British, the concept of a group is functional to stimulate collaboration between schools and within Scotland, the concept of community schools is deployed to denote such groupings (Delpont & Makaye, 2009). Jita and Ndlalane (2009) acknowledge the expanded reputation the teacher network approach in the United States of America and United Kingdom has, but cast doubt on research dealing with the efficacy of these groups.

Mokhele (2011) describe a cluster as a curriculum sustenance setting made up of a group of teachers from neighboring schools that have typically comparable social and economic settings. Makaye (2015) indicates that teachers who attend cluster meetings have an in-depth

understanding of the subject content, so for instance, if one member in the cluster group is experiencing difficulty with a specific section in particular, another teacher who maybe more *au fait* in that section can share ideas.

Nwagbara (2014) asserts that school clusters serve two main purposes: to improve teaching when staff members share experiences and expertise among each other, and to expedite administrative aspects of the cluster by sharing resources and skills through effective networks and collaboration among the teachers from different schools. The clusters are developed to assist teachers to work cooperatively and collaboratively by sharing ideas.

The agenda to transform schooling in South Africa to achieve equity and quality education for all still has a long way to go and encouraging collaboration among schools maybe a viable vehicle to achieve these aims (Jita & Ndlalane, 2009).

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#### **2.4. The Purposes of Cluster**

Dittmar et al. (2002) contends that clusters as PLCs act as an important point where directives from higher levels in the chain of command may be sent, as a midpoint for collection of material such as the type of assessment to be set, increase improved planning and providing an improved framework for teacher check-ups. This allows schools to increase access to extra resources that encourages teacher and curriculum development, providing an environment for innovation and encouraging support in school developments.

Jita and Mokhele (2014) have found that many teachers work in isolation, therefore clusters could encourage them to be more involved by supporting and collaborating with each other. In the same view, Giordano (2008) asserts that cluster meetings assist teachers to share ideas and confront problems, and acts as a form of professional training. According to Nwagbara (2014) and Mothilal (2011) the older and more experienced teachers can help the novice teachers that are less experienced. The passionate teachers can insert a new approach to the worn-out teachers allowing them to develop professionally. Jita and Mokhele (2014) assert that clusters have held successful curriculum workshops, trying out new materials and teaching aids have been prepared, enabling curriculum development to occur smoothly. According to Mokhele (2013), clusters are widely seen as a way to develop the use of scarce resources and to advance educational quality.

The above discussion of the views from various scholars highlights the characteristics that a cluster should possess in order to function as a PLC.

## **2.5. Professional Learning Communities**

Astuto et al. (1993) cited in Hord (1997) and DuFour (2004) point out that there are various groups that have labelled themselves as PLCs. This observation speaks to the point that no universal definition of a PLC exists (Bolam et al., 2005; Stoll et al., 2006).

According to Wenger (1998), learning communities are referred to as clusters of teachers working collectively who aware of adjusting and developing their practice to meet the learning needs of their learners, which develop collaborative work cultures for teachers. Hord (2009) defines a PLC as a cluster of teachers who meet regularly, work collaboratively and share their expertise to expand their professional skills and development. In the same light, Vescio et al. (2008) contend that PLCs equip teachers to work collaboratively, allowing them to participate in learning activities to improve their teaching. DuFour (2004) describes a PLC, as a place where a group of teachers with an interest in education meet and share their views and generate a collaborative culture of learning to improve learner performance.

According to Brodie and Borko (2016), PLCs are essential for professional development, shifting teachers' views and approaches about continuous curriculum change initiatives and learners. Collaboration within a PLC is a regular, logical process that systematically enables teachers to work collectively to explore and improve their classroom practice (Stoll et al. 2006). Similarly, Brodie and Borko (2016) assert that collaboration within a PLC shows that PLCs help to bridge the gap between education theory, policy and practice. Furthermore, PLCs provide spaces for discussing educational practice and subject content knowledge (Brodie & Borko, 2016). PLCs also allow teachers to share advanced ideas with other experienced teachers whilst also providing opportunities for mentoring novice teachers (Vescio et al., 2008). In this way, teachers are capable of interrogating and reinventing their practice and training instead of recycling old ideas. PLCs have two main goal lines: namely, to advance and develop teacher practice which in turn leads to enhanced learner achievement. Hargreaves (2015), Fullan (2012) and Stoll et al. (2006) suggest that a community is not temporary but is a longstanding group of staff members who share a comparable educational aim.

In order to reinforce teacher learning and professional development through collective participation, the South African Departments of Basic Education and Higher Education and Training came up with the Integrated Strategic Planning Framework for Teacher Education and Development (ISPFTED) (DBE & DHET 2011). In addition, the DBE developed the Department of Basic Education Guidelines for PLCs, as an aid to schools and other stakeholders in the establishment of PLCs (DBE, 2015). These documents bear testimony to a strong conviction within South African official circles that PLCs are a viable solution to promote teacher learning, professional development and learner achievement. The DBE and DHET (2015) conceptualise PLCs as groupings (communities) of professionals involved in learning that is based on practice and research and guided by a professional attitude.

## **2.6. Characteristics of PLCs**

Katz et.al. (2009) cited in Brodie (2013) identify four key characteristics of a successful PLC namely, a challenging focus; productive relationships through trust; collaboration infused with “moderate professional conflict” for the joint benefit of members; and engagement in rigorous inquiry. On the other hand DuFour (2004) identifies what he calls the three “big ideas” that represent the core principles of PLCs as ensuring that students learn; a culture of collaboration; and a focus on results. Borrowing from various researches, the South African DBE identify ten characteristics of a PLC which are mutual trust and respect; support a challenge and constructive critique; shared vision and focus on learning for all learners; collaborative and reflective enquiry; inclusive membership; leadership; collective responsibility for student learning; coherent, responsive change in practice; regularity and systematic, rigorous enquiry into practice (DBE, 2015, p.5). The various characterisations of PLCs highlight elements that should be present in order for a PLC to be successful.

## **2.7. Teacher Learning**

According to the Collins English Dictionary, learning is defined as “the act of gaining knowledge” (as cited in Sfard, 1998, p.5). How one gains this knowledge through learning is vital. According to Sfard (1998), learning can take place through acquiring knowledge or by

participating in activities. Rogers and Scott (2008) assert that the way we gain knowledge shapes our identity as an individual and defines who we are and the way we think and act.

Sfard (1998) argues that learning can be understood broadly in two ways, that is, as acquisition or participation. Similarly, Kelly (2006) describes two theories of teacher learning namely, the cognitive approach theory and the socio-cultural approach theory. Different professional development models are informed by these learning theories (these models are discussed on page 17).

### **2.7.1. Acquisition metaphor and participation metaphor**

According to Sfard (1998) learning can be understood using the acquisition and participation metaphor. These metaphors are used to “guide our work as learners, teachers and researchers” (Sfard, 1998, p. 4). “The language of ‘knowledge acquisition’ and ‘concept development’ makes us think about the human mind as a container to be filled with certain materials and about the learner as becoming an owner of these materials,” (Sfard, 1998, p. 5). This refers to the acquisition metaphor because learning is seen as an act of gaining knowledge and an accumulation of concepts. The focus is on inward knowledge where knowledge is internalised and individualised. Once knowledge is acquired, it may, “be applied, transferred (to a different context) and shared with others” (Sfard, 1998, p. 6), similar to the cognitivist theory (Kelly, 2006). Kelly (2006) assert that the acquisition metaphor forms a crucial part in different learning structures such as, in cognitivism, constructivism as well as social learning; all permeate the mind with skills that enables one to retain knowledge.

On the other hand, Sfard (1998) asserts that the participation metaphor represents learning not as cognitive growth, but through being actively involved in the process of learning, rather than accumulating knowledge. Knowledge is a possession of action, social cooperation, and identity from the experiences of interaction with the world. Sfard, (1998, p. 6) suggests that the words practice, discourse and communication show us that learners are seen as a “person interested in participation”. Sfard (1998, p. 6) contends that learning is situated in a specific context where, “the ongoing learning activities are never considered separately from the context within which they take place in” whereas Kelly (2006) reinforces that a learning culture is part of a community. Learners form a community of practitioners, developing community membership and identity.

Sfard (1998) argues that the main difference between the two metaphors is the transfer of knowledge. Within the acquisition metaphor, transfer means that someone has applied knowledge learned in one context to another context, which could be very difficult due to the different contexts learning takes place in and by whom and how it takes place. According to Sfard (1998, p.8), this could create division between people; because knowledge could be hard to articulate and can “put forward competition and solitary achievement”. However, within the participation metaphor, knowledge is not treated as an object. Subject matter disappears and networks of concepts are ignored. Sfard (1998, p. 6) contends that the transfer of knowledge takes place amongst members within a group, where “learning should be viewed as a process of becoming a part of a greater whole”. This occurs through interaction and socialising with others becoming an active participant. Sfard (1998) similarly to Kelly (2006) agrees that learning proceeds within the socio-cultural approach.

### **2.7.2. Cognitive and socio-cultural approach to teacher learning**

According to Kelly (2006), cognitivism is described as a theory where “individuals acquire, skills, knowledge and understanding in one setting, often specifically designed for that purpose, and are subsequently able to use these skills, knowledge and understanding elsewhere” (p.506), which is similar to Sfard’s (1998) view of knowledge being acquired. Cognitivism is similar to the acquisition metaphor because it does not acknowledge participation and learning from experience or learning-in-practice, it focuses on the individual. It ignores context and teacher identity. The cognitive approach does not include social issues and the resources available for learning. Most researchers indicate that the social context in which teachers work including as well as their identities are ignored by the cognitive approach (Wenger, 1998; Woods & Jeffrey, 2002, as cited in Kelly, 2006).

Kelly (2006, p1.) argues that “socio-cultural theories are more helpful, providing insights into teacher learning” which is different from the cognitive approach but similar to the participation metaphor, in that, teachers learn through practice. Both Kelly (2006) and Putnam and Borko (2000) contend that learning is distributed across people and resources. Teacher expertise in the socio-cultural theory is linked to context and views learning as situated. Putnam and Borko (2000) argue that the learning context and learning activity cannot be separated and that knowledge needs to be authentic. They assert that social collaboration is an important component of situated learning, where teachers become participants in a community of practice representing certain philosophies and routines to be

acquired. Learning takes place in communities of practice as well as individually, engaging in the process of collective learning. The situated theory focuses on how different settings provide different kinds of knowledge. Teacher expertise in the socio-cultural theory is linked to context, similar to that of the participation metaphor by Sfard (1998) and Putnam and Borko (1998), who refer to learning in a situated learning context, learning activity, cannot be separated and that knowledge needs to be authentic. Putnam and Borko (1998), agree that learning is distributed across people and resources while knowing-in-practice does not exist within individuals only. It is distributed across teachers, students and both theoretical artefacts.

## **2.8. Models of Professional Development**

According to Kennedy (2014), there are different types of models, reflecting on continued professional development (CPD). Out the seven models of PD, I will only discuss five which are relevant to my study.

### **2.8.1. Training model**

According to Kennedy (2005, p. 237) the training model “supports a skills-based, technocratic view of teaching whereby CPD (Continuing Professional Development) provides teachers with the opportunity to update their skills in order to demonstrate their competence”. Knowledge and skills are disseminated by an expert in a decontextualized way. Training can occur within the participants’ workplace but most often, occurs away from the workplace and “delivered off-site” (Kennedy, 2005, p. 237). Therefore, context is not taken into account. Kennedy (2005, p. 237) contends that training is standardised and “overshadows the need for teachers to be proactive in identifying and meeting their own developmental needs”, giving teachers very little autonomy. This model is used to update teachers’ knowledge and skills. According to Sfard (1998) knowledge is more important than knowing.

The model is informed by the cognitive approach and the acquisition metaphor. According to Kennedy (2005, p. 237) the person who is the expert already knows how they will deliver this information, while the participants who are the teachers “are placed in a passive role,” having little autonomy, controlled by higher authority. Learning takes place in one context and is transferred to another.

### **2.8.2. Award-bearing model**

Kennedy (2005, p. 238) refers to the Award-bearing model as higher education degrees “usually, but not exclusively, validated by universities”. According to Kennedy (2005, p.238) “external validation” is seen as “quality assurance”; to maintain a certain level of quality at different stages of study and in this way, validating bodies are able to exercise their control. This model is informed by the participation metaphor and sociocultural theory because it allows teachers to increase their expertise as experienced, good quality teachers. Learning takes place in a group allowing teachers to interact with each other and initiated by the teacher. Many ex-teachers who have furthered their studies often teach courses, interacting with teachers at school level allowing teacher learning to occur, (Kennedy, 2005). Therefore this could be transformative. The award bearing model could also be informed by the cognitive theory and acquisition metaphor, depending on the nature of the course and if the purpose is transmission.

### **2.8.3. Cascade model**

Kennedy (2005, p. 240) asserts the model “involves individual teachers attending ‘training events’ and then cascading or disseminating the information to a colleague”. He further asserts that “the cascade model supports a technicist view of teaching” and the model focuses on “skills and knowledge” as more important than “attitudes and values”. This occurs when resources are limited. The model is informed by the cognitive approach and the acquisition metaphor. According to Kennedy (2005, p. 240) learning context is not taken into account, “assuming that it is the knowledge per se that is the important part of the process and not necessarily the context in which it is gained or used,” Therefore, this is transmission of knowledge.

### **2.8.4. Coaching/mentoring model**

According to Kennedy (2005, p. 242) this model focuses on “the one-to-one relationship” among teachers to support CPD and usually occurs between two teachers. Kennedy (2005, p. 242) asserts that “coaching is more skills based and mentoring involves an element of ‘counselling and professional friendship’”. Kennedy (2005, p. 242) asserts that this model focuses more on “confidentiality as opposed to accountability” and the model allows teachers to develop from novice to expertise, with the help of an experienced teacher, which is similar

to Putnam and Borko (2000) who believe that new teachers can effectively learn from their mentors at school to become expert teachers. Kennedy (2005, p. 242) further asserts that learning takes place within a school or classroom, and can be enriched by “sharing dialogue with colleagues”. Therefore, according to Kelly (2006), it’s informed by the socio-cultural/situated theories, because the learning context and learning activity is not separated. Kelly (2006) asserts that teachers gain knowledge in practice and cognition or social learning takes place, and teachers’ expertise is linked to context. This is imperative in teacher learning and it helps novice teachers to better handle challenges within the schools and in their classrooms. Kennedy (2005) asserts when teachers observe each other while teaching in class, it assists in transforming each other in practice. It is also informed by the participation metaphor because the teacher is gaining knowledge through active involvement. “There is a relation between communities of practice... and the coaching/mentoring model of CPD” (Kennedy, 2005, p. 242).

#### **2.8.5. Community of practice model**

Kennedy (2005, p. 244) asserts that a “community of practice generally involves more than two people and would not necessarily rely on confidentiality”, as opposed to coaching and mentoring. Learning in communities involves “mutual engagement, understanding and tuning enterprise, and developing repertoire, styles and discourse” (Wenger, 1998, cited in Kennedy, 2005, p. 244)). According to Kennedy (2005) this model is informed by socio-cultural/situated theories and the participation metaphor and learning takes place within a community of practice, where teachers learn from others creating new knowledge from combining several individuals’ knowledge. According to Putnam and Borko (2000) knowledge is distributed and shared through mutual engagement and support by a group of teachers for a common purpose.

#### **2.9. Linear approach and the complexity approach**

According to Opfer and Pedder, (2011) the linear approach focuses on individual teachers, activities or programs while the complexity theory focuses on the teacher, institutional and school systems. The linear approach is more rigid and impenetrable and more like a closed system where there are very little interactions with other systems or outside the environment

and outcomes can always be predicted (Opfer & Pedder, 2011). It believes that if teachers attend an effective professional development activity this will transform their knowledge, skills, and beliefs which in turn, leads to improved learner achievement. In addition, the linear approach does not account for teacher identity, school contexts or broader systems. According to Opfer and Pedder (2011, p.384), a “large amount of attention given to teacher professional development by researchers and policy makers has often rested on a process-product conceptualization” indicating that if teachers develop professionally, their instructional practices will improve (the process) which will improve student learning (the product). The linear approach is similar to cognitivism and the acquisition metaphor because it does not acknowledge participation and learning from experience or learning-in-practice, it focuses on the individual and knowledge-of-practice while ignores context and teacher identity (Kelly, 2006; Sfard, 1998).

