EXPLORING TEACHER IDENTITIES AND EMOTIONS IN THE TEACHING OF EVOLUTION IN GRADE 12 LIFE SCIENCES

By

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ABSTRACT

Over the past eighteen years, the Department of Education (DoE) has implemented significant changes in the life sciences curriculum. The most recent change in 2008 included the study of evolution in life sciences, both *human evolution* and *natural selection* in the curriculum at grade 12 level. This accounts for forty-four percent of the weighting in Grade 12 life sciences paper 2, that is, sixty-six marks out of a total of one hundred and fifty.

This research study therefore focused on the teaching of evolution in Grade 12 life sciences and specifically how teachers' identities, namely on a personal and professional level influenced the teaching of evolution. In addition, it endeavoured to evaluate the extent to which teaching this topic is an emotional practice. In this context, personal identity refers to the character of a teacher that is located outside school and is associated with family and social roles, whilst the professional identity embraces the policy expectations of what an ideal teacher is, as well as their educational aspirations.

This study adopted a qualitative approach, with an interpretative paradigm and a narrative research method. The conceptual frameworks of Day and Gu's (2007) *Dimensions of Teacher Identity* and Hargreaves (2000) *Emotions of Teaching and Educational Change* were used to explore the link between teacher identities, their emotions and the impact on teaching evolution. Purposive sampling was used to invite six life sciences teachers in the uMgungundlovu district in Pietermaritzburg to participate in this study. Methods of data collection included semi-structured interviews, collages and reflective journals. The qualitative data that was collected was coded and analysed using thematic analysis.

The key findings of this study indicated that in terms of teacher identities being compromised during the teaching of evolution, some teachers submitted that their identities on a professional level did not change because their beliefs and perspectives did not change. However, this study indicated that a teacher's personal identity, is intricately linked to their professional identity, therefore this infers that the one merges into the other and this in turn directly or indirectly influences the teaching of evolution to learners.

The data on teacher emotions revealed a descent into anxiety, frustration and indifference by some participants. They revealed that inadequate training on the topic of evolution, together

with insufficient support from school management teams and the DoE made them feel anxious and frustrated. In addition, a lack of resources and financial constraints with the incessant pressure to perform and produce good results caused many teachers to feel challenged and apathetic in the classroom, which culminated in exhaustion and burn-out. The large number of learners in a class, language barriers and inadequate contact time with learners also contributed to their negative feelings towards teaching evolution. However, it was not only negative emotions that teachers felt, but also what I termed 'a kaleidoscope of positive emotions'. Teachers at different stages of teaching evolution felt hope, rewarded, appreciation, fulfilment and excitement. This study has revealed that there is a strong link between teachers' identities and their emotions. I used the expression 'evolutionary partners' to accentuate the long-lasting, intertwined relationship between these two elements.

Recommendations include the need for teacher professional development and training in teaching evolution in Grade 12 life sciences; the provision of adequate resources; more time to be allocated to teaching evolution and allowances for on-site visits and excursions. The following problems and limitations were encountered during this study: participant teachers were not available for the scheduled interviews due to the COVID-19 pandemic in 2020, therefore interview questions were made available via email and responses collated and analysed thereafter. The limited number of participants were not representative of the population of Grade 12 life sciences teachers, therefore the findings of this study cannot be generalised, but can only be applied to other similar scenarios. This study aims to increase the awareness of the Department of Education, in providing much needed support to life sciences teachers, not only materially but in terms of their identities and emotional support too.

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, Anastasia Paulette Baijnath, declare that:

The research reported in this thesis, except where otherwise indicated, is my original research.
This thesis has not been submitted for any degree or examination at any other university.
This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

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

Their words have been re-written but the general information attributed to them has been referenced.

Where their exact words have been used, then their writing has been placed in italics and inside quotation marks, and referenced.

This thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the Reference sections.

Student Signature

6 July 2021

Date

Dr Jaqueline Naidoo

Name of Supervisor

Signature

DEDICATION

This thesis is dedicated to my precious children, Andrea and Kohen Baijnath for their unconditional love and faith in me and my husband Steven Baijnath, for his ongoing support, patience, understanding and encouragement. Collectively, you have sustained me on this evolutionary, challenging exploration.

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My beloved Mum, Patricia Stephens who taught me to persevere in spite of the 'giants' in front of you; and my late Dad, James Stephens, who inculcated a love of education in us all – you would have been so proud of the academic achievements of the 'Stephens' siblings.

PREFACE

The research study described in this thesis was carried out with six Grade 12 life sciences teachers from five different schools in the uMgungundlovu District of KwaZulu-Natal. The project commenced in 2019 and concluded in 2021, under the supervision of Dr J. Naidoo of the Pietermaritzburg campus of the University of KwaZulu-Natal.

This study represents the original work completed by the author and has not been submitted in any form for any diploma or degree to any other tertiary institution. Where the author has made use of the work of other authors, this has been duly acknowledged in the text.

Anastasia Paulette Baijnath — 06 July 2021 (Date)

As the candidate's supervisor I agree/do not agree to the submission of this dissertation.

Dr J. Naidoo — Date
Supervisor
Pietermaritzburg Campus

LIST OF ACRONYMS

Acronym	Description
CAPS	Curriculum and Assessment Policy Statement
CPD	Continued Professional Development
DBE	Department of Basic Education
DoES	Department of Education and Skills
DoE	Department of Education
FET	Further Education and Training
NCS	National Curriculum Statement
NSC	National Senior Certificate
PLPs	Professional Life Phases
VITAE	Variation in Teachers' Work, Lives and their Effects on Pupils

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CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

The fact of evolution is the backbone of biology, and biology is thus in the peculiar position of being a science founded on an improved theory, is it then a science or faith?

1.1 Introduction

This study sought to discover the influence of teachers' personal and professional identities and how it affects their teaching of evolution in Grade 12 life sciences. In addition, it endeavoured to evaluate the extent to which teaching evolution is an emotional practice. Day and Kington (2008) describe identity as the way in which we make sense of ourselves to our personal selves. In this study specifically, personal identity refers to that make-up of a teacher that is located outside school and is associated with family and social contexts. Day and Kington (2008) further elaborate that professional identity embraces the policy expectations of what a worthy teacher is and the educational aspirations that they embrace. Similarly, Lasky (2005, p. 901) concurs that teacher professional identity is "how teachers define themselves to themselves and to others". Hargreaves (2000) emphasises the emotional dimension in educational platforms. He contends that teaching is not just a practical business but is linked to teachers' personal lives, and that teachers merge their sense of personal and professional identities. Furthermore, Zembylas (2003, p. 213) asserts that: "issues of emotion and teacher identity inform each other and construct interpretations of each other both on a conceptual and personal level". I consequently linked the concepts of 'teacher identity' and 'emotions' together, in what I termed 'evolutionary partners', because of the common, complementary and deep-seated relationship that they shared. I have commenced each chapter with a simple graphic illustration that poignantly depicts the complexity of evolution as organisms adapt to their environment in varied ways. I am in no way advocating the theory of evolution, but merely using this illustration to give the reader a sense of the background to the teaching and learning about evolution.

This introductory chapter provides a summary of this study: the purpose, rationale, background and the key research questions that guided this study. A brief synopsis of the literature review and the conceptual frameworks of Day and Gu's (2007): *Dimensions of teacher identity* and Hargreaves (2000) *Emotions of Teaching and Educational Change* that was adopted to facilitate this study is highlighted. Next, the methodological approach wherein a qualitative study, with an interpretative paradigm and a narrative research method is discussed, together with sampling procedures, data collection methods and ethical considerations that were adhered to. The chapter draws to a close with an overview of the thesis.

1.2 Purpose

The resolve of this research study was to explore how teachers' personal and professional identities influenced their teaching of evolution in Grade 12 Life sciences. This study also aimed to examine the degree to which teaching evolution in Grade 12 life sciences was an emotional practice.

1.3 Background information

Over the past eighteen years, the Department of Education (DoE) has implemented significant changes in the life sciences curriculum. A contemporary change in 2008 included the study of evolution in life sciences, both *Human Evolution* and *Natural Selection* in the curriculum at Grade 12 level (Mpeta, 2013). *Human Evolution* and *Natural Selection* accounts for forty-four percent of the weighting in the Grade 12 life sciences paper 2, that is, sixty-six marks out of a total of one hundred and fifty. The Department of Education's National Curriculum Statement (2011) envisioned a life sciences teacher to effectively deal with controversial issues such as natural selection and biological evidence for evolution. Josef de Beer (2016) from the Department of Science and Technology Education at the University of Johannesburg in South Africa asserts that teachers are expected to teach the content of evolution as well as to assist learners in resolving any religious or other challenges that they have. On the other divide of the classroom dynamic, Mpeta (2013, p.2) deliberates that according to Learning Outcome 2 of the NCS, learners in Grade 12 are required to "access, interpret, construct and use life sciences concepts to explain phenomena relevant to: origin of species, evolution theories, mutation, natural selection, macro-evolution and speciation". Mpeta (2013) therefore argues that in order for both teachers and learners to substantially comprehend the theory of evolution,