On the other hand, the complexity approach is like an open system which enables one to see the process of learning in a more complex way, interacting with other systems within or outside the environment, because teacher learning is not just one event (Opfer & Pedder, 2011). Bertram (2011, p. 92) describes “‘teacher learning’ as a way of signalling a process rather than a teacher development activity, with the assumption that professional learning may take place in a range of different places and spaces, both formal and informal, and not only as a result of formal professional development activities”. Complexity theory sees the world in ways which break with the simple cause-and-effect approach of teacher learning in a linear predictability, where the main reason for teacher learning is to increase student learning. This is replaced with, non-linear, holistic approaches and teacher knowledge essentially needs to be conceived as an intricate system rather than an event. The complexity approach is more flexible. According to Opfer and Pedder (2011) teacher learning is nested in other systems: the single teacher, a collective of teachers, the institute, the district, the province, the national system and “these systems and subsystems are interdependent and reciprocally influential”. Opfer and Pedder (2011) assert that outcomes within the complexity approach are not completely random or unpredictable; there are patterns that can be generalised. They argue there are three smaller systems that impact teacher learning which are the professional development movement, the teacher and the school context. Kelly (2006, p.1) “argues that socio-cultural theories are more helpful, providing insights into teacher learning” which is different from the cognitive approach but similar to the participation metaphor and complexity theory, in that, teachers learn through practice. Teacher expertise in

the socio-cultural theory is linked to context, similar to that of the participation metaphor by Sfard (1998) and Putnam and Borko (1998), who refer to learning as situated where the learning context and learning activity cannot be separated. This is also similar to the complexity theory.

### **2.9.1. Professional development activity**

“Teachers need time to develop, absorb, discuss and practice new knowledge,” for professional development to occur (Opfer & Pedder, 2011, p.384). Activities that allow professional learning to occur need to be intensive rather than relatively short-lived and irregular. Opfer and Pedder (2011) argue that the model does not really matter, but what matters more is the features of the model, therefore they are shifting away from the structure of the model and focus on the features, which is linked to Desimone’s (2011) argument that traditional workshops are unlikely to lead to teacher change. This falls into the managerial model of professional development (Department of Higher Education and Higher Education and Training, 2011) and includes general pedagogic knowledge (Grossman, 1990). Guskey, (2000) asserts that professional development requires time for it to be effective. Opfer & Pedder (2011) asserts that learning actions that occur via demonstration and remembering the new knowledge, is less likely to change teachers practice. Whereas professional development is more effective in teacher learning if teachers participate on a collective level. This will enable teachers to form communities of practice to try to understand and improve teacher learning. According to Wenger (1998, cited in Kennedy, 2005, p. 244), learning in communities involves “mutual engagement, understanding and tuning enterprise, and developing repertoire, styles and discourse”, which occurs within the school context. Kennedy (2005) asserts that communities of practice are informed by socio-cultural/situated theories and the participation metaphor. A curvilinear relationship exists between teacher collaboration and teacher learning, indicating that if there is too much collaboration; it may prevent teachers from learning. This could negatively impact the teacher. According to Opfer and Pedder (2011, p. 386), it can lead to “conformity of group norms at the expense of inventiveness and initiative” and “caution that collaboration should not be seen as a panacea” because too much could decrease creativity, whereas too little decreases growth and causes isolation.

The individual teacher’s own knowledge base and competency level is important for what they are willing to learn. According to Opfer & Pedder (2011, p. 387) “teachers bring both

past experiences and beliefs to their teaching and learning” and preservice teachers’ beliefs about their efforts are shaped by the teaching they have once experienced as students. Therefore, individual teachers carry their past knowledge, and beliefs towards education. Opfer & Pedder (2011, p. 388) assert that “complexity theorists emphasize the simultaneity of the knower and the known”, where the knower is the teacher and one does not only focus on the knowledge the teacher has, but also focuses on the teacher’s identity, which is linked to the sociocultural approach and the participation metaphor. According Day and Gu (2007, p. 427) the “perceptions of the work environment and the benefits of participation; support of the senior leadership team; sense of positive professional identity; self-efficacy; aspirations for career advancement; and events in their lives outside school”. No one can force a teacher to learn but themselves. Rogers (2008) contends that teachers have to reflect on who they are to see if they are willing to learn and should also take into account the specific phase in their career that will make them want to learn. Novice teachers will be more willing to learn compared to teachers that are close to retirement. Therefore, Opfer and Pedder (2011) argue that the individual teacher must not forget to bring about change or else it will not occur. If new practice is close to their current orientation, it’s easier for teachers to learn. Orientation is more likely to change with practice and active professional development activities.

According to Day and Gu (2007, p. 428):

variations in educators experiences and competence to manage the realities of teaching and work-life tensions, together with the variance in the levels of support available within the workplace, create particular conditions for their professional learning and development and lead to variations in their concerns and needs at different critical moments or phases of their professional and personal lives.

This is similar to Pedder’s (2006, p. 175) view “that schools need to develop the processes and practices of learning organizations if they are to embody the conditions that optimise and sustain teacher learning”. The schools orientation towards education can impact teacher learning and how much the teacher wants to learn. Teachers could make a change depending on their sense of agency or if there is a sense of agency within the school. Learning takes place in a social process within a school.

Peer observation, collaboration, individual inquiry, experiential learning, conferences/workshops and graduate courses facilitate teacher learning (DuFour, 2004). Kyndt et al. (2016) contend that teacher learning can be either formal or informal. Formal learning includes a planned learning process done at a specific time and includes well-

planned aims and objectives to succeed; whereas informal learning can either take place in a collaborative way without control or monitoring.

## **2.10. Conceptual framework**

There are many theories used to gain an understanding of teacher learning. The study drew on Reid's quadrants of teacher learning and Desimone's (2011) framework for teacher professional development. These two frameworks were used to make sense of the research findings on teacher learning in a Grade 12 Life Sciences PLC.

### **2.10.1. Reid's quadrants of teacher learning**

Reid's four quadrants of teacher learning describes teacher learning as a single and collaborative process which take place in four domains, which include: formal, informal, planned and incidental domains (Fraser et al., 2007)). The first quadrant involves formal ways of learning which are not initiated by a teacher while the informal quadrants are established by the teachers. These include networking with different schools and incidental meetings with teachers. Planned opportunities can be formal or informal and planning needs to be arranged beforehand, whereas incidental opportunities are spontaneous, unstructured and unplanned teacher interactions. This framework will be used to answer the first research question about how Grade 12 Life Science teachers learn in a cluster as a professional learning community. The study will be conducted using a cluster of teachers within the uMgungundlovu district, these meetings took place at least once a term and was a planned formal meeting; therefore, the four quadrants of formal, informal, planned and accidental were used for this study.

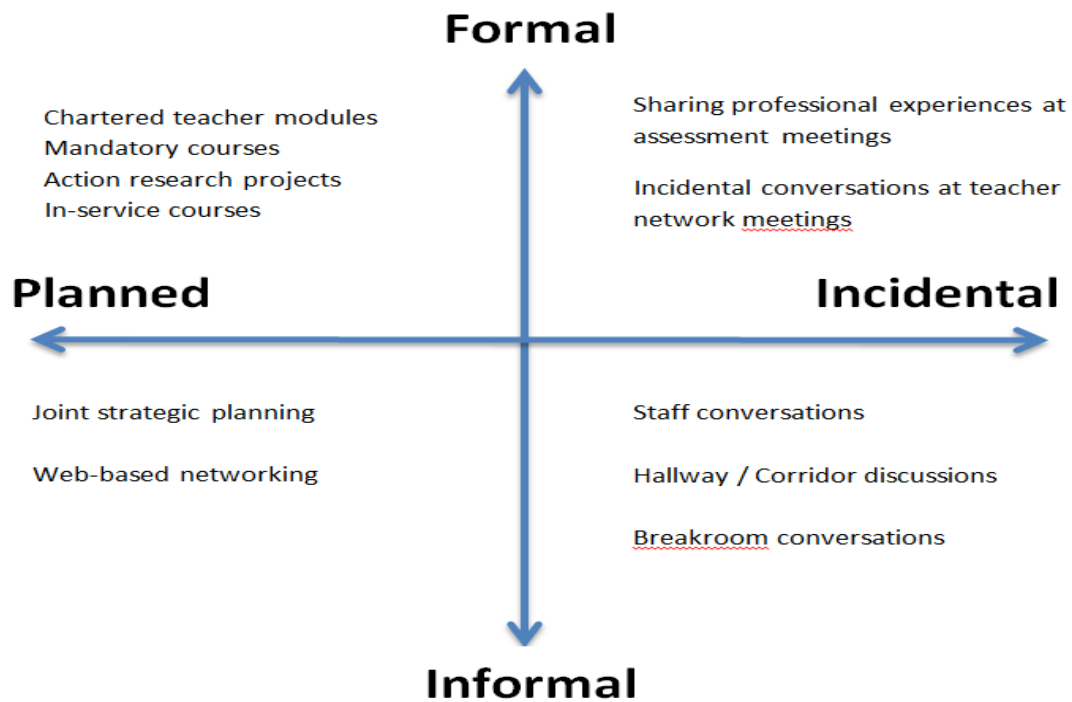


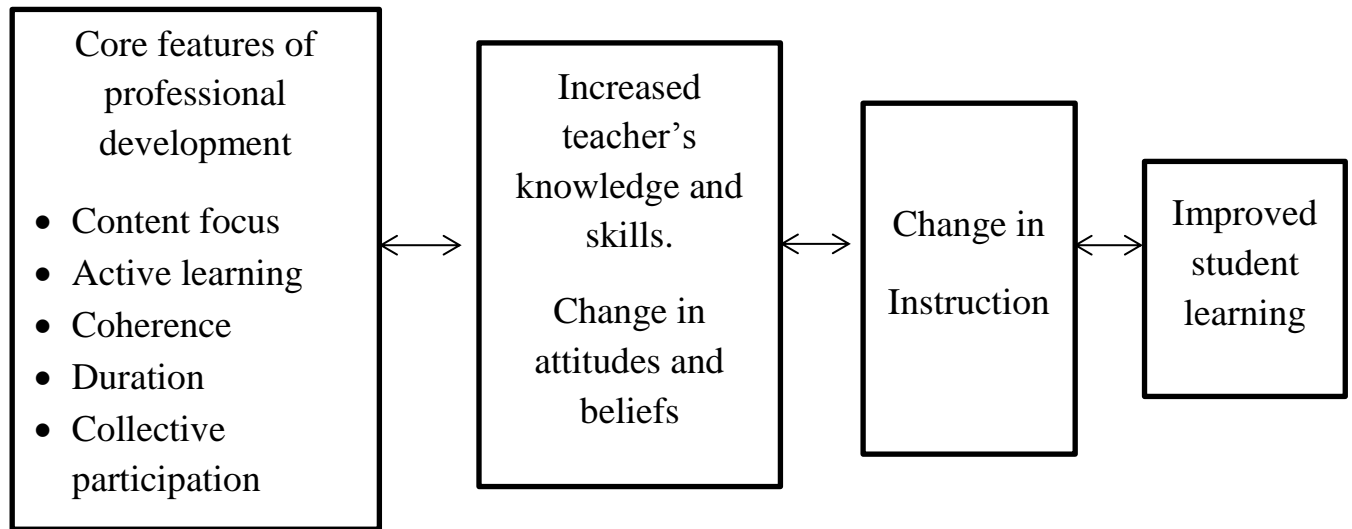
Figure 1: Reid's quadrants of teacher learning (Fraser et al., 2007, p.12)

### 2.10.2. Desimone's framework of teacher professional development

According to Desimone (2011), there are five core features of professional development which must exist in a professional development program including content focus, vigorous learning, coherence, time and shared participation.

Desimone (2011) further mentions that content focus is mainly attributed to the subject content and how teacher's will disseminate the subject content to their learners. According to Desimone (2011) active learning must allow teachers feedback from observations from both teachers and learners. Desimone (2011) added that what teachers learn during professional development activities must essentially be coherent and relevant to current policies and that professional development for teachers requires time for it to be effective. Desimone (2011) asserts that professional development should be carried out with teachers teaching in the same school, the same grade or the same subject, in this way they can collaboratively engage with each other. According to Desimone (2011) the four steps shown in the diagram below must be followed to ensure that professional development is a success, where the improved "student" learning refers the teacher. Desimone's (2011) framework of teacher professional development is used to answer the second research question of this study: To what extent

does a PLC in a cluster contribute to professional development of Grade 12 Life Sciences



**Figure 2: showing 4 steps of PD (Desimone, 2011)**

## 2.11. Conclusion

This chapter discussed teacher professional development, focusing on how teachers develop through learning. School clusters and the purpose of school clusters were explained. Professional learning communities and the characteristics of PLCs were then discussed. Lastly teacher learning, focusing on the theories and models of teacher learning were described. The chapter is completed with an outline of the conceptual framework adopted in the study, drawing from Reid's quadrants of teacher learning and Desimone's (2011) framework of teacher professional development. The next chapter presents the research methodology.

## CHAPTER 3

### RESEARCH DESIGN AND METHODOLOGY

#### 3.1. Introduction

In pursuit of the purpose of the study, relevant literature and the conceptual framework which was used to illuminate the research findings were presented in the previous chapter. This chapter discusses the research design and methodology that was adopted in the study. The discussion focuses on the research paradigm, the methodological approach, the research design, the sampling strategy and data the collection methods. Finally, this chapter concludes with a discussion of ethical issues affecting the study and the credibility and trustworthiness of the study

#### 3.2 Interpretive research paradigm

The term ‘paradigm’ became popular in the academic disciplines including educational research as a result of Thomas Kuhn’s seminal work, *The Structure of Scientific Revolutions* (Cohen et al., 2011). From a Kuhnian perspective, a paradigm is “a set of very general philosophical assumptions about the nature of the world (ontology) and how we can understand it (epistemology)” (Kuhn, 1962 cited in Maxwell, 2008, p.224). Although various definitions of a paradigm abound (Bertram & Christiansen, 2007; Kamal, 2019), for purposes of this study, a paradigm is understood a lens composed of norms and assumptions which one uses to view and make sense of one’s experiences and the world around them (Maree, 2007; Gilbert, 2008; Cohen et al. 2011).

The interpretive paradigm is deployed in this study. The choice of paradigm is influenced by the nature of the study which seeks to understand the subjective experiences of Grade 12 Life Sciences teachers in a PLC (Cohen et al., 2011). Bertram and Christiansen (2014, p.26), echo this choice when they observe that interpretive “researchers do not aim to predict what people will do, but rather to describe and understand how people make sense of their worlds and how they make meaning of their particular actions”. In the same vein, Mackenzie and Knipe (2006, p.3) contend that “interpretivist approaches to research have the intention of

understanding the world of human experience, suggesting that reality is socially constructed.” Leonard (2014) also aims to describe human nature and experiences through social actions. Cohen, Manion and Morison (2011) assert that an interpretive researcher wants to understand the explanation of the world around them. According to Ponterotto (2005) the interpretive paradigm is informed by hermeneutics and aims to understand and describe human nature and experience. He argues that the researcher follows a hermeneutical approach, which maintains that the meaning is hidden and will be exposed through an interaction between the researcher and the participants, which is an exclusive way of viewing the world. Scotland (2012) believes that an interpretive approach assists the researcher in understanding the participant’s viewpoints.

Mackenzie and Knipe (2006) outline the ontology of the interpretive paradigm as having multiple realities, which are socially constructed and subjective and based on values, attitudes and culture. Krauss (2005, p. 758) contends that, “ontology involves the philosophy of reality; epistemology addresses how we come to know that reality”. The epistemology includes knowledge that is interpretive and shaped by the collaboration between the researcher and respondent. It assumes that context dependent truths can be understood, and that multiple truths and knowledge can exist. Another epistemological assumption of the interpretive paradigm is that knowledge is socially constructed (Maree, 2007; Merriam, 2009). The interaction with the participants as they narrated their experiences of learning in the PLC authenticates this epistemological assumption. Furthermore the divergent experiences of the participants also substantiates an ontological assumption of the interpretive paradigm posits that reality exists in multiple forms (Maree, 2007; Merriam, 2009; Cohen *et al.*, 2011; Creswell, 2012).

In this study every participant had their personal perceptions established from their individual experiences of learning in a cluster as a PLC. Choosing to use the interpretive paradigm, I gained an understanding of how Grade 12 Life Sciences teachers learn from a cluster as a PLC. Cohen *et al.* (2011) and Bertram and Christiansen (2014) suggest that research situated in the interpretive paradigm lends itself to qualitative approaches.

An interpretivist approach also highlights the views of the participants which were collected during the interviews. The interviews were conducted in each of the participants’ own context, within their schools. According to McMillan and Schumacher (2001, p.6) there are multiple interpretations of a phenomenon, depending on the individual’s social and cultural

context, resulting in “multiple socially constructed realities”. The phenomenon of teacher learning in a cluster as PLCs through the interpretive lens allowed for interpretation of teachers experiences as they were the main source of information in this study. The socially constructed knowledge resulting from the participants, endorsed a deep understanding and interpretation of their lived experiences. The following section explores the qualitative research approach in more detail.

### **3.3. Qualitative methodological approach**

A qualitative methodological approach was used to unravel the learning and professional development experiences of Grade 12 Life Sciences teachers in a PLC. Berg and Howard (2012) cited in Daniel (2016, p.92), describe the qualitative research approach as, “meanings, a concept, a definition, metaphors, symbols and a description of things”. Hammersley (2013) cited in Cohen et al. (2018, p.287) defines qualitative research as:

[a] form of social inquiry that tends to adopt a flexible and data-driven research design, to use relatively unstructured data, to emphasize the essential role of subjectivity in the research process, to study a number of naturally occurring cases in detail, and to use verbal rather than statistical forms of approach.

According to Creswell (2012), qualitative research is best suited for addressing a research problem for which the variables are unknown and exploration is needed. He further points out that a qualitative approach is appropriate in instances where one wants to understand complex phenomenon from the point of view of the research participants (Creswell, 2012). The characterisations of a qualitative methodological approach captured above emphasise such aspects as subjectivity, description, researching phenomenon in its natural setting and constructing reality in social settings. These characterisations coincide with the aims and characteristics of the interpretive paradigm. Hence the adoption of the qualitative research approach flows naturally from the paradigm that I positioned my study in.

The central purpose of this study was to understand how Grade 12 Life Sciences teachers learn in a PLC from the perspective of the research participants. Adopting a qualitative approach was therefore appropriate as the approach relies on the ontological assumption that reality is subjective and can be reinforced by individuals’ perspectives and interpretations

(Creswell, 2009; Baxter & Jack (2008). Brynard (2014, p.39) contends that descriptive data produced “is generally the participants own written or spoken words”.

Qualitative research methodological approach explores and interprets the experiences of how Life Sciences teachers learn from a cluster as a PLC. This will allow for a deep, rich and detailed understanding of teachers’ experiences of those personal perspectives related to how they learn from a cluster as a PLC. According to Baxter and Jack (2008), the qualitative researcher examines the meanings of people’s behaviour, actions, and influences they have on each other. A qualitative researcher therefore goes directly to the people themselves. Creswell (2003), Wolcott (1994) and Sidani and Sechrest (1996) have similar views on qualitative research as Baxter and Jack (2008), indicating that qualitative research produces descriptive data. The researcher must interpret the data by transcribing, coding, and analysing the trends and themes within the data. In this study the participants were interviewed using open-ended questions and these interviews were transcribed. The transcripts were then coded and themed to analyse data, to obtain the participants perceptions and understanding of how they learnt in a PLC. Cluster meetings were observed and data gathered from these meetings were coded and themed to analyse the data.

Golafshani (2003) indicates that in qualitative research, outcomes are reached through individual meetings with the participants. Furthermore, Merriam (2009) argues that people interviewed are not forced into producing fixed answers for the researcher’s purpose but they rather respond according to their own understandings. The focus of the qualitative approach is to understand phenomena in the contexts in which they occur, hence Denzin and Lincoln (2003) understanding of qualitative research as a situated activity. In this study, the grade 12 life science teachers’ context is a cluster, the understandings and the beliefs about the world in which they live filtered their experiences, knowledge and how meaning was constructed from their practice (Lave & Wenger, 1999; Borko, 2004). Knowledge is drawn from their experiences working collaboratively in a cluster. According to Maree (2007, p.78), “The emphasis is thus placed on the participants’ frame of reference and how they see things from within”. Terre Blanche et al. (2006) and Willis (2007) assert that qualitative researchers are concerned with obtaining direct information concerning the emotions and practices, as it takes place in the actual world. Therefore, this study will rely on the Grade 12 Life Science teachers’ views and experiences on how they learn in a cluster as a PLC and how this contributes to their professional development. The next section discusses the case study research design, which was adopted in this study.

### **3.4. Case study research design**

#### **3.4.1. Defining a case study**

“A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”, (Yin, 1994, p. 13). Creswell (2007) cited in Creswell (2012, p.465) defines a case study as an “in-depth exploration of a bounded system ... separated out for research in terms of time, place, or some physical boundaries.” Case studies assist in finding answers to specific questions. Furthermore, Yin (2003) and Terre Blanche et al. (2006) contend that a case study can be used in different circumstances in contributing to our understanding of individual, group, organisational, social, political phenomena, which are characterised by the questions in study, analysis of the logical connecting of the data to the suggestions, and the criteria for interpreting the findings. Cohen et al. (2018) emphasises that a case study is in-depth and detailed. This depth is shown when the data is analysed. In the same vein Willis (2007) states that a case study allows the researcher to collect rich, in-depth and detailed information within an authentic setting. Therefore, a case study supports the idea that the human behaviour is best understood as lived experiences in the social context.

Describing something as a case study does not only occur individually but forms a larger community of events; therefore, according to Rule and John (2011) it is a case study of something. Cohen et al. (2011) describe a case study as a study of different events taking place and indicates that a specific activity is part of the whole activity. This is supported by Rule and John (2011) asserting that a case study may be an individual, a cluster of individuals, an event, an organisation or a community, similar to the view of Thomas (2011). The phenomenon in this study is teacher learning and the case study is a PLC in a life sciences cluster.

#### **3.4.2. Types of case studies**

Case studies can be classified into three categories: intrinsic, instrumental and collective case studies (Stake, 1995 cited in Creswell, 2012). The concept of an intrinsic case study arises when a “case” is the subject of interest and merit in itself in a study (Creswell, 2012).

According to Bertram and Christiansen (2014), in an intrinsic case study the researcher scrutinises the case for its personal sake. In other words, an intrinsic case study solves the specific problems of a specific case (Stake, 1995). An instrumental case study refers to a situation where the focus of the research is a specific issue and a case is only used as an instrument to shed light on the particular issue (Creswell, 2012). An instrumental case study usually explores an issue or issues using a small group of participants. As implied in the terminology, a collective case study refers to the use of several cases to illustrate or explore an issue.

This study adopted an instrumental case study design, where the issue at stake was how teachers learn in a PLC and the case of a Grade 12 Life Sciences cluster was used to explore this issue. As a Life Sciences teacher, I have attended cluster meetings which I found to have similar characteristics as a PLC. These PLC meetings helped to develop and mould me into the teacher I am today. I gained a lot by attending these meetings and I always wondered if other teachers felt the same way. Mouton (2001) suggests that the case study research design is fundamental in qualitative research and is often formed during the development of the study and is not prearranged.

Case studies can also be categorised into exploratory, explanatory or descriptive cases (Yin, 2003; Cohen et al., 2011). An exploratory case study is used as a pilot study for large-scale research development and its goal is to show that additional inquiry is necessary (Cohen et al., 2011). They can also be used to explore and discover those circumstances in which the issue being evaluated has no clear single set of outcomes. An explanatory case study is used to test theories and to deal with an issue that needs an explanation on the presumed causal links in real-life interventions that are too complex for the experimental strategies (Cohen et al., 2011). According to Yin (2003), a descriptive case study provides narrative accounts. In addition to being an instrumental case study, this study is also exploratory as it focused on understanding how teachers learn in a Grade 12 Life Sciences cluster as a PLC.

### **3.4.3. Strengths and weakness of case study research design**

Davies (2007) argues that the case study research design has numerous strengths because the researcher is able to use different research methods, rapport can also be established by the participants and rich in-depth information can be acquired. Nisbert and Watts (1984) indicate

that case studies are strong in reality and one researcher can take on the case study which grasps exceptional features that can be mislaid in a bigger scale like surveys. They embrace and shape unanticipated actions and controlled variables.

Nisbert and Watts (1984) and Bertram and Christiansen (2014) indicate that results from a case cannot be generalized to the wider population. As a result, a case study can be considered to be weak since findings cannot be generalised and it is not easy to find similar cases. Furthermore, different researchers interpret the same data differently implying that the researcher's own beliefs and feelings may have an influence on the analysis of the case study. Therefore, conclusions drawn from a particular case may not be applied elsewhere. Willis (2007) also noted the lack of control posed by case studies since they are difficult to replicate while Terre Blanche et al. (2006) argue that a case study compromises the validity of information.

### **3.5. Research questions**

This study was steered by the following subsequent research questions:

1. How do Grade 12 Life Science teachers learn in a cluster as a professional learning community?
2. To what extent does a PLC in a cluster contribute to professional development of Grade 12 Life Sciences teachers?

### **3.6. Research context**

This study was situated in the UMgungundlovu District in Pietermaritzburg in KwaZulu-Natal. Five Life Science teachers from five different schools were selected with each teacher having different contextual backgrounds, which is from both rural and urban schools. All the schools were based in urban areas but of different socio-economic status, therefore some were developed, partially developed and undeveloped with resources. All the teachers that participated in this study from different contextual backgrounds attended cluster meetings in

the same district but belonged to different circuits. These cluster meetings served as a PLC and was initiated by the subject advisors.

### 3.7. Sampling procedure

Purposive sampling was used to select the participants for this study. Purposive sampling entails making specific choices in the selection of research participants (Bertram & Christiansen, 2014, p. 60). McMillen and Schumacher (2010) and Cohen, Manion and Morrison (2009) emphasise setting criteria to hand-pick participants who are considered to be most likely informed. Purposive sampling also uses a small sample size which is frequently used in the interpretive paradigm (Cohen et al., 2011). I selected five Grade 12 Life Sciences teachers as I was interested in how they learn in a cluster as a PLC. A district cluster was selected for the study, which included teachers from different circuits within the UMgungundlovu District. I selected participants based on their ability to respond and answer the two research questions. The criteria for choosing participants included subject and grade being taught, namely Life Sciences Grade 12; attendance of cluster meetings in the UMgungundlovu (Pietermaritzburg) District for more than one year; and possession of a teaching qualification. I also ensured that the participants came from different school contexts and ranged from novice to experienced teachers. The next section discussed the data generation methods used in this study.

**Table 3.1: A profile summary of the participants in the study**

<b>Participants name (Pseudonym)</b>	<b>Gender</b>	<b>Age</b>	<b>Total years of service</b>
<b>Sarah</b>	Female	40-49	16
<b>Jane</b>	Female	30-39	7
<b>Nadia</b>	Female	60-69	35
<b>Melissa</b>	Female	30-39	13
<b>Zoey</b>	Female	30-39	12

Table 3.1 shows a summary of the biographical details of the participants of the study. All participants teach Life Sciences as a subject in Grade 12 and attend PLCs.

### **3.8. Data generation methods**

This study made use of observations of cluster meetings and semi-structured interviews as data generation methods.

#### **3.8.1. Observations**

Observation, as method of generating research data, entails studying people going about their daily life without interfering in what they are doing (Bertram & Christiansen, 2014; Bless & Higson-Smith, 2000). Cohen et al. (2018) assert that for observations to take place, the researcher has to go to the site of the study to observe what is actually taking place, in this way first-hand data is obtained. According to McMillen and Schumacher (2010) and Brynard et al. (2014) observation enables the researcher to see and hear what is taking place on site and in this way, the researcher is able to acquire a deep understanding of the context and the behaviour of the participants.

In this study, I conducted observations of two PLC meetings within a cluster setting to observe how Grade 12 Life Sciences teachers learn in a PLC. Data was generated using field notes from the observations. In this study, the observations were focused on describing how teachers learn in a Life Science clusters, and aimed to address the first research question of the study related to how Grade 12 Life Science teachers learn in a cluster as a professional learning community. Therefore, the observation schedule was designed to indicate activities and periods of each activity so the researcher was able to record what took place during each activity, what teachers learnt and how teachers engaged in these activities, thereby meeting Lauer (2006)'s criteria that a good observation needs clear guidelines on what is to be observed.

##### **3.8.1.1. Strengths and weaknesses of observations**

According to Burton and Bartlett (2009), an observation allows the researcher to see the behaviour of people in their environment. It allows the researcher to generate information about participants that are less verbal. According to Brynard et al., (2014) the researcher is able to collect detailed data first hand in a short space of time; therefore, data collected is valid and reliable. The researcher is able to collect data that would not be collected from interviews only.

Although the data collected from the observation is different from that of an interview, it is also subject to interpretation by the researcher who has a great degree of freedom and autonomy with regards to what they choose to observe and how the information is interpreted. Brynard et al., (2014) state that the researcher's interpretation could be biased.

### **3.8.2. Semi-structured interviews**

According to Rubin and Rubin (1995, pp. 46 - 47) "qualitative interviewing design is flexible, iterative, and continuous, rather than prepared in advance and locked in stone. ... questioning is redesigned throughout the project." Semi-structured interviews were also used in this study. Interviews are suitable for interpretive research because they provide a platform to understand people's perceptions and understandings (Bertram & Christiansen, 2014). According to McMillen and Schumacher (2010), semi-structured interviews use open-responses to obtain information on how people make sense of their surroundings and events in their lives. Cohen et al. (2018) assert that speaking to participants allows the researcher to ask probing questions and make them clearer to the participants. In this way the researcher will be able to collect more detailed, descriptive data and gain an in-depth understanding of the teachers' perspectives. Interviews also permit the researcher to find out the participants' knowledge, values and preferences, approaches, attitudes and beliefs in relation to the phenomenon and topic being studied (Bertram & Christiansen, 2014). .

In this study, I used five Grade 12 Life Science teachers as participants who belonged to and attended the cluster meetings. The teachers chose when and where they were comfortable for the interviews to take place where they appeared to be quite at ease in the environment. The teachers all requested to be interviewed at the schools they were currently teaching in. The interviews were conducted in the form of a conversation to allow the participants to feel comfortable even though they were familiar with their surroundings. In this way, I was familiar with the type of questions asked and the conversation flowed allowing me to ask the participants probing questions where there was a need. The main topics included how teachers learnt in the cluster as a PLC, in what ways learning occurred and if this learning led to their professional development. I tried to let the interviewees do most of the talking while I listened carefully, interpreting the meaning of the responses and its significance for the research, and then either asking other probing questions to take the matter further or judging

that the response was complete and directing the interviewee to a new aspect (Babbie, 2005, p. 314). An electronic audio recorder was used to capture the interviews and afterwards transcriptions took place.

### **3.8.2.1. Advantages and disadvantages of interviews**

The advantage of interviews is that it allows the interviewee and the participant to meet face-to-face, allowing the interviewer to interact with the participants. In this way, misunderstandings can be addressed immediately. Interviews are voice-recorded which captures the accurate details of the participant's responses and nuances of verbal expression, providing evidence which can be quoted.

On the other hand some disadvantages of interviews include, the researcher, which is the interviewer, can impose their presence or agenda on the participants. The interviewer requires skills to prevent the respondent digressing significantly from the questions and providing biased responses that are irrelevant to the study and also to direct follow-up questions to make sense of responses that may be confusing. Transcription of interviews is time-consuming, expensive and requires careful checking.

## **3.9. Data analysis**

Maree (2007) and McMillen and Schumacher (2001), contend that when data is coded and arranged into themes and patterns, data is analysed to make meaning of a phenomenon. According to Cohen et al. (2007) thematic analysis is a qualitative data analysis method where patterns and themes are established from the data collected and all aspects of research data are analysed in a purposeful and sequential manner after the data is collected. Maree (2007) maintains that qualitative data analysis was based on interpreting the data to find meaningful content. This is done by thorough inductive analyses which require the researcher to locate emergent themes from the data. Bertram and Christiansen (2014) suggest that data has to be reduced, by organising and sorting it into codes or categories, allowing the researcher to look for patterns and themes to make sense of them. Data was displayed to draw conclusions.