it is likely that they would source their own world views and belief systems. This research study therefore focused on the teaching of evolution in Grade 12 life sciences and specifically, how teachers' identities and their emotions influenced the teaching of this topic.

This study aimed to explore gaps evident in recent literature about teacher identities in the teaching of evolution in Grade 12 life sciences and the extent to which teaching evolution is an emotional practice. This study attempted to establish whether the teaching of evolution is purely empirical and 'fact-based' or did the identities and emotions of teachers influence their delivery of evolution content in the classroom, and if so, how did the teaching of evolution relate to the required learning outcomes in Grade 12 life sciences. In light of the fact that the theory of evolution is now firmly entrenched in the South African schooling system, it is crucial to understand how teaching and learning is implemented. According to Mpeta (2013), it is very important to evaluate the extent to which teachers can help learners to understand evolution and furthermore, to determine the value of evolution education in South Africa.

1.4 Rationale

Dempster and Hugo (2006) maintain that evolution is discussed primarily according to the National Senior Certificate requirements and challenges in terms of curriculum implementation, student difficulty in understanding scientific concepts, especially to second-language learners and the inadequacy of teacher training in teaching evolution. Furthermore, they question whether the recommended forty hours of teaching time is purely empirical or enquiry driven, and whether there is room for teachers to draw on their identities in their teaching of evolution. Similarly, Evans (2005) highlights that biological evolution is studied mainly using empirical standards, logical arguments and explanation. In addition, Alters and Nelson (2002) assert that most teachers and researchers do not fully understand the public's view of evolution. They point out that it is not just evolutionary concepts that students do not retain, but a misunderstanding of the evolutionary concepts being taught. Alters and Nelson (2002) contend that this stems from a lack of attention to teaching methods in life sciences. Furthermore, they suggest that teachers do not pay much attention to the effectiveness of their teaching which could lead to the decline in the teaching of evolution. This suggests that the focus of research on teaching evolution is on content and empiricism, whilst there is a dearth of research on the role of the teacher as a person with multiple identities and a range of emotions. I therefore had the following concerns: do all teachers teach evolution in the same

manner, given the prescribed content as outlined in the NSC curriculum, or do the identities and emotions of teachers play an important role in their teaching of evolution in the Grade 12 life sciences classroom? Is the quality of evolution education implemented in South Africa of an acceptable standard or is it thwarted by underlying factors including South Africa's historical background, gender, race, the discrepancies between public and private schools and social factors – all of which would inevitably shape a teacher's personal and professional identity (Day and Gu, 2002) and the emotions that filter from within them. Therein lies the motivation of this research study.

Evolution contributes a significant percentage (44%) of Grade 12 life sciences paper 2, and it is therefore important that all life sciences teachers comprehensively teach the key concepts of evolution in preparation for the examination. As a life sciences teacher currently teaching Grade 12 evolution, at the time of this study, this core requirement has proven to be a definite challenge not only in terms of content and implementation, but also in terms of my personal and professional identity and the resultant varying emotions that have emerged in the classroom. Are life sciences teachers adequately equipped to teach evolution at Grade 12 level and is sufficient training and support provided to teachers to meet the challenges posed? I have grappled with these dilemmas for many years, and was therefore motivated to conduct this research study, to better understand how teachers' identities and their emotions influence the teaching of evolution at Grade 12. I believe that this study is important to contribute to knowledge about the effective teaching of evolution, not only as a working platform for life sciences teachers, but also to subject advisors and departmental heads in enhancing the understanding that is pivotal to scientific concepts, critical thinking skills and the ultimate rationale of including evolution in the Grade 12 life sciences syllabus.

1.5 Key Research Questions

This research study strove to address the following research questions:

1. How do teachers' personal and professional identities influence their teaching of evolution in Grade 12 life sciences?