Thematic data analysis was used in this study, to analyse data from the semi-structured interviews and PLC observations. After transcribing the audio recordings the transcripts were availed to the participants to ascertain if their responses had been captured correctly. The data from the transcripts were then coded to identify themes from recurring concepts.

### **3.10. Ethical issues**

According to Creswell (2012) and Rule and John (2011), the way in which ethical issues are addressed is vital while conducting research. Ethical contemplations in research derive from three basic principles of autonomy, non-maleficence and beneficence (Rule & John, 2011).

I observed a number of ethical protocols which are laid down by the University of KwaZulu-Natal and some which are generally accepted principles of ethical research. Firstly, I secured clearance to conduct this research from the university's Research and Ethics Committee. I then had to be cleared by the Provincial Department of Education to conduct research in the district clusters. The subject advisors who facilitated the cluster meetings were informed of the purpose of the study and consent was granted from them to conduct research in the District Cluster. I met with the participants to explain the purpose of the study, the reason for inviting them as participants, the data collection instruments and timeframes and obtain informed consent from the participants to take part in the study. The subject advisors and participants all signed informed consent letters with the detailed scope of the study and the confidentiality clause. The informed consent letter clearly specified that participation was voluntary and the participants could withdraw at any given time with no repercussions. The participants were guaranteed of their confidentiality and anonymity by ensuring that all their information will be kept confidential. The participants and the schools were given pseudonyms. Throughout the research process ethical considerations were kept in mind.

### **3.11. Limitations of the study**

The sample size of the study consisted of five life science teachers from UMgungundlovu District, therefore the findings of the study cannot be generalised in every setting. Therefore,

the results of the study cannot represent all life science teachers from the UMgungundlovu districts and other districts.

### **3.12. Trustworthiness**

Bertram and Christiansen (2014) contend that trustworthiness refers to whether the data collected and findings reflect the reality and experiences of the participants. According to Rule and John (2011, p. 107) trustworthiness endorses “scholarly rigour, transparency and professional ethics”. The trustworthiness of the data was enhanced by triangulation of the two data methods that was used in the study namely, observations and semi-structured interviews. According to Cohen et al. (2007) the use of two or more data collection methods gives the researcher a better understanding of what was studied. Bertram and Christiansen (2014), state that trustworthiness is ensured by confirmability, dependability, credibility and transferability.

According to Rule & John (2011, p.107) confirmability “addresses concerns about the researcher’s influences and biases on the study”. When the data and findings are viewed by others it must be a true reflection of the study. The data was interpreted and understood clearly without the influence of the researcher. To ensure transparency, transcription of the interviews was given back to the participants for verification of accuracy.

Bertram & Christiansen (2014) refer to dependability, as the variation that takes place in the study and how it is seen by others; therefore the data collected is reliable. During the semi-structured interviews participants probed with other questions to gain more information and when required, follow up interviews were conducted.

Petty, Thomson & Stew (2012) define credibility as the method where the findings of the study are trustworthy and reveal the reality of participants. Bertram and Christiansen (2014) contend that the researcher needs to check the data corresponds and reflects with the participants’ responses and the researched phenomenon. Scripts were given back to participants and checked. Different data collections methods were used to strengthen the credibility of the study

According to Bertram and Christiansen (2014) transferability is the way the study can be conveyed. Data needs to be interpreted without the influence of the researcher and cannot be

generalised as this will affect transferability and the outcome of the study. Participants' interview responses were recorded for this study to ensure transferability.

### **3.13. Conclusion**

In this chapter the research methodology and design of the study was discussed. The chapter outlined the interpretive research paradigm and qualitative research methodological approach the study adopted. The types of case studies and its strengths and weaknesses were discussed. The research context and questions were outlined. The sampling procedure was also discussed. Data collection methods were outlined which included observations and semi-structured interviews. The data analysis method using thematic analysis was discussed. Lastly, the ethical issues were discussed and the chapter concluded with the trustworthiness of the research study. The next chapter presents the data collected, analyses it and describes the research findings.

## CHAPTER 4

### DATA PRESENTATION AND ANALYSIS

#### 4.1. Introduction

The previous chapter presented the research design and methodology that was used to generate data for this study. This chapter focuses on the presentation, findings and discussion of the results data in terms of the research questions:

1. How do Grade 12 Life Sciences teachers learn in a cluster as a professional learning community?
2. To what extent does a PLC in a cluster contribute to professional development of Grade 12 Life Sciences teachers?

In this chapter the data generated from observations of teacher learning in a PLC and semi-structured interviews with the participants are presented and analysed. This was followed by a discussion of the findings. To gain a good understanding of the teacher learning that occurred in the PLC the records of the observation and the transcripts from the interview was read several times to make sense of the data and get a better understanding of how teacher learning took place in the PLC. After in-depth and comprehensive examination of the transcripts and observation reports, data was coded into categories, which were grouped into themes. Direct quotes from participants written in italics were used to support evidence.

This chapter will firstly provide a brief biographical profile for each participant in this study. To protect the participant's identity pseudonyms were used.

#### 4.2. Biographical profiles of participants

In this study, the five participants' real names were replaced by pseudonyms. All participants were teaching Life Sciences in Grade 12 and were females from different age groups. Three participants were from fully resourced schools, one from a semi-resourced school and one from a poorly resourced school. As much as was possible the responses of the participants

are captured verbatim to highlight participants' voices and give authenticity to the study. Below are the profiles of the five participants.

#### **4.2.1. Participant 1: Sarah**

Sarah is a female teacher who is in the age category of 40-49 years. Sarah is a post level one teacher who is the grade head for Life Sciences. Sarah has a Bachelor of Arts degree, Bachelor of Science (Hons) degree with majors in Human Physiology and Psychology and a PGCE teaching qualification. Her major subjects at the time of her study were English, Afrikaans and technology. Sarah has been teaching for a total of 19 years and has 16 years of experience in teaching Life Sciences in the FET phase. Sarah said that she started teaching biology when a post became available at her school and was offered to her at that time. Sarah stated that *“from that time forward, I continued with Life Sciences and mastered the subject”*.

Sarah said that she had a passion for teaching Life Sciences and loved the challenge of simplifying the content so that learners could understand the dynamics of the content. She added that she *“loves watching learners transform from merely enduring the subject to enjoying it and excelling”*.

Sarah found the content too much for Life Sciences with a limited time to teach the subject. She felt that:

*[t]o teach the current content requires loads of fundamental teaching to promote understanding....additional teaching on Saturdays or after school is required so that content comprehension is facilitated and consolidation can occur, without which learners would be performing poorly.*

She also believed that duplication of paperwork took up lots of time.

#### **4.2.2. Participant 2: Jane**

Jane is a female, post level one teacher in the age category of 30-39 years. Jane had a Bachelor of Science degree with majors in microbiology and biochemistry and a PGCE and Bachelor of Education (Hons) teaching qualification, with majors in life sciences, natural science and mathematics (GET level). Jane has been teaching life sciences at grades 10, 11 and 12 for a total of 7 years. Jane said that she was inspired to become a teacher by her high school life sciences teacher because she made sure she enjoyed her classes.

Jane said that when she sees her learners “*excited faces when she introduces new content,*” it makes her love teaching Life Sciences which motivates her to put more effort in the preparation of her lessons and introduce new resources.

One of the things Jane did not like about life sciences was the difficult terminology for the learners to learn. She indicated that the terminology that was used in Life Sciences was confusing because it was difficult to pronounce, write and remember. A lack of resources was also a challenge at Jane’s school. There was no laboratory which made doing practical work a challenge as teachers were expected to carry out practical work for every grade doing Life Sciences. Teaching and learning was hindered by not having all the resources.

#### **4.2.3. Participant 3: Nadia**

Nadia is a female, post level one teacher in the age category of 60-69 years. Nadia has a Bachelor of Science degree and a diploma in Education with majors in botany and zoology. Nadia has been teaching life sciences, grade 10, 11 and 12 for a total of 35 years. She said that “*it was called biology at first before the changed to life sciences.*”

Nadia said that “*biology was her favourite subject at school; she loved it and had a passion for it.*” For that reason she became a life sciences teacher. She suggested that the subject was very relevant to our lives, and it involved interesting concepts and practical’s that could be conducted in the fully resourced laboratories at the school where she teaches, giving joy to the learners and allowing them to be experiment with the content taught. This played a crucial part of students learning life sciences which made them appreciate and love the subject.

Nadia found the content too much for life sciences in a limited time to teach the subject. She explained:

*To teach the current content requires loads of fundamental teaching to promote understanding....additional teaching on Saturdays or after school is required so that content comprehension is facilitated and consolidation can occur, without which learners would be performing poorly”.*

She also felt that duplication of paperwork took up lots of time.

#### **4.2.4. Participant 4: Melissa**

Melissa is a female teacher who is in the age category of 30-39 years. Melissa has a degree in education with majors in life sciences and maths. Melissa has taught life sciences for 13 years in the FET phase. Melissa said that, *“Biology was the most enjoyable subject at school and the subject that I got the most marks in.”* She explained that she was inspired and motivated by biology when she was at school because she learnt about life and about how organisms survive, thrive and change.

Melissa has had a passion for this subject from her school days and she loved to see the *“learners’ astonishment when they learn something new.”* She added that teaching life sciences brought joy to her when she imparted new knowledge to learners about the important life processes, which allowed them to understand the processes that took place in their bodies, ecosystems and environment.

Melissa found that teaching certain sections that sometimes have no relevance to the learners are the sections that confused them. The terminology was difficult, especially for English second language learners. She mentioned that certain sections in each FET grade was unnecessary and should be removed. She also suggested that the paperwork that life sciences teachers had to do was a lot more compared to other subjects, taking much time from teaching that could be used for preparation.

#### **4.2.5. Participant 5: Zoey**

Zoey is a female teacher who is in the age category of 30-39 years. Zoey is a post level one teacher and the subject head for life sciences at the time of the study. She has Bachelor of Education degree specialising in the GET and FET phase. Her majors include life sciences, natural sciences, geography, technology, and life orientation. Zoey has been teaching for 12 years, but only as a qualified teacher for a period of 9 years. She has been teaching Life Sciences, grades 10, 11 and 12 for a total of 9 years. Zoey chose life sciences as her teaching subject because she found the subject interesting from her school days and she loved learning about animals, science and the environment. Zoey said that she *“loved analysing and learning new concepts that were ever changing with advancements in science”*.

Zoey enjoyed teaching life sciences because she believed that she had the “*opportunity to inspire our youth and to become scientists in everyday life and in the future*”. She said that she enjoyed being able to spark an interest and challenge students who had an appreciation for science and the environment. Zoey added that:

*Learners got to understand how life processes works in humans and in plants, helping learners understand their environment and organisms around them. This helps to change their mind set and appreciate nature.*

Zoey shared that her hardest challenge teaching the subject is getting learners who choose the subject electively. Zoey said that:

*Life sciences are a very difficult subject to comprehend, it is a demanding subject and if learners don't put in the effort and time to enjoy the subject while learning they will not manage to pass. So if learners do not take this subject seriously they will fail.*

Zoey mentioned that this was her biggest challenge teaching Life Sciences even though her school is a fully resourced school.

#### **4.3. Life Sciences teachers understanding of a “Professional Learning Community”**

When the participants reflected on their understanding of a PLC, they had a fairly good idea of what PLCs were, although they had different ways of explaining it as the following discussion of their personal definitions of PLC highlights.

Sarah described PLCs as:

*A group of individuals that would assist each other in teaching strategies, sharing of resources and would support each other in mastering the subject content and the various testing techniques that may be implemented.*

She had a good understanding of PLCs, and her view resonates with Hord's (2009) definition of a professional learning community (PLC) as a cluster of teachers who meet regularly, work collaboratively and share their expertise to expand their professional skills and development. Similarly, Jita and Mokhele (2014) suggest that a cluster represents a group of teachers from different schools within the same geographical area, called a circuit. These

two views are similar to DuFour (2004) who defines a PLC as a place where a group of teachers with an interest in education meet and share their views and generate a collaborative culture of learning to improve learner performance in schools. Sarah further elaborated that:

*PLCs also assist teachers in keeping abreast with the current changes occurring outside the classroom in order to be able to incorporate those changes in the curriculum to encourage interest and to better prepare learners for tertiary education.*

This implies that if teachers improved their practice so too will learner achievement improve. Likewise, Hord (1997), DuFour *et al.* (2008) and Vescio *et al.* (2008) suggest that the goal of teacher work in PLCs is to improve their effectiveness and efficiency as professionals so that learners benefit.

In accord with Jane and Nadia, Sarah viewed the PLC as a space where teachers work together to enhance and improve the results of their learners. According to Sarah:

*Clusters could be seen as a PLC where teachers meet and whereby we can have collaborating teaching to help each other with different topics, especially if there is only one teacher in a school who teaches grades 10 to 12 to help improve learners' results.*

These teachers expressed their views that collaboration occurs in a PLC. Similarly, Jita and Mokhele (2014), define teacher learning in a professional learning community in the form of collaboration and collegiality. In the same vein, Vescio *et al.* (2008) and DuFour (2004) view PLCs as collaborative culture of learning.

Melissa and Zoey shared similar views that a PLC is a place where teachers meet at workshops or during moderation to discuss aspects that are common to them, and where they share skills and expertise, giving feedback to other teachers in the form of moderating assessments to ensure there is standardisation. These views of Melissa and Zoey were very similar to that of Vescio *et al.* (2008, cited in Brodie & Borko, 2016) who indicated that PLCs prepared teachers to participate in activities related to their work which allowed them to learn from each other and improved their ability to be better teachers. This resonates from Brodie and Borko (2016) and Stoll *et al.*'s. (2006) views that PLCs assists teachers to improve their classroom practice.

All participants expressed understanding of what a PLC was and indicated that they had learnt from others formally and informally within a PLC. They opined that PLCs are groups

sharing ideas to improve their teaching and learner achievement. According to the ISPFTED, Professional Learning Communities are defined as:

communities that provide the setting and necessary support for groups of classroom teachers, school managers and subject advisors to participate collectively in determining their own developmental trajectories, and to set up activities that will drive their development (DBE & DHET, 2015, p.14).

The position of the DBE and DHET as expressed in the ISPFTED is that learning in a community produces enhanced learning outcomes (DBE & DHET, 2015).

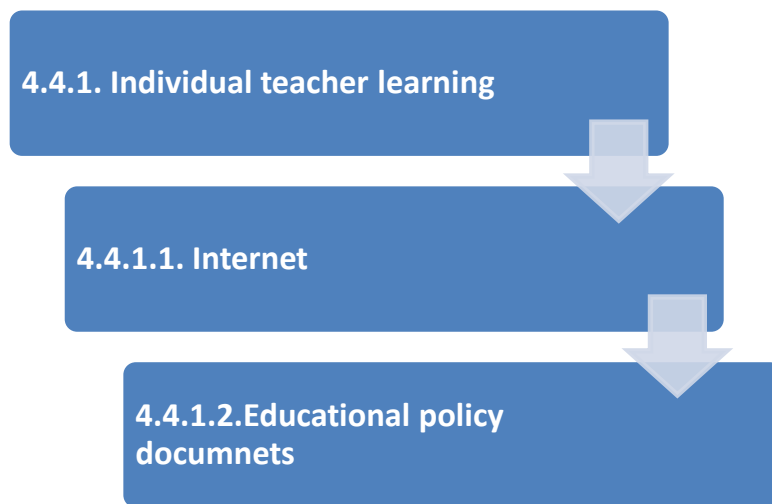


Figure 4.1: Theme showing individual teacher learning within a professional learning community.

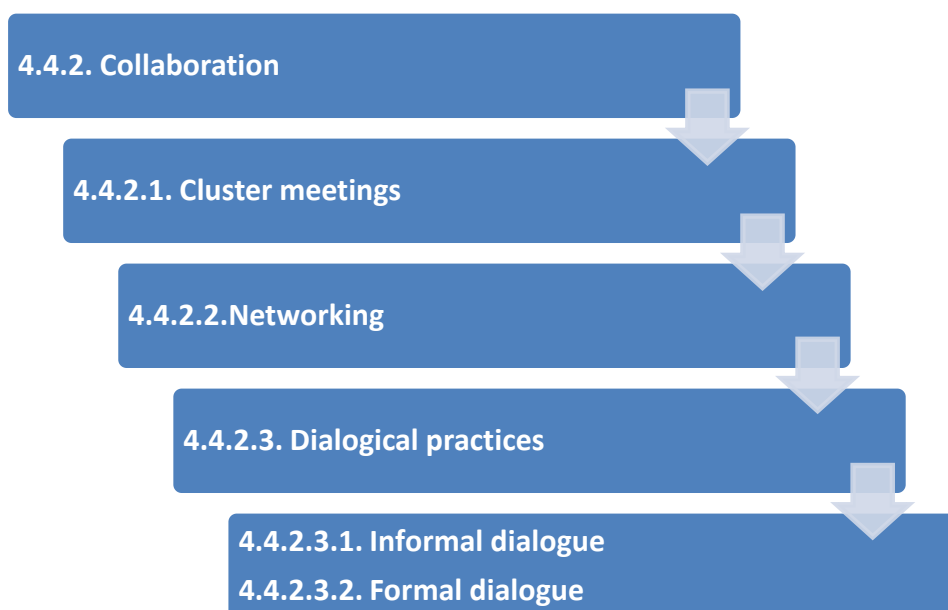


Figure 4.2: Theme showing collaborative teacher learning within a professional learning community

#### **4.4. Teacher learning within a professional learning community**

Data generated from the semi-structured interviews with each participant and observations conducted at two PLC meetings was coded and categorised into themes and sub-themes for easy interpretation and analysis of the data by inductive analysis.

The coding represented how teachers learnt from various activities or methods of teacher learning and two distinct themes of teacher learning emerged from the data. The first theme was individual teacher learning which described how participants learnt in an individual capacity and the second theme was collaborative teacher learning which described how participants learnt in a collaborative capacity. Both themes are aligned to Reid's quadrants of teacher learning (Fraser *et al.*, 2007) which was used to address the first research question of the study and moulded the basis of the theoretical framework.

##### **4.4.1. Individual teacher learning**

According to DuFour (2004), individual teacher learning are learning activities that teachers engage in on their own and are an individual inquiry which holds no connection to their school or district. Individual teacher learning leads to a teacher been a lifelong learner, as society and curriculum changes, so too does teachers' learning change. Individual teacher learning is often self-initiated, allowing the teacher to gain information they require to enhance their skills in their profession for personal and professional development. Therefore, according to Moloï (2010) it is important for teachers to engage in individual learning. In the same vein, the *Norms and Standards for Educators 2000* (Republic of South Africa, 1996), with specific regard to role four which clearly outlines the need for teachers to be researchers, scholars and life-long learners. Teacher learning is an active process, where teachers are constantly engaged in their learning trying to improve their knowledge and skills. According to Lawless and Pellegrino (2007), life-long learning is a component that is often used to help teachers remain in line with current changes in their department and the country, learner performance standards and new approaches of teaching in the content area that can be used to easily propagate new teaching strategies as school environments constantly shift and learners become more diverse and advanced. Sfard (1998, p. 5) contends that:

The language of 'knowledge acquisition' and 'concept development' makes us think about the human mind as a container to be filled with certain materials and about the learner as becoming an owner of these materials.

This refers to the acquisition metaphor, where learning is seen as an act of gaining knowledge and an accumulation of concepts. The focus is on inward knowledge where knowledge is internalised and individualised. Sfard's (1998) view is similar to Kelly (2006, p.506) who asserts that, "individuals acquire skills, knowledge and understanding in one setting, often specifically designed for that purpose, and are subsequently able to use these skills, knowledge and understanding elsewhere".

All participants' mentioned that at some point or the other they were involved in independent learning. Although each participant's response to individual learning was different and phrased differently, it highlighted the concept of individual learning. Participants' responses suggested that they engaged in individual learning in two ways: through the internet and from educational policy documents. These two sub-themes are discussed next.

#### **4.4.1.1. The internet**

The internet helps people to attain enhanced educational outcomes, developing the expertise that they and their societies need. During the semi-structured interviews, all participants indicated that they make use of technology and the internet to learn on their own. They used the internet to research information about how to improve their teaching, content knowledge and practice to keep up-to-date. Sarah stated that:

*A lot of my learning is initiated on my own. I did a lot of self-study and self-research to keep abreast with the changing curriculum and aspects within life sciences.*

She further elaborated that she made constant use of "Google" on the internet to research information.

Jane suggested that the internet has changed the way she learns, which in turn, changed the way she taught. Jane said that she experienced a lot of "*self-teaching*" and when she was asked to elaborate further on what she meant by the concept, she said "*I used Google from the first year of teaching, I even understood hypothesis testing better than I did before.*"

Melissa had a similar way of learning to Jane and Sarah and explained:

*If a learner asks me a question and I am unsure of the answer, all I do is search it up on the internet, because I don't want to guess the answer and give the learner the wrong answer. I make use of my phone and computer in my classroom and search for the answer; at least I am getting to learn with the learner. I also do this if a teacher in a workshop or meeting asks me something and I don't know, I just quickly Google it.*

Likewise, the technological method of researching on the internet was transferred by Zoey who specified that she too used the internet to engage in research. She stated that “*all the teachers in their department always use the internet to research.*” Zoey and the other participants used books to research as well but found it more convenient and easier to access the internet, if not in their classrooms, then on their phones. She stated that, “*The internet has made it easier to access books online.*” In the past, the internet was mainly accessed through computers, which most teachers could not afford. Advances in technology and access to mobile phones played an important part in expanding internet access among teachers. Teachers predominantly use mobile phones to access the internet, which serves as a new means to foster creativity and learning amongst teachers, for personal and professional use.

Nadia on the other hand, who is a much older, experienced teacher indicated that she made very little use of the internet and used it only if she had to. She stated:

*I'm old school and haven't really got the chance to properly learn computers; well I didn't feel it was important. The school is fully equipped with computers but I just teach without them. I read if I have to research a topic from another book. I will leave it to the younger teachers to use computers. I'm out soon.*

According to Pattahuddin (2008), Nadia could be described as a low use internet teacher. Although the use of the internet can improve learning, it can also inhibit or confine learning if it is not used optimally (Pattahuddin, 2008). The research participants acknowledged the internet as a useful resource in the development of their practices as teacher-learners. Sarah stated that:

*We find that we are teaching in the 21st century and we need access to the internet to access the latest information in terms of obtaining resources, lesson plans to make outreaching easier. I personally did a course on classroom practice, everything was online. It's fundamental to living in the digital world, particularly for the growing number of children that is growing up so technologically advanced.*

All the participants indicated that they used computers as the main resource, either provided by the school or their personal computers to assist them in developing their teaching and learning practices. Some teachers, as mentioned in the previous paragraphs, used their mobile phones to gain quick access as a resource to assist their learning. The data that has been generated on individual self-initiated teacher learning resonates with Reid's quadrants on teacher learning focusing precisely on the individual, planned and incidental learning domains of teacher learning quadrants (Fraser *et al.*, 2007). The use of the internet for teachers to gain knowledge to better their teaching practice aligns with Reid's quadrants of planned and informal learning, focusing on web-based networking. This is also in accordance with Sfard's (1998) acquisition metaphor, where knowledge is acquired and cognitivism by Kelly (2006), as well as the linear approach by Opfer and Pedder (2011) focusing on individual learning and knowledge-of-practice.

From the data gathered it also emerged that all participants made use the internet to improve their teaching practice and familiarise themselves with other techniques and skills to approach learners. According to Solheim et.al. (2018) Internet access provides great opportunities for education, for both teachers and policymakers. It is used to improve the quality of learning and understanding for teachers and hence, the education for individual learners, generally benefitting the teacher and learner. Greater access to information and resources also enhances teaching and learner performance and this is particularly so in the digital era (Ibieta et al., 2017). According to Opfer and Pedder (2011, p.384), a "large amount of attention given to teacher professional development by researchers and policy makers has often rested on a process-product conceptualization". This suggests that if teachers develop professionally, their instructional practices will improve (the process) which will improve student learning (the product).

#### **4.4.1.2. Educational policy documents**

When teachers were asked during their semi-structured interviews about how individual teacher learning took place, besides the use of the internet, many reflected on the reading of educational policy documents. Sarah mentioned that, "*Policy documents are easily available on the internet, but we have to read it to understand how to implement it*".

Nadia on the other hand shared that they were given policy documents at workshops but it was not fully explained. She added that without reading the policy document on her own she would not know what to do, and stated that:

*Teachers are confused when they leave the workshops and we don't know how to implement the new policies that have been read to us. I go back and thoroughly read the contents of the policy documents to get a better understanding of it. In this way, I will know what to do, I will know how to implement it. Without reading any document given to me in the cluster or other teachers, I will be lost.*

When further probed, she stated that, *"I have to take the document and read it thoroughly to understand it, it helps having a hard copy as I don't use the internet much"*.

Zoey agreed with Nadia's view on policy documents in that they have to be read to be understood more clearly, because it was only briefly explained at the workshops they attended because there was not enough time. She added, *"I have to read the documents received from workshops again, it guides me on what I need to do, especially when there are changes to the content and assessments"*.

Melissa also suggested that reading educational policy documents were important for equipping her in the workplace. She believed that by reading and engaging with current information and knowing how and what had to be implemented empowered her and she elaborated:

*It gives me a deeper insight and understanding. When I understand the documents I feel confident knowing what to do. If another teacher requires guidance I can easily assist because I feel confident.*

Jane, on the other hand, had friends in other provinces who she communicated with to keep herself updated. She also stated that:

*I always look on the internet, to check other provinces like Gauteng to see if they put up new policy documents, they are always ahead of us. I have friends in other provinces teaching life sciences, so we network over WhatsApp; they always inform me of changes.*

It is apparent after the analysis of the information generated in this study that individual learning and initiative was at the heart of the reading educational policy documents. Results also indicated that teachers engaged in reading educational policy documents to empower

themselves on the educational curriculum as well as school developments, which improved their confidence in their subject or educational matters. Although school principals in the five participants' schools were generally apathetic to the idea of teacher learning through the reading of educational policy documents, all participants valued reading of policy documents as a way of keeping abreast with the life sciences curriculum as well as to assist others. This speaks to Reid's quadrants of teacher learning, and more specifically to the domain of planned and informal learning which is categorized by teachers' initiative to participate in deliberate and thoughtful professional learning (Fraser *et al.*, 2007). According to Fraser *et al.* (2007) Reid's quadrants of informal learning is initiated by the teacher, the participants in the study took it upon themselves to read policy documents to keep themselves abreast with the changing curriculum. This also falls under the planned formal or informal domain because teachers had to plan and set aside time to read the policy documents making it part of formal planned learning. They were informed about the policy documents from their colleagues and friends making it fall within the planned informal domain because they set aside time to have an informal summarised conversation about the policy documents. When one knowledgeable colleague shares knowledge with a novice teacher they are cascading information. According to Kennedy (2005) when knowledge is transmitted it falls under the cascade model which is informed by the cognitive approach and acquisition metaphor.

#### **4.4.2. Collaborative teacher learning**

A PLC is described in different ways, although the different definitions share similar notions about adult learning. Collaboration for the drive of cultivating learning and teaching takes on different practices and terms, reliant on the context. According to DuFour *et al.* (2008) PLCs are defined as teachers who are working collaboratively in continuing practices of joint inquiry and action research to attain improved overall results for the learners they teach. Hord (1997) contends that teachers work and participate in PLCs to improve their efficiency as professionals for the advantage of their learners.

Similarly Brodie (2013) argues that a single characteristic of effective professional learning communities is collaboration amongst the teachers. Collaboration is the key for a PLC to function effectively and efficiently. Jane explained that she preferred working with other teachers:

*I prefer to work in a group rather than by myself, we get more done and we know each other weaknesses. Even though we meet in our clusters for a short while we get lots done, we set up dates for our meetings, we get to meet new teachers and exchange numbers in our clusters. We become like a family, because I can call the cluster members or any life science teacher I have met, if I ever need help and they are willing to help me. I would do the same for them.*

Data generated indicated that the element of collaboration between cluster members prevailed and was in line with Dodge and Kendal's (2004) assertion that one of the benefits of being a member of a learning community was creating friends with the members of the same community. Many authors suggest that learning is a social process which takes place when teachers work in groups to collaborate and are able to construct knowledge and are able to solve problems (Goncu & Gauvain, 2012; Lave & Wenger, 1991; Matusov & Rogoff, 2002).

Brown and Duguid (1996) found that it is vital to deliver teachers with the opportunity to collaborate and mirror their work. They contend that when teachers collaborate on contextually meaningful activities, they developed a stronger sense of determination which then created an unrelenting culture of learning. Melissa stated that:

*As we learn together and from other teachers, we take it back to our other teachers in our departments, cascading the information that we have learnt to enrich them as well, so they too can develop professionally and it can benefit their own learners.*

The benefits of collaborative learning can be seen in the valuable inspiration that it has on learner accomplishment to the influence it has on teachers (Stoll *et al.*, 2006; Hord & Sommers, 2008; Vescio *et al.*, 2008).

Wenger (2006) indicates that the goal of communities of practice is for clusters of people who segment their apprehension and desire for something and learn how to do it better when they interact often with others. This resonates with the observations of the cluster meetings where teachers seemed very happy when certain aspects were discussed with others. Zoey said "we have to meet again out of the cluster meeting to discuss, we learning so much together" and other teachers nodded their heads in agreement as they carried on with their discussions. When Zoey was probed during her semi-structured interview on why she believed that teachers worked best together, she stated that:

*If a teacher sits in their own corner thinking they too proud and they know it all, they won't learn anything from other teachers. Once a person has that attitude, they will just do their*

*own thing. Even though the subject advisors are clear when explaining certain aspects, teachers need assistance from each other on formal and informal issues related to teaching.*

This resonates with McDougall and Stoilescu (2011) and Vescio et al. (2008), who concur that teachers learn best from each other. In addition Garet et al. (2001) establish that teachers who engaged in collaborative professional development were more effective than traditional professional development models. The following are outlined as effective characteristics of professional development: being collaborative, increased pedagogy and content knowledge, must be continuous and have clear goals, and must be active and inquiry based (Garet et al., 2001; Guskey, 2003; Moore & Shaw, 2000; and Supovitz, Mayer, & Kahle, 2000). Nadia said “*So once people are always together and are always sharing ideas they will be developed.*” Similarly, Sfard (1998, p. 6) contends that once knowledge is acquired, it may “be applied, transferred (to a different context) and shared with others”.

All participants highlighted the importance of collaborative learning compared with learning alone in separation. Collaborative learning is a describing component of Wenger’s social learning theory (1998) whereby social participation defines a community of training such as a PLC. Kelly (2006, p.1), “argues that socio-cultural theories are more helpful, providing insights into teacher learning”. PLCs are composed of teachers who collaborate, over a prolonged period of time, to enhance their knowledge and skills in order to enhance the effectiveness of classroom practice and instruction. Participants further articulated the different methods of learning that they engaged in through collaboration that involved peer interaction. These modes of learning included: attending cluster meetings/workshops, networking and dialogical practices.

#### **4.4.2.1. Cluster meetings**

The findings from the analysis of data generated showed that cluster meetings were a form of learning collaboratively amongst teachers that attended these clusters meetings and other workshops. Participants had similar views about the importance of cluster meetings as being helpful to their professional development. This was reinforced by Nadia who explained that:

*It’s important to attend clusters meetings because they are supposed to develop teachers and they do. Teachers have challenges all the time and they need help for their subject advisors and each other. It helps us to keep updated with all the changes that take place. We are able*

*to see how other schools perform and get help from them. It's very important."* Similarly, Zoey stated that *"these clusters are informative and helps us a lot.*

This resonates with Mphahlele (2014) who suggests that clusters are an innovative networking strategy for teacher learning where teachers are allowed to collaborate in groups. Mphahlele's (2014) view is similar to Dittmar et al. (2002) who believe that clusters act as a pivotal point to which directions from upper ranks in the chain of command might exist acting as a hub for gathering information and material on acceptances of local decision-making, such as the type of assessment to be set, the improved planning and ensuring an improved framework for teacher reviews. This allows schools to gain access to extra resources, encourages teacher growth and development, promotes curriculum development and provides an environment for innovation, inspiring cooperation in school projects. The mutual understanding with the scholars mentioned above is that learning cannot be individualized. It is a process of sharing knowledge in clusters or communities. According to Mphahlele (2014) teacher learning should be a collective effort and clusters serve as sites of teacher learning.