2. To what extent is teaching evolution in Grade 12 life sciences an emotional practice?

1.6 Brief outline of key concepts and conceptual framework

The following key concepts were relevant in this study:

Life sciences as a subject, according to Ayerst, Langley, Majozi, Metherell and Smith (2013, p.1) refers to the "systematic study of life in the changing natural and man-made environment". The **life sciences curriculum** is divided into four main strands in Grade 12, namely, *life at molecular, cellular and tissue level; life processes in plants and animals; environmental studies; and diversity, change and continuity* (NCS, 2012). The study of evolution is included in the strand: diversity, change and continuity. The study of evolution includes the following topics: *origin of ideas about the origins of the species; artificial and natural selection; formation of new species; evolution in present times; evidence of common ancestors of living hominids, including humans; The Out of Africa hypothesis; fossil, genetic and cultural evidence for evolution and alternative views to evolution* (Ayerst et al, 2013).

Biological evolution, according to de Fontaine et al (2013, p.265) is a process by which "populations change over time and many generations, to remain adapted to changes in their environment". There are various categories of evidence to establish evolution such as biogeography, fossil records, descent with modification, and genetic evidence (de Fontaine et al, 2013). In addition, Tidon and Lewontin (2004) states that evolutionary biology involves many disciplines of biology and overlaps with knowledge areas such as sociology and mathematics. It has evoked many questions and explanations related to the origin and evolution of species on earth.

Day and Kington (2008) describe identity as the way in which we analyse ourselves to our personal selves. This also includes the image of ourselves that we portray to others. **Teacher identities** are considered by Day and Gu (2007) on 3 levels: the *professional, situated* and *personal dimensions*. The professional dimension encapsulates the social and policy expectations of what a good teacher is (Day and Gu, 2007). The situated dimension is located within the school and includes the occurrences in a classroom, department or local conditions of a school. The personal dimension refers to life positioned external to school and is connected to family responsibilities and community affiliations.

Hoschild (1983, cited by Yin and Lee, 2012, p. 58) defines emotion as "an awareness of four elements usually experienced at the same time: appraisal of a situation, changes in bodily sensations, the free or inhibited display of expressive gestures and a cultural aspect". In keeping with this study, Hargreaves (1998, p.330) describes **teacher emotions** as "deeply intertwined with the purposes of teaching, the political dynamics of educational policy and school life, the relationships that make up teaching, and the senses of self which teachers invest in their work".

This research study adopted the conceptual frameworks of Day and Gu's (2007) *professional, situated and personal dimensions of teacher identity* and Hargreaves's (2000) *emotions of teaching and educational change: emotional intelligence, emotional labour, emotional understanding and emotional geographies*. Day and Gu (2007) postulate that teacher identities fluctuate according to how they manage their identities at different stages in their career. Their framework, together with the six professional life phases of a teacher (Day and Gu, 2007) framed the enquiry of the first research question: How do teachers' personal and professional identities influence their teaching of evolution? Hargreaves (2000) draws on concepts of emotions to highlight the neglect of the emotional aspect in education. He contends that teachers come into the classroom from different backgrounds with their own world views, and this shapes the teaching-learning process. His framework was therefore exemplary in evaluating my second research question: To what extent is teaching evolution an emotional practice?

1.7 Methodological approach

I adopted a qualitative research design within the interpretive paradigm and a narrative framework for this study. Creswell and Creswell (2014) states that in qualitative research, researchers use various forms of literature to validate the viewpoints of their participants. It was suitable for this study since it explored identities and emotions of Grade 12 life sciences teachers. It allowed for the exploration of the views and challenges that teachers faced teaching evolution and how they managed their lives on a personal, professional and situated dimensions. The teaching of evolution was examined through the eyes of the participants: their personal views on evolution, the suitability of including evolution in the life sciences curriculum, their religious orientations and how it impacted their teaching, and the challenges faced in the classroom with different learners' perspectives on the theory of evolution. Cohen, Manion and Morrison (2018) assert that the interpretive paradigm is characterised by the study