Jane indicated that cluster meetings were very informative and ensured that standardisation took place in all schools, and teachers were accountable. She stated that:

*Although we have lots of discussion with colleagues and learn from each other, the cluster meetings are very structured, subject advisors ensure certain things must be done. Scripts are moderated, this ensures standardisation and makes teachers accountable.*

It was also evident during observations that cluster meetings were very structured, even though teachers snacked in conversation at various times informally.

Melissa believed that more workshops and cluster meetings should be held and it should be held on a continuous basis. She added:

*Teachers cannot be developed in three cluster meetings in a year; we need to be continually developed so we can learn more. The department needs to have more workshops to continually develop teachers, even on the curriculum itself.*

This resonates with Giordano (2008) who contends that clusters are extensively understood as a means to develop the use of limited resources and to give elevation to educational quality.

Melissa further stated that, *“In these meetings they just tell us what to do, it can be very boring”*.

The views of participants suggested that they required more guidance from these workshops and cluster meetings held by the department and indicated that it was a way in which they developed and learnt. This resonates with Free and Olivier (2010) who found that teachers believed workshops held by the Department of Education by trained specialists were beneficial to them, provided support in their training, learning and developing. Boston (2013) contends that teacher learning was improved when they participated in professional development workshops. It was found that these workshops assisted teachers to improve their understanding and their instructional practices which consequently had a positive impact on student learning. The participants specified that teachers needed to share information and resources to learn from one another. Teachers in clusters get an opportunity to work and slog together in discussing and solving problems in a group of teachers rather than being secluded and working on their own.

#### **4.4.2.2. Networking**

It was evident from the data generated from the semi-structured interviews as well as the observations of cluster meetings that teachers formed network groups with other teachers. Teachers networked informally within and out of the PLC. They also communicated formally within and out of the PLC meetings. Therefore, participants met at cluster meetings to network, and in this way, they were able to address the difficulties they faced and got an opportunity to hear other participant’s difficulties and helped each other. The following statement was taken from Jane’s interview:

*These PLC meetings have helped me a lot, especially in my first year of teaching I was given a Grade 12 class. I was so afraid but I didn’t have a choice, I had to teach and I also needed a job and money. I was very confused I didn’t know what to do but after I attended the first cluster meeting, I met other teachers who helped me a lot. I told them about my challenges, like teaching Grade 12 for the first time and I didn’t understand plant hormones and evolution very well they guided me along. At any time I can contact them to ask for help. They were my mentors.*

Sarah expressed a similar view:

*Teachers help each other more informally than on a formal level as we are very limited formally and we have to follow strict regulations within our clusters. As an experienced teacher, I often mentor the younger teachers in our cluster, they often seek advice from me and due to time constraints, and we exchange numbers forming a network where we exchange information and ideas to help each other. Teachers that are new to the profession often needed help with the content and classroom management, teachers would also express their concern that their learners are not performing and that many do not apply themselves and speaking to more seasoned teachers helps mentor them.”*

According to Wenger (1998), teachers who are a part of a community of practice in their group, engage with a colleague from an external community of practice. This communication amongst members permits a negotiation of social participation.

In the same vein, Melissa commented:

*When we attend meetings, we get opportunity to socialize with teachers from other clusters. We share teaching ideas and content; we ask each other how far they are with the syllabus. Teachers learn from each other and improve their classroom practice. Older teachers are guides in cluster and it's good for young teachers to communicate with them.*

According to James and McCormick (2009) and Stoll *et al.* (2007), teachers engage in networking with teachers within their schools and other schools on both a personal and professional level. Zoey articulated her experience of formally networking with teachers from other schools and shared that:

*When I work with teachers from other schools from the same cluster, we set up a date when we will meet and a venue, often at one of the teachers' school. In our meetings we have discussions that are very formal relating to the content and setting of tasks, often if that process is completed and teachers still have time, then we have informal discussions, but most of the time teachers are rushing to finish.*

Stoll *et al.* (2007, p. 63) contend that networking with other schools empowers teachers to:

[s]hare and tease out principles of good practice, engage in in-depth dialogue across schools, create knowledge to respond to particular challenges that any school might find hard to resolve, observe colleagues elsewhere, experience fresh perspectives, reduce isolation and see their own school through a different lens.

After analysing the participant's responses it can be interpreted that networking takes place formally and informally, allowing teachers to learn from other teachers who share similar expertise and work in a similar subject area. After the analysis of the data generated from the semi-structured interviews, it was evident that many teachers used social networking as a way of communicating with each other. Zoey stated that, "*we always chat to other teachers on WhatsApp to find out information.*" Sarah elaborated:

*When we meet in our cluster groups we exchange numbers. The cluster coordinator normally takes down everyone's number that forms part of our group and forms a WhatsApp group chat, so if there is anything related to life sciences we post it there and communicate; it is an easy way to communicate. no teacher has an excuse because everyone has phones.*

The phrase "*chatting to colleagues*" was used by all participants at some point. During observations of the cluster meetings, many teachers, not only including the participants, used the phrase "we will chat on WhatsApp", especially towards the end of the cluster meeting.

Teacher interaction on social media platforms like WhatsApp provided learning opportunities for the teachers. Colibaba, Vlad and Petrescu (2012) note the importance of social networks as a teacher learning tool. Jones and Dexter (2014) refer to these interactions as personal learning networks. All the research participants indicated that they make use of these networks to share resources with fellow teachers and the network extends beyond the boundaries of the PLC.

The research participants also found WhatsApp a convenient and accessible learning tool. These networks fall into incidental and informal domains of Reid's quadrants. According to Fraser *et al.* (2007) Reid's incidental learning is spontaneous, and unplanned teachers interactions are established by the teacher. Teachers forming network groups and interacting via WhatsApp and other forms of social media are initiated by the teacher and therefore falls into these domains.

#### **4.4.2.3. Dialogical practices**

During the semi-structured interviews, when teachers were probed about the way they learn collaboratively in the PLC, all participants indicated that they engaged in dialogue with their peers within the PLC. This was reinforced during the observations of the cluster meetings, as all teachers that participated belonged to different circuits/wards and engaged in formal and

informal discussions. Dialogical Practices amongst teachers were group discussions as well as individual (one on one) discussions.

Nadia stated that:

*A lot of discussion takes place in our meetings; discussions take place with teachers and the subject advisors.*

When probed further about the type of discussions that take place, she further stated that:

*We discuss issues around setting tasks, teaching strategies, content coverage and obviously moderation. We learn from each other and I get new ideas to implement in my own classroom.”*

In the same vein, Melissa mentioned that,

*Subject advisors come to each table having discussions with each circuit, to help and guide each group with issues relating to our subject. Sometimes when teachers need further explaining, they will speak to them individually to assist were they can*

These statements resonated with the observations of the PLC meetings.

The sharing of experiences and challenges faced [through listening and communicating] also contributed to the learning of the participants (Meirink *et al.*, 2009). One participant, Jane, often used the phrase “*we discuss*” in her semi-structured interview, showing that discussion played an important role in how teachers learn from each other. She also acknowledged dialogue as a way of informal teacher learning which teachers engaged in regularly to communicate their challenges. She explained:

*Teachers wait for the subject advisor to finish talking so that we can carry on with our own conversations on issues that affect us directly. Sometimes we talk while the subject advisors still presenting, I know it’s rude but if we don’t do that we often get very little time to chat as everyone rushes out.*

During the cluster observations, teachers only discussed issues related to teaching and learning. Some of the dialogical practices that teachers’ engaged in their cluster groups as well as from their semi-structured interviews were aspects such as discussions on teaching strategies, presentations and group discussions. According to Reid’s quadrants this will fall into the informal and formal dialogue as explained in the next paragraph.

#### 4.4.2.3.1. Informal dialogue

Teacher informal dialogues focused on operational teaching strategies. These dialogic practices differed on the source of its formal and informal capacity. The motivation behind these conversations was to get information on new teaching methods and techniques that could contribute to them in developing and evolving their Life Sciences teaching practices, especially for different topics and how to use the resources they had available in their schools. Zoey reiterated the importance of dialogue as follows:

*I really enjoyed the discussions our group had on practical skills. Teachers had amazing ideas on practical's and how to conduct certain practical's, especially from teachers that didn't have much resources in their schools, they used practical, cheap and easy resources the learners could bring from home. This amazed me I use to always try it with my own learners.*

Jane further added that,

*...after attending these cluster meeting where lots of ideas are exchanged and discussions made I have grown a lot and I have learned different teaching approaches that I practice in my classroom*

Melissa had a difficult time as a novice teacher and she explained that she was able to communicate with other teachers, and was given the opportunity to be mentored when attending PLC meetings. She became friends with some of the best Life Sciences teachers and stated:

*even though I did Life Sciences in high school and copied some of the ways of my high school teacher taught in my own classroom, its wasn't as good as what I had learnt from the teachers in the cluster."*

The above responses resonate with one of the aims of the ISPFTED which seeks to make teachers take ownership of their own learning and development. Teachers also reflected on their teaching strategies based on their teaching experiences of specific topics and how their learners understood it (DuFour & DuFour, Eaker & Karhanek, 2004). According to Kennedy (2005) coaching/mentoring model teachers are enriched by sharing dialogue with their colleagues to develop the professional practice. This is further asserted by Kelly (2006) suggesting that knowledge is gained in practice where social learning takes place.

Nadia stated that:

*Dialogues with my colleagues are the best thing ever, we get to talk and learn, whether we are old teachers or young, it's good for everyone. In the cluster we focus on learning new teaching strategies to improve our classroom practice"*

This response affirms that collaboration in a PLC brings about individual development which cannot be achieved in isolation (DuFour & Eaker, 1998). Teachers' content knowledge and innovative teaching methods are also developed in communities of practice leading to new classroom roles and outlooks about learner performance (Brodie, 2013; Darling- Hammond & McLaughlin, 1995).

Nadia confirmed the importance of dialogue as an approach of informal teacher learning that allowed teachers to participate on a consistent basis. She confirmed that during informal discussions teachers communicate their challenges with each other. She explained:

*We sometimes take a toilet break, or if teachers are finished and are free, we informally talk or hear others talking about learning and teaching."*

Hord and Sommers (2008) observe that when teachers collaborate they engage in dialogic practices about teaching and learning. These importances of these informal dialogues in the Grade 12 Life Sciences PLC are consistent with Reid's (2007) informal, incidental quadrant of learning. In addition, these dialogues also contribute to the development of teachers as dynamic members of a community of practice with capacity to create meaning and sustained mutual commitment.

#### **4.4.2.3.2. Formal Dialogue**

During the observations of cluster meetings it was evident that formal dialogue also took place. During the process of Moderation teachers checked each other's work/tasks that they had set as well as marked a certain percentage of learners' scripts. This ensured that teachers were setting tests that were fair and met the requirements of the department. If not, then other teachers together with the subject advisors assisted teachers by showing them where they went wrong and how they could improve. In this way teachers were able to learn on a formal basis about how they should set tests as well as mark and assess their learners. This was reinforced by Sarah who stated that "*teachers facilitate the moderation process which is*

*strictly guided by the subject advisors*". During the observation of the cluster meetings the subject advisor would have an agenda laid out for the day. One aspect included the moderation process, which they monitored as they moved to different tables, checking teachers' files and moderating teachers' assessments and learners work.

Nadia added that:

*Moderation emphasises what is expected of teachers regarding assessments and helps teachers to learn to develop better assessments.*

During the moderation process teachers formally engaged in checking, correcting and guiding each other on specific aspects related to the moderation process. Teachers were able to learn from each other.

Zoey explained that:

*Communication in the cluster meetings are always mainly through dialogic and very structured especially when the process of moderation is taking place.*

It was evident that the official, formal nature of dialogue which occurred in PLCs was more controlled and organized creating a more insightful method of teaching and learning practices. Nelson (2008) recognizes the reputation of an enquiry stance headed for dialogic practices in a PLC. Dialogic practices were not lead and maintained by the subject advisors only, but by the teachers as well.

Another form of formal dialogue that was observed during the cluster meetings were presentations and group discussions. Firstly, a presentation was conducted by the subject advisor, reflecting on past examinations and school performance, and there was no discussion about the presentation. At some point, teachers were handed tasks and they had to discuss examination papers and practical task in their groups and then present to others. According to The group discussions facilitated knowledge acquisition through exchanges with others (Borko & Borko, 2016), teachers gain knowledge through participation in group discussions with others. This echoes Putnam and Borko (2000)'s view that learning is made possible through collaboration, socialisation and participation.

#### **4.5. PLC contribution to professional development of teachers**

Teachers are lifelong learners and Life-long learning is vital for Continuous Professional Teacher Development (CPTD). Lessing and De Witt (2007) refer to CPTD as any activity that is aimed at improving skills and knowledge of teachers. This can be done by means of orientating, training and supporting the teacher. Professional development encompasses all formal and informal learning experiences and interventions which aim to enhance a teacher's classroom practice. CPTD formal activities include attending conferences, formal subject meetings and discussions (PLC), workshops, and training courses at higher education institutions to improve qualifications leading to a teacher's professional development. Formal activities can also be teacher initiated. Desimone (2009) conceives professional development activities as formal, informal or both. Whether these activities are formal or informal they share certain common features namely, a focus on content, active learning, consistency, duration and collective participation (Desimone, 2009). In addition, she advises that for teachers to experience development teacher knowledge must be increased and the new knowledge, skills, approaches and principles acquired are in turn harnessed to improve one's practice with the aim of increasing students' learning (Desimone, 2009).

On the other hand, in accordance with Day (1999), the informal aspect of CPTD typically occurs on a daily basis for teachers allowing them to discuss ideas, to develop and refine lessons, develop assessment, networking and sharing of classroom experiences. Discussions during the lunch break and informal chats about teacher and learning experiences form part of informal professional development of a teacher.

##### **4.5.1. Enhances knowledge, skills and teaching strategies**

The significance of understanding exactly how teachers learn is fundamental for transformative teaching and learning within schools. Teachers attending and being part of a PLC are able to enhance their knowledge, teaching skills and practices as a result of the support they acquire in a PLC. Though it is not possible to see knowledge acquisition and learning in action we can still see proof of these in new actions (Darling-Hammond et al., 2009).

Janes stated:

*By participating in a PLC I have increased my subject knowledge, my teaching strategies has really improved and I am better equipped to teach.*

This response corresponds affirms the idea that professional development refers to processes and activities aimed at enhancing the knowledge, skills and attitudes of teachers, in order to improve student learning (Guskey, 2000). Melissa mentioned that by her attending cluster meetings she had gained knowledge about the curriculum and about teaching strategies which contributed to her professional development. She elaborated:

*My teaching strategies change for different topics and different learners; I have learnt how to manipulate my teaching for the benefit of my learners and this I learnt to do from communicating with other teachers in the cluster meetings.*

This finds affirmation in the view that asserts that, teacher professional development is the main key to improving the value of teaching and learning, when teachers are involved in activities that can “increase their knowledge and skills, improve their teaching practice, and contribute to their personal, social, and emotional growth. (Desimone, 2011, p. 28)

PLCs aid teachers to reflect on ideas therefore by learning from others in a PLC it allows teachers to reflect on certain ways to improve their teaching and to amend their practice. King (2016, p. 574) views professional development, “as the growth of teacher expertise leading to a change in practice that results in improved student outcome”.

This was evident in Nadia’s response:

*After I attend the PLCs I am so determined to improve the results of my learners, so I use to seek help and support from teachers in the PLC. I was also so motivated that I would engage in self-learning*

Similarly, Zoey indicated,

*Other teachers they have helped me tremendously, what I have learnt I used in my classroom practice and I have seen a huge improvement in the learner’s marks*

Avalos (2011, p. 1) agrees that “...professional development is about teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students’ growth.” Avalos (2011) concurs with Guskey (2002) that teacher learning and teacher professional development must privilege student learning hence the two should be

pursued with the end in mind. Put in another way teacher learning and teacher professional development should start with student learning.

From the analysis of the data it was evident that novice teachers benefitted from the PLCs. Novice teachers feel overwhelmed by a number of different issues related to teaching and learning as it was new to them. Novice teachers are unfamiliar with certain aspects, such as classroom management, instruction, curriculum coverage, preparing assessments and administration. When teachers attend PLCs they learn from the subject advisor and from the other experienced teachers they meet in their cluster groups. This was mentioned earlier by Jane. PLCs assist the teachers and help them to become more effective teachers.

Sarah stated that,

*PLC meetings are so useful to new teachers, it guides them with the syllabus coverage, exposes them to other teachers that are more experienced and who assist with the development of these new teachers. It's good for new teachers.*

With extra support new teachers learn extra effective practices to relate to daily challenges. Support given to new teachers helps to retain new teachers and assists them to become effective teachers, to develop personally and professionally within their careers making them more confident teachers.

Nadia mentioned that:

*Teachers that are new are not in the profession for long, they challenged in their first year not having support and feel exhausted, but the ones that attend these meetings all the time come back looking and speaking about Life Sciences more confidently.*

New teachers develop classroom management skills from older teachers as they seem more like mentors, Melissa stated that:

*Older teachers seem to be mentors to all the young teachers in our group, we provide guidance on curriculum coverage and assessments, we help them with issues they have in the classroom on how to management the learners*

#### 4.5.2. Enhances confidence, motivation and commitment

PLCs enhance strong connections between team members and the very essence of a PLC is an emphasis on and a pledge to student learning. From the observations that I conducted I noted high levels of commitment, confidence, motivation, enthusiasm and excitement in the members of the PLC. The five research participants were in attendance in all the meetings that I observed.

Sarah stated that:

*Teachers love attending the cluster meetings it is all full, some teachers arrive late but they still attend, they motivated, happy and excited to be there.*

This was evident during the observations as well, teachers were happy to see each other and to engage in discussions and activities; they eagerly entered the venue although later some seemed not so eager.

In the same vein, Jane mentioned the following about the cluster:

*Our cluster is one that is motivated, we share learning vision. Everyone believes in team work, sharing activities and responsibilities as well as challenges that we are faced with on a daily basis.*

She believed that by engaging in the cluster she too feels motivated and driven to do her best “*I feel driven when I attend, I want to go the extra mile.*”

Similarly, Nadia stated:

*My learners and their needs come first if they excel I excel. I love attending these meeting because I learn from other teachers and practice that in my classroom. It gives me confidence as teacher”. In the same vein, Zoey responded: “The cluster meetings are engaging it keeps us motivated we can keep abreast with content and administrative work”.*

I also observed active participation by all members of the PLC including the five research participants. This translated into high levels of engagement in the discussions and other activities in the PLC meetings. Teachers took ownership of the meetings as their personal educational space. Subject advisors were welcoming and approachable and allowed teachers to take the lead on certain aspects, they assisted were there was a need to. Although teachers

were happy to attend these meetings, some felt that it was not scheduled at the perfect time, which affected teaching and learning. Some teachers felt demotivated by attending cluster meetings because of the issues mentioned above.

Melissa responded that:

*Meetings normally take place during working hours, so we losing lots of time with our learners and we then spend weekends covering up without any compensation.*

This was reinforced by Sarah as she also felt that the meetings wasted teaching and learning time, which was evident in her response:

*Just a few hours away from the classroom has a huge impact on teaching time, I feel under pressure to make up the hours lost, it's exhausting."*

While some teachers felt that teaching and learning time was lost, many felt that the time lost out of class was helpful because teachers increased their own knowledge in these meetings so that they could implement it in their own classrooms. Jane added that *"We lose and we gain"* meaning that they lost time with their learners but they gained knowledge.

DuFour (2003) contends that professional confidence is reinforced when teacher learning within teams creates the result that the members have toiled hard to accomplish. Brodie (2013) agrees that PLCs can offer a beneficial and challenging podium for massive and forceful teacher learning and development.

All participants interviewed demonstrated an understanding that their learning was important for student learning hence their motivation and enthusiasm. This understanding that learning in a PLC is for the benefit of learners is supported by Hollins (2006) and Robert (2010) who contends that PLCs are an aim to make teacher to take collective responsibility for student learning and achievement. DuFour (2004) also asserts that the core driver of PLCs is a pursuit to ensure that learners learn hence the focus in PLCs is learning and not teaching. In other words the teachers in a PLC double-up as teachers and learners but it is learning that is privileged in this arrangement hence one can understand participants in a PLC as teacher-learners.

## **4.6. Barriers to learning in a PLC**

### **4.6.1. Insufficient time**

In terms of articulating teachers' learning experiences within a PLC, from the analysis of the data generated there has been a consensus amongst all participants that time was an obstructing factor which prohibited them from collaborating with one another. Sarah specified that the reason for a lack of time to work together with teachers from other schools was due to the huge amount of administrative work they had to cover before they could engage. She believed that the policies were too intense in that short space of time and stated that:

*Ever since CAPS there has been so many changes that I still haven't got fully used to, so not much time to discuss because we have to listen, follow and implement.*

Nadia agreed that insufficient time did not give them the chance to interact with their colleagues as they would have liked to, and added,

*We just have no time to interact with our peers, in a rush there's a short briefing, then complete individual and group activities and then rush to finish moderation.*

She further stated that, "the meetings are one big rush", while Zoey added:

*Even sometimes during our breaks we don't have a break because we want to complete as much work as we can in a short space of time.*

Jane shared:

*I sometimes switch off because too much information is given in a short space of time, we exhausted to interact.*

This information overload evidently confines teacher learning in a PLC. This was highlighted by Schechter (2012) and Hord and Sommers (2008) who found that information and work overload of teachers is a hindering aspect in the growth of a PLC. Stoll et al. (2006) and Hord and Sommers (2008) advocate for leaders of PLCs to be creative in removing barriers to teacher learning.

From the observations it was evident that teachers rushed to finish the moderation of scripts. Many teachers spoke about personal duties that they needed to get done after the meeting, and

they also had negative feelings about how it was rushed. Some teachers do not correspond and subject advisors had many schools to see to at the same time. Jane expressed this by stating, “Cluster meetings help us a lot with curriculum changes, but I can’t wait to get out of there”. Zoey on the other hand said that, “Clusters in my district has too many schools attending at the same time, we all don’t get to interact with our seniors”.

All participants concurred that time constraints inhibited learning in the PLC. In addition, the size of the cluster was also identified as a barrier to effective collaboration. Teachers were of the view that there was inadequate time to collaborate with their peers about the different modes of teacher learning.

#### **4.6.2. Conflict and unwillingness to learn in the PLC**

Participants shared that many teachers in the cluster groups, especially new teachers attending the meetings for the first time, seemed to have an attitude of just being there because they had to. After analysing the participant’s semi-structured interviews, it was evident that many teachers were unwilling to learn new ideas or be corrected, when they were not following the right content which many participants stated was evident in the type of assessments the teachers brought for moderation. It was also noted that many teachers were impatient and could not wait for the meeting to finish; they just wanted to leave the meeting. This was reinforced by Nadia:

*A few members in our cluster group just want to go through the motions thus negating the aim of the meeting. Some can’t get out of there quick enough.*

Some teachers were not approachable or even open to discussions; they became angry when addressed about their work. It was evident from my observations that they felt intimidated and reacted accordingly to shield or protect themselves from the criticism. Jane, on the other hand, believed that it was healthy to have discussions where people do not always agree on certain aspects, but felt that it needed to be done in an orderly manner and not in an aggressive or an abrupt way. When probed further and asked to describe the relationship between members in their PLC, she stated:

*Although there’s sometimes a lot of tension between teachers especially during the process of moderation of assessments, teachers are often pleasant; there are times when we agree to disagree in a professional manner.*

Yukl (2009) identifies conflict amongst stakeholders in a group as inhibitive to collective learning. He suggests that this leads to disagreement and differences about objectives and priorities. These disagreements and differences inhibit the abilities to collectively learn since it obstructs shared values and vision. In contrast, Hargreaves (2007) contends that trust and relationships are crucial characteristics of sustainable PLCs.

According to Stoll *et al.*, (2006, p. 239) “teachers are unlikely to participate in classroom observation and feedback, mentoring partnerships, discussion about pedagogical issues, curriculum innovation, unless they feel safe”. Therefore teachers need to feel safe in the environment they interact in, especially with other teachers. This suggests that it is important for leaders to play an important role in encouraging a safe and positive working relationship grounded on trust between peers. Teachers need to be corrected about their work in a way that does not criticise their professionalism and them personally, but makes them feel empowered knowing that they can improve. There should be leaders helping and guiding teachers in need. According to Harris and Jones (2010, p. 179) the role of the leader is “one of establishing a high-trust environment where it is safe for teachers to change practice and to innovate.” Yukl (2009, p.52), asserts that “building a culture of shared values for learning and flexibility, encourages a win-win solution to conflict and creates optimism” which could be a way in which this challenge can be addressed.

#### **4.7. Chapter summary**

This chapter presented an analysis of the results gathered from the participants through semi-structured interviews and observations. All Results have been analysed and presented according to themes. This chapter, firstly gave a brief biological profile of each participant, and then an overview of life sciences teachers’ understanding of PLCs. Then it discussed the ways teachers learn within a PLC, namely individual teacher learning, which focused on the use of the internet and educational policy documents as ways in which teachers learn. Collaborative teacher learning was then discussed, focusing on cluster meetings, networking and dialogical practices as forms of teacher learning. How PLC contributes to a teachers’ professional development was then discussed and the chapter concludes with barriers to teacher learning.

## CHAPTER 5

### DISCUSSION OF FINDINGS, RECOMMENDATION AND CONCLUSION OF THE STUDY

#### 5.1. Introduction

This qualitative study was located in the interpretive paradigm to look at teacher learning in a PLC for using a Grade 12 life sciences district cluster as a case study. Five participants were interviewed and two PLC meetings were observed to generate the data that constitute the basis of this study. In the fourth chapter, this data was presented and analysed using a thematic approach and the said themes were developed through a coding process which focused on key words among other criteria. The analysis of the data was carried out within the confines of the interpretive paradigm and the conceptual framework which draws from Reid's quadrants of teacher learning and Desimone's framework for teacher professional development. Additionally, concepts and learnings drawn from the literature review presented in Chapter 2 were also used to make sense of the findings of the research. The study is organised into five chapters as highlighted below.

Chapter 1 is a foundational presentation of the study which addresses the rationale and purpose of the study; the research questions what the study sought to answer; a brief discussion of the background to the study; and an introductory review of literature focusing on teacher learning and professional development in PLCs and the conceptual framework which derives from Reid and Desimone. The methodology used in the study is also introduced in Chapter 1. The first chapter concludes with an outline of the structure of the study.

The purpose of Chapter 2 was to ground the study in the body of existing scholarship and to unpack key concepts related to teacher learning and professional development. To that end, Chapter 2 presented a detailed review of the literature, addressing concepts related to PLCs, teacher learning and the professional development of teachers. The concepts which framed the study drawn from Reid and Desimone are articulated to bring the chapter to its conclusion. This conceptual framework focuses on quadrants of teacher learning and framework for teacher professional development by Reid and Desimone respectively.

Chapter 3 focuses on the methodological dimensions of the study. This entailed unpacking the philosophical and methodological assumptions of the interpretive paradigm, the qualitative research approach and a case study research design. The discussion of the research paradigm, research approach and design is accompanied by justifications for their use in this study. The research questions, research context, sampling procedures, data generating methods and methods of data analysis are also identified and/or explained in this chapter. The chapter concluded with addressing ethical issues and trustworthiness.

In Chapter 4, I present the findings from the in-depth interviews and observations of two PLC meetings. The research findings are articulated within the boundaries of Reid's quadrants of teacher learning, Desimone's framework of professional development and ideas drawn from the literature which was reviewed in Chapter 2. The research participants are given a voice in this chapter through the direct quotes from the interview transcripts.

Chapter 5 discusses the findings that emerged in response to the research questions. In addition to the findings, this chapter outlines the limitations of the study and concludes with suggesting recommendations and drawing conclusions based of the findings. The discussions of the findings in this chapter are organized according to the two research questions:

1. How do Grade 12 Life Sciences teachers learn in a cluster as a professional learning community?
2. To what extent does a PLC in a cluster contribute to professional development of Grade 12 Life Sciences teachers?

## **5.2. Summary of findings**

The discussion below summarises the three key findings of this study:

1. Teachers learnt both individually and collaboratively in the PLC.
2. PLCs contributed to teachers Professional Development:
  - Enhanced knowledge, skills and teaching strategies
  - Enhanced confidence, motivation and commitment

3. Insufficient time, conflict and unwillingness to learn were barriers to teacher learning in the PLC.

### **5.2.1. Teachers learnt both individually and collaboratively in the PLC**

This study found that teachers had a good understanding of what teacher learning referred to and most participants described teachers as “lifelong learners”. A key finding was that teachers learnt in an individual capacity as well as in a collaborative capacity. This is aligned to Reid’s (2007) quadrants of teacher learning.

The findings suggested that teachers firstly learnt on their own by engaging and making use of the internet that was used to research information on content, thereby helping them to develop resources to use in their classrooms and to gain professional development. All participants in the study had indicated that at some point they had made use of the internet to enhance their learning. Teachers mainly used their own personal computers, as well as their cell phones to access the internet. Secondly teachers learnt in an individual capacity from reading educational policy documents which they had accessed from their devices or educational policy documents given to them by a colleague during a cluster meeting. It was also found that the readings of policy documents were self-initiated.

The study also highlighted that teachers learnt collaboratively when they attended cluster meetings. It was found that teachers who attended cluster meetings were given vital information from the subject advisor who conducted the meetings. Teachers received policy documents, and performed moderated tasks to ensure that standardisation took place across the different schools in the circuit. At cluster meetings teachers formed network groups with other teachers. Teachers networked with other teachers both formally and informally within the cluster meetings and outside of the cluster meetings. It was found that when teachers networked with other teachers they exchanged ideas related to teaching, classroom management, resources, assessments, the content coverage and their learners. It was found that teachers learnt collaboratively through dialogue. Teachers communicated with each other formally and informally, they engaged in group discussions or individual discussions. The dialogue discussions that took place were based on setting tasks, teaching strategies, content coverage and moderation.

### **5.2.2. PLCs contribute to professional development**

Teachers who attended the PLCs felt that it had enhanced their knowledge, skills and teaching practices because of the support they received from other teachers through dialogue and networking with them. This study found that teachers reflected on their own practices in the classroom and used the new ideas gained at PLCs to enhance their own classroom and teaching practices, which resulted in them becoming more confident teachers. Both novice and experienced teachers benefited from attending PLCs. This enhanced their confidence, motivation and commitment. Teachers were active participants in the PLCs, which suggested that they enjoyed the learning activities and conversations that took place in PLCs.

The findings also suggest that the participants were self-motivated lifelong learners, who clearly understood the need for professional development and so were committed and willing to learn. The attitude of the participants towards learning and professional development resonate with Darling-Hammond et al. (2009)'s view that professional development should be rigorous and on-going. These attitudes towards learning also made the participants more confident about the subject while teaching in the classroom which in turn improved learner's performance. Teachers attending and being part of the PLC were able to enhance their knowledge, teaching skills and practices by the support they acquired in the PLC. This suggests that PLCs enhance strong associations between team members; the actual essence of a PLC is a focus on and a commitment to teacher learning.

### **5.2.3. Insufficient time, conflict and unwillingness to learn were barriers to teacher learning in the PLC.**

All participants cited insufficient time as being limiting to collaborative learning in the PLC. Too much administrative work, along with limited time to complete the work also affected teacher learning. They were bombarded with policy documents about the constantly changing curriculum and had to figure out how to use and implement it. Teachers also felt that PLCs were conducted at the wrong time, taking them away from the classroom. Throughout the observation of the cluster meetings it was evident that teachers rushed through the whole process of moderating scripts. Insufficient time was a barrier to effective teacher learning in a PLC.

The findings showed the unwillingness of certain teachers, especially the new, young teachers, to learn from other teachers. Teachers became upset when corrected on the assessments or moderation and marking of scripts, and had a “know it all” attitude. They felt intimidated and became defensive towards the teachers correcting them. This was another factor that hindered teacher learning in the PLC. This resonates with Yukl (2009) who described conflict between participants as a barrier to collective learning, since it obstructed shared values and vision; this is not part of the characteristics of a PLC as indicated by Hargreaves (2007).

### **5.3. Limitations of the study**

A purposive sample of five Grade 12 Life Sciences teachers and two PLC meetings were observed for practical considerations which include time and financial resources that were available to the researcher. The study did not include Life Sciences teachers for other grades and neither did it include teachers teaching other subjects. This means that the study is context specific and not representative of the experiences of all teachers. However the study remains useful as the rigours trustworthiness were adhered and its findings can be used for exploratory purposes in other research contexts. This is particularly so in situations with similar socio-economic conditions.