of the individual and their interpretations of the world around them. In addition, a narrative research approach was used wherein the researcher studies the lives of individuals who provide stories about their experiences (Reissman, 2008). Purposive sampling of six teachers from the uMgungundlovu district in Pietermaritzburg, with the following criteria were invited to participate to make this a meaningful study: a Grade 12 life sciences teacher that taught evolution, must have taught life sciences for a minimum of five years and displayed expertise in the field of knowing the science. The data collection methods used were semi-structured interviews which allowed for probing and clarifications; collages to visually express the identities and emotions of participants; and reflective journals which outlined the lesson topic, outcomes, teaching strategies, activities in the classroom, as well as teacher reflections. After data was collected, it was analysed, interpreted and coded using an interpretive paradigm and thematic analysis. Quotes of participants were selected and presented verbatim to succinctly capture the views of participants. Ethical considerations such as anonymity, informed consent, confidentiality sensitivity and were important to abide with the ethical requirements. Furthermore, rigour and trustworthiness was ensured by using a variety of data collection methods, and there was a high level of honesty between myself and each participant with regards to information that was conveyed.

1.8 Overview of the dissertation

This research study which explored *teacher identities and emotions in the teaching of evolution in grade 12 life sciences* is presented in five chapters. Chapter 1 outlines the focus and purpose of this study, the rationale and background information. It introduces the key research questions and provides an overview of the key concepts and conceptual frameworks. The research methodology is addressed and thereafter the analysis of data. The chapter concludes with an overview of the structure of this thesis.

Chapter 2 provides a detailed description of the literature reviewed in this thesis. It engages the views and arguments of various authors on life sciences and evolution. It commences with an outline of being a life sciences teacher; evolution education in South Africa; the life sciences curriculum and the challenges of teaching the subject; in particular, the teaching of evolution. The conceptual framework of Day and Gu's (2007) *personal, professional and situated dimensions on teacher identity* are elaborated to understand the identities of teachers and how this influenced their teaching of evolution. In addition, Hargreaves' (2000) *emotions of*

teaching and educational change, with the notion of emotional geographies was highlighted to explore the emotional aspects of teaching evolution.

Chapter 3 outlines the study's methodological approach. It justifies the qualitative research approach that is underpinned by the interpretive paradigm and a narrative research design. It also substantiates the use of semi-structured interviews, collages and personal reflections/reflective journals as methods used to generate data. Ethical considerations, rigour and trustworthiness are also addressed.

Chapter 4 showcases the data, provides an analysis of data and discusses pertinent findings. It commences with an outline of the profiles of participants and uses quotes of participants to support the themes that were identified. The process of coding, thematic analysis and inductive analysis was employed and the conceptual frameworks of Day and Gu (2007) and Hargreaves (2000), together with relevant literature was used to interpret and make meaning of the data and to address the key research questions in this thesis. This chapter also addresses the support provided to life sciences teachers from the Department of Education together with recommendations to enhance the teaching of evolution in Grade 12.

Chapter 5 summarises the key findings and significance of this study on *teacher identities and their emotions when teaching evolution.* It highlights the intricate link between teacher identities and teaching evolution; and that teaching evolution is an emotional practice. In addition, I combined the two pivotal research questions to validate that teacher identities and their emotions are "evolutionary partners". Thereafter recommendations for further research that became evident during this study are proposed. The chapter ends with the strengths and weaknesses of this study as well as recommendations for future study.

1.9 Conclusion

This chapter outlined the purpose, rationale and background of this research study. It placed in perspective the research questions, key concepts, conceptual frameworks and methodological approach that were used. The chapter concludes with an overview of the five chapters that bind this thesis together.

The next chapter provides an in depth description and analysis of the literature and conceptual frameworks used in this study.

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Great literature should do some good to the reader: must quicken his perception though dull, and sharpen his discrimination though blunt, and mellow the rawness of his personal opinions. *H. E. Housman*

2.1 Introduction

This chapter commences by discussing the life sciences curriculum as outlined by the Department of Education's (DoE) Curriculum assessment policy and the National Assessment Policy Document (2003, 2012). This is followed by an outline of the biological evolution content to be taught by Grade 12 life sciences teachers to learners. Next, is a discussion of teacher identities pertaining to their personal and professional identities. Teacher emotions, with an emphasis on the *intra-personal, inter-personal and socio-political* contexts are also discussed in analysing the teaching of evolution in life sciences. The chapter ends with the discussion of the conceptual framework adopted for this study, which draws on Day and Gu's (2007) *personal, professional and situated dimensions of teacher identity* and Hargreaves' (2000) *emotions of teaching and educational change.*

2.2. Curriculum reform in the South African education context

The history of South Africa has had a profound bearing on the lives of its people – what they believe in and their views about life (Mpeta, 2013). In 1996, the Constitution of South Africa became the supreme law of the country. It stipulated that everyone has a right to basic education; is equal before the law; and that everyone has the right to freedom of conscience, religion, belief, thought and opinion. The Centre for Development and Enterprise (CDE) workshop that was held in 2011 highlights that "the South African education system is large

and complex. It is very diverse, with huge differences within provinces, districts and schools" (CDE, 2011, p.2). Similarly, Preethlal (2015) points out that the new government of South Africa experienced many challenges in education after the first democratic elections in 1994. Some of these challenges included nineteen racially and ethnically divided departments of education with under-qualified teachers. These circumstances would have a bearing on the quality of education being imparted; in this context the teaching of evolution in Grade 12 life sciences.

2.3 Evolution Education in South Africa

'Life sciences' was the new name that replaced the traditional subject 'biology'. Evolution education is one of the major topics that has been recently introduced into the life sciences curriculum in 2008 (Mpeta, 2013). Fikeni (2014) asserts that evolution was previously omitted from the curriculum because it was not in line with the principles of Christian National Education (CNE). The National Curriculum Statement of life sciences for Grade 12 introduced the knowledge strand diversity, change and continuity' which included topics such as the *origin of species, evolution theories, biological evidence for evolution and macro- and micro-evolution* (NCS, 2012). Mpeta (2013) contends that the inclusion of evolution in life sciences is important to enhance the value of the role of life sciences as a substantial scientific subject. Similarly, Dempster, Coleman and Stears (2015) supports the notion that evolution can be recognised as a scientific theory because there is a vast accumulation of evidence to support it. Mpeta (2013), however, argues that many life sciences teachers were not likely to have studied evolution in their own learning in secondary schools, whilst Dempster et al. (2015) cautions that scientific knowledge fluctuates as new evidence is assimilated.

Of significance to evolution education in South Africa, are the views of the previous Minister of Education, Naledi Pandor (2004), who stated "scientific ideas are shaped by the social and economic structures of their time" (Merriam, 2009, p.62). The Minister expressed reservations about the "proposed focus on Darwinian evolution, adding that evolution has been used to give support to repugnant racial theories and racial movements" (Merriam, 2009, p.63). She however, advocated that it was time to look at evolution in a different light – one that unites other biological concepts and contributes to scientific literacy.

There is much debate as to whether evolution should be included in the life sciences curriculum or not. Berkeley (2018) argues that studying evolution at school is essential to our curriculum and to scientific literacy. To acquire an overall understanding of biology, students need to understand life on earth in terms of its history, its future and the changing life forms and ecosystems that have arisen and changed over billions of years, as well as the mechanisms that have brought about those changes. Fikeni (2014) highlights that the main pillars of the theory of evolution are: firstly, evidence that natural selection can produce evolutionary change and secondly, evidence from fossil records that evolution has occurred. She further adds that information from various areas of biology such as embryology, anatomy, molecular biology and biogeography is regarded as an outcome of evolution, which is information that supports the Darwinian theory of evolution.

Further to this, recent advancements in the field of molecular biology having analysed the genomes of numerous species, including *Homo sapiens*, indicate that the theory of evolution holds much stability (Mpeta, 2013). This leads to the notion that teaching evolution would augment the understanding and appreciation of science (Mpeta, 2013; Berkeley, 2018). South Africa has been in the world stage for important evolutionary discoveries such as the hominid *Australopithecus africanus* discovered by Raymond Dart in 1924; "Little foot" – the oldest Southern African hominid fossil, discovered by Ronald Clarke and Philip Tobias in 1994; the transitional fossil *Australopithecus sediba* by Professor Lee Berger in 2008, and more recently *Homo naledi* discovered at the Cradle of Humankind in 2013, also by Professor Lee Berger, together with his son Mathew. South Africa is certainly advantaged with a wealth of fossil evidence at the World Heritage Site in the Cradle of Humankind, Maropeng, Gauteng. This site yields crucial evidence that would provide a rich resource for learners to experience first-hand, thus widening their view and understanding of evolution (Mpeta, 2013; Dempster et al., 2015).