### **5.4. Recommendations**

Most of the participants in the study used the internet as a way of teacher learning, either to research information, as resources or for developing their teaching practices. Teachers use different devices to access the internet, like their personal computers or their phones but all for the same purpose. Teachers make use different social networks to communicate with other teachers, WhatsApp currently being the most popular and easily accessible. This form of communication overcomes the barrier of time that hinders teacher learning in a PLC. I, therefore recommended that virtual learning for teachers should be developed to allow teachers to engage more often with each from the cluster groups. Subject advisors who conduct the cluster meetings should also develop these virtual platforms to engage with teachers outside these cluster meetings. In this way, teachers will gain more support from

their colleagues and seniors. Teachers view themselves as lifelong learners and their learning is self-initiated through various different ways as described in the findings of the study. Virtual learning platforms will allow teachers to attend workshops and meetings that are not only mandatory to enhance their development.

I further recommend that teachers attend development workshops during the school holidays to overcome the hindrance of time and receive a stipend for attending, which will motivate teachers to attend development workshops. This will ensure that the contact time for teaching and learning is not affected. School timetables should include professional development workshops which will prevent teachers from rushing to complete tasks and exit the cluster meetings because they view PLCs as a compulsory practice. This should be initiated by the Department of Education. More time should be given for teachers to discuss issues in the PLC as this was one of the most common and popular ways that teacher learning took place collaboratively. Louis and Mark (1998) also found that the contribution of teachers in a professional community, adds immensely to social provision for achievement and higher levels of pedagogy.

## **5.5. Conclusion**

This chapter summarized the key finding of the study. There were three key findings in the study discussed above namely; teachers learnt both individually and collaboratively in the PLC, PLCs contributed to teachers' professional development that enhanced their knowledge, skills, teaching strategies, confidence, motivation and commitment. The last key finding was insufficient time: a conflict and unwillingness to learn were barriers to teacher learning in the PLC. A limitation to the study was discussed and the chapter concluded with recommendations that were made.

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## APPENDICES

### APPENDIX A: Permission: Department of Education KwaZulu-Natal



education

Department:  
Education  
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma

Tel: 033 392 1063

Ref.:24/18/1723

Mrs U Mohan  
07 Kirkcaldy  
Pelham  
Pietermaritzburg  
3200


Dear Mrs Mohan

#### PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: "AN EXPLORATION OF TEACHER LEARNING OF GRADE 12 LIFE SCIENCES TEACHERS IN A PROFESSIONAL LEARNING COMMUNITY", 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 11 February 2019 to 01 July 2021.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

UMgungundlovu District

  
Dr. EV Ndama  
Head of Department: Education  
Date: 15 February 2019

KWAZULU-NATAL DEPARTMENT OF EDUCATION

Postal Address: Private Bag X9137 - Pietermaritzburg - 3200 - Republic of South Africa

Physical Address: 347 Burger Street - Anton Lembede Building - Pietermaritzburg - 3201

Tel.: +27 33 392 1000 - Fax: +27 033 392 1000- Email: Phindile.Duma@kzndoe.gov.za - Web: www.kzneducation.gov.za

Facebook: KZNDOE ... Twitter: @DOE\_KZN ... Instagram: km\_education ... Youtube: kzndoe

..Championing Quality Education - Creating and Securing a Brighter Future

## APPENDIX B: Ethical Clearance: University of KwaZulu-Natal



20 February 2019

Mrs Urica Heslop 205502494  
School of Education  
Pietermaritzburg Campus

Dear Mrs Heslop

Protocol reference number: HSS/0084/019M

Project Title: An exploration of teacher learning of grade 12 Life Sciences teachers in a Professional Learning Community.

### Full Approval – Expedited Application

In response to your application received 29 January 2019, 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

.....  
Prof Ronicka Mudaly (Deputy Chair)

/px

cc Supervisor: Dr J Naidoo

cc. Academic Leader Research: Prof SB Khoza

cc. School Administrator: Ms S Jeenarain, Ms M Ngcobo and Ms K Sophie

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Humanities & Social Sciences Research Ethics Committee

Dr Rosemary Sibanda (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag X54001, Durban 4000

Telephone: +27 (0) 31 260 3587/8356/4857 Facsimile: +27 (0) 31 260 4608 Email: [ethics@ukzn.ac.za](mailto:ethics@ukzn.ac.za) / [ethics@ukzn.ac.za](mailto:ethics@ukzn.ac.za) / [ethics@ukzn.ac.za](mailto:ethics@ukzn.ac.za)

Website: [www.ukzn.ac.za](http://www.ukzn.ac.za)



Founding Campuses: ■ Edgewood ■ Howard College ■ Medunsa ■ Pietermaritzburg ■ Westville

## **APPENDIX C: Letter to the Subject Advisor**

7 Kirkcaldy, 05 Newscotland Road  
Pelham  
Pietermaritzburg  
3201

### **The Subject Advisor**

#### **Re: Request for permission to conduct research in your school**

I am Mrs Heslop, currently studying towards a Master's Degree in Education. My study requires me to conduct a research project titled: "An exploration of teacher learning of grade 12 Life Science teachers in a Professional Learning Community". The purpose of this study is to examine how grade12 Life Science teachers learn in a cluster as a PLC. In addition, this study aims to explore how the PLC contributes to teacher learning and professional development. In order to understand this I will be interpreting and understanding the experiences of teachers learning in professional learning communities.

I humbly request your permission to conduct my research at your cluster with grade Grade 12 Life Science teachers. The teachers will be required to participate in individual interviews that are expected to last between 30 minutes at the times convenient to them which will not disturb teaching and learning. Follow-up interviews may be conducted if necessary. Each interview will be voice-recorded. Observations of two PLC meetings will take place to observe what occurs in a Life Science cluster as a PLC.

Please note that there will be no financial benefits for participants' participation in this research project. The schools' or the participant's identities will not be divulged under any circumstance. All teachers' responses will be treated with strict confidentiality. Pseudonyms will be used (real names of the participants and the institution will not be used throughout the research process). Participation is voluntary; therefore, participants will be free to withdraw at any time without negative or undesirable consequences to them.

Data will be stored at my supervisor's office in the University of KwaZulu-Natal in a locked cupboard for a maximum period of five years, thereafter it will be destroyed. You may contact my supervisor, the Research Office or me should you have any queries or questions. Your positive response in this regard will be highly respected.

Yours faithfully

---

**My contact details:**

Cell: 073 070 9630

E-mail: [urica.heslop@gmail.com](mailto:urica.heslop@gmail.com)

**Supervisor:**

Dr J. Naidoo

Email address: [naidooj@ukzn.ac.za](mailto:naidooj@ukzn.ac.za)

Telephone 033 260 5867

**UKZN Research Office**

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: [HSSREC@ukzn.ac.za](mailto:HSSREC@ukzn.ac.za)

---

**Declaration**

I.....(Full names of the subject advisor) hereby confirm that I have been informed about the nature, purpose and procedures for the research project and give consent for the researcher to attend and observe grade 12 Life Sciences PLC meetings.

Participant signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **APPENDIX D: Letter to the participants**

7 Kirkcaldy, 05 Newscotland Road  
Pelham  
Pietermaritzburg  
3201

### **The Participant**

Dear Sir/ Madam

### **Re: Request for participation in research project**

I am Mrs Heslop (Mohan), currently studying towards a Master's Degree in Education. My study requires me to conduct a research project titled: An exploration of teacher learning in a Professional Learning Community (PLC) of grade 12 Life Science teachers. The purpose of this study is to examine how grade 12 Life Science teachers learn in a PLC. In addition, this study aims to explore how the PLC contributes to teacher learning and professional development. In order to understand this I will be interpreting and understanding the experiences of teachers learning in professional learning communities.

I humbly request your permission to be a participant in this study. You will be required to participate in individual interviews that are expected to last between 30 minutes at the times convenient to you which will not disturb teaching and learning. Follow-up interviews may be conducted if necessary. Each interview will be voice-recorded. Observations of two PLC meetings will take place to observe what occurs in a Life Science PLC.

Please note that there will be no financial benefits for participants' participation in this research project. The schools' or the participant's identities will not be divulged under any circumstance. All teachers' responses will be treated with strict confidentiality. Pseudonyms will be used (real names of the participants and the institution will not be used throughout the research process). Participation is voluntary; therefore, participants will be free to withdraw at any time without negative or undesirable consequences to them.

Data will be stored at my supervisor's office in the University of KwaZulu-Natal in a locked cupboard for a maximum period of five years, thereafter it will be destroyed. You may contact my supervisor, the Research Office or me should you have any queries or questions.

Your positive response in this regard will be highly respected.

Yours faithfully

---

**My contact details:**

Cell: 073 070 9630

E-mail: [urica.heslop@gmail.com](mailto:urica.heslop@gmail.com)

**Supervisor:**

Dr J. Naidoo

Email address: [naidooj@ukzn.ac.za](mailto:naidooj@ukzn.ac.za)

Telephone 033 260 5867

**UKZN Research Office**

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: [HSSREC@ukzn.ac.za](mailto:HSSREC@ukzn.ac.za)

---

**Declaration**

I.....(Full names of the participant) hereby confirm that I have been informed about the nature, purpose and data collection procedures and timeframes for the research project and consent to participating in this research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

Participant signature: \_\_\_\_\_ Date: \_\_\_\_\_

Additional consent, where applicable

I hereby provide consent to the following data collection instruments: (Please circle response)

**Semi-structured Interview** YES / NO

**Observation of PLC learning activities** YES / NO

## APPENDIX E: Semi-structured Interview Schedule

1. What age category do you fall in? 20-29; 30-39; 40-49; 50-59
2. What qualifications do you have?
3. What subjects did you major in?
4. How many years of experience do you have as a teacher?
5. How long have you been teaching Life Sciences?
6. Why did you choose to teach Life Sciences?
7. What do you like about teaching Life Sciences? Why?
8. What don't you like about teaching Life Sciences? Why?
9. What do you understand by 'Professional Learning Community'?
10. What is the importance of clusters as a PLC?
11. How often do Life Sciences teachers meet formally to engage in professional learning activities?
12. In what ways does informal learning take place in your cluster?
13. How would you describe the relationship between you and other teachers when you learn?
14. What restricts you from collaborating with your peers in a PLC?
15. How does participation in a PLC enhance teacher's professional development?  
Elaborate.
16. How does the PLC support you as a Life Sciences teacher? Give examples.
17. What are the professional learning activities that you engage in, in the PLC? Give examples.
18. How does teacher learning take place in a PLC?
19. What knowledge, skills, attitudes and values do you learn in a PLC?
20. How are the PLC meetings facilitated?
21. To what extent are you free to participate in discussion within the PLC?
22. How has the PLCs enhanced or inhibited your confidence as a Life Sciences teacher?  
Give examples.
23. Why is it important for Life Science teachers to participate and learn in a PLC?
24. How would you describe your PLC cluster group?
25. To what extent is the subject advisor encourages learning and participation in PLC meetings?
26. To what extent is the time allocated for PLC meetings sufficient? Explain.

**APPENDIX F: Observation Schedule**

**PLC Observation date:** \_\_\_\_\_ **Time:** \_\_\_\_\_

**Number of Life Sciences teachers present:** \_\_\_\_\_

**Purpose of PLC meeting:**

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**Topic/s discussed:**

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**Professional learning activities:**

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**Interaction and discussion among teachers:**

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**General notes:**

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## APPENDIX G: Sample to show how data was analysed

Question 1: How do grade 12 Life Sciences teachers learn in a cluster as a professional learning community?

Code	Theme	Framework
To keep up-to-date with new curriculum changes, Using the internet, teachers library, reading departmental policy documents, researched information, technologically advanced(to improve teaching skills), assisted by google, use the internet to access resources. Learning is self-initiated. Self-taught, I read educational policy documents to keep ahead, attending workshops, studying further, I look for resources, I taught myself about it and learnt to implement it, completed a science degree to assist me and helped me become more informed	Individually learning <ul style="list-style-type: none"> <li>• Internet</li> <li>• Educational policy documents</li> </ul>	Reids (individual, planned and incidental learning domain of teacher learning quadrants (Fraser <i>et al.</i> , 2007).
Get together, working in a team, I would ask another teacher,help each pther, learning from each other,assists each other, helps new teachers develop an learn, willingness to learn from each other, work together, promotes deeper team learning, creating relationships, egage with other teachers	Networking/ Sharing ideas	Reids (individual, planned and incidental learning domain of teacher learning quadrants (Fraser <i>et al.</i> , 2007).
Sharing, new ideas, exchange new ideas, informal discussions, to share with colleagues, we share assessments, new ideas to approach a topic, views on moderation and learner performance, challengers faced in the classroom, work as buddies, share	Collaboration	Putnam and Borko(2000)

resources, building a team collaborating with other teachers, I learnt how to teach, exchanging information during informal discussions, collaboration between teacher, assist each other, sharing resources informal an formal learning occurs, shate skills and expertise, dicussions		
Discussion of Policy documents, we informed about new changes made to the curriculum, improves my knowledge about the subject, following departmental polices are important	Educational Policy documents	Reids (individual, planned and incidental learning domain of teacher learning quadrants (Fraser <i>et al.</i> , 2007).

Question 2: To what extent does the cluster as a PLC contribute to professional development of grade 12 Life Sciences teachers?

<b>Code</b>	<b>Theme</b>	<b>Framework</b>
Gave me support as a new teacher, provides guidance, it helped me a lot, supportive and helpful, improved teaching skills.	support	Desimone (2011)
Increased my confidence, increased my subject knowledge, improved my teaching skills and strategies, in generally I am more professionally developed, really gave me confidence, enhanced my confidence in teaching, helps new teachers develop and learn, empower teachers, helps to reflect and become better, teachers become informed, ways to improve, feel very comfortable to engage with other teachers, it has helped me become more confident, making me want to learn, developed me	Confidence/motivatio n/ commitment	Desimone (2011)

## APPENDIX H: Turnitin certificate

dissertation			
ORIGINALITY REPORT			
13%	12%	1%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS
PRIMARY SOURCES			
1	<a href="http://researchspace.ukzn.ac.za">researchspace.ukzn.ac.za</a> Internet Source	8%	
2	Submitted to University of KwaZulu-Natal Student Paper	2%	
3	<a href="http://hdl.handle.net">hdl.handle.net</a> Internet Source	<1%	
4	<a href="http://core.ac.uk">core.ac.uk</a> Internet Source	<1%	
5	Submitted to University of Pretoria Student Paper	<1%	
6	<a href="http://scholarworks.waldenu.edu">scholarworks.waldenu.edu</a> Internet Source	<1%	
7	<a href="http://uir.unisa.ac.za">uir.unisa.ac.za</a> Internet Source	<1%	
8	<a href="http://creativecommons.org">creativecommons.org</a> Internet Source	<1%	
9	<a href="http://www.internetsociety.org">www.internetsociety.org</a> Internet Source	<1%	

## APPENDIX I: Language editing certificate



21<sup>st</sup> April 2021

To whom it may concern

### EDITING OF DISSERTATION FOR URICA MOHAN HESLOP

I have a master's degree in Social Science, Research Psychology and a TEFL qualification from UKZN. I also have an undergraduate and honour's degree Bachelor of Arts in Health Sciences and Social Services from UNISA.

I have 15 years of teaching experience and have been editing academic theses for students from UKZN, UNISA, the University of Fort Hare, and DUT for the past eight years. I have further undertaken editing, transcribing and other research work for private individuals and businesses.

I hereby confirm that I have edited Urica Heslop's dissertation titled "An exploration of teacher learning of Grade 12 Life Science teachers in a professional learning community in a district cluster" for submission of her master's dissertation in education at the University of KwaZulu-Natal. Corrections were made in respect of grammar, tenses, spelling and language usage using track changes in MS Word 2013. Once corrections have been attended to, the dissertation should be correct.

Yours sincerely



Terry Shuttleworth (TEFL, UKZN, MSocSc, Res Psych, UKZN).

### DISCLAIMER

Should the student not attend to the changes suggested by the editor and make additions to the dissertation after editing has been completed, the editor cannot guarantee the language, grammar and tenses are correct at the time of publication.