It is valuable to note that Reiss (2009) supports the idea of including religion in science education with the intention that it is 'respectful' to learners. He suggests evolution as an example of a topic that would afford secondary school learners freewill to exercise their freedom of thought. Reiss (2009) describes religion as 'encompassing elements' such as prayer, worship, preaching and meditation. On the other hand, Beyers (2010, p.342) describes religion as a human's way of representing reality and as the "continual participation in traditions passed

from one generation to the next". Mpeta (2013), however, argues that teachers and learners are likely to draw on their own belief systems, especially if what they affiliate to, is in opposition to the theory of evolution.

2.4 Life Sciences Curriculum in South Africa

According to Ayerst, Langley, Majozi, Metherell and Smith (2013, p.1):

> "Life sciences is the systematic study of life in the changing natural and man-made environment. It involves critical inquiry, reflection, and the understanding of concepts and processes and their application in society. Life sciences enable learners to develop inquiry, problem-solving and critical-thinking skills, to apply scientific knowledge, to explain the nature of science and to acknowledge the influence of ethics and bias in science, technology, indigenous knowledge, the environment and society."

Furthermore, the DoE (2003a, p.9), cited by Mpeta (2013), provides some expectations concerning the teaching and learning of life sciences:

> The study of life sciences enables learners to explore concepts that are essential for understanding basic life processes and the interrelationship and interdependence of components of the living and physical world".

In South Africa, life sciences education is clearly stated in a policy framework referred to as the *National Curriculum Statement (NCS)* for life sciences in Grades 10 - 12. The *NCS* emphasises inquiry teaching and learning to ensure that scientific content is not the only focus of science teaching but also methods and processes for authentic, open-ended inquiry (Preethlall, 2015). The life sciences curriculum is divided into four main strands or themes in Grade 12 as follows: Strand 1 encompasses *life at molecular, cellular and tissue level*; Strand 2, *life processes in plants and animals*; Strand 3, *environmental studies* (which is covered and also tested in Grade 11) and Strand 4 which embraces *diversity, change and continuity*. Mpeta (2013) highlights that one of the latest developments in the curriculum of South African secondary schools has been the addition of evolution to the life sciences content which has been examinable from 2008. This is highlighted in Table 2.1 and Table 2.2 below, which has

been adapted from the *National Curriculum Statement* (NCS), *Curriculum and Assessment Policy Statement, Further Education and Training Phase* :*Grades 10 -12* (2011, p.66,68).

Time	**Topic**	**Content**	**Investigation**	**Resources**
2 weeks (8 hours)	Evolution by Natural Selection	Origin of Ideas about origins: Different kinds of evidence: fossil records, modification by descent, biogeography and genetics. Overview of history of different theories of development: Lamarckism, Darwinism and Punctuated Equilibrium.	Class debate and discussion.	Opinion of learners, newspaper articles.
		Darwin's Theory of evolution by Natural Selection: Evolution through natural selection depends on variation/ gene pool of inherited characteristics and production of more offspring than is required. Changes in the environment and pressure leads to extinction or successful adaptation.	Demonstrate Natural Selection through games e g. Camouflage	Reference books, Biography of Darwin.

Table 2.1: Overview of teaching Natural Selection adapted from the National Curriculum Statement: Curriculum and Assessment Policy Statement Grades 10-12, (2012, p. 66).

Time	Topic	Sub-Topic	Activity	Resources
1/2 week (2 hours)	Human Evolution	Evidence of common ancestors for living hominids including humans	Poster presentation	
		Anatomical differences and similarities between African apes and humans: • Fossil evidence: Key features e.g. Bipedalism, teeth, palate size, cranial and brow ridges, brain size, prognathism. • Genetic evidence: mitochondrial DNA • Cultural evidence : tool making	Map out three major phases in hominid evolution from 6 mya up to the present: •"Ardipithecus" (Ethiopia) • "Australopithecus" (East and South Africa) • "Homo" species (various sites) The map/timeline should show the diagnostic features, and approximate times that examples of the three major genera existed	• Textbooks • Newspaper articles • DVD's • Maps, photographs and pictures

Table 2.2: Section of Human Evolution syllabus adapted from the National Curriculum Statement: Curriculum and Assessment Policy Statement Grades 10-12, p. 68.

Majozi (2018) contends that the life sciences curriculum is underpinned by three specific aims. Specific aim 1 is about *knowing science*, the subject content and how to explore, synthesise and communicate knowledge. It involves understanding and making meaning of scientific ideas, and then connecting these ideas. Furthermore, Johannes and Weisswange (2018) claim that theory is not just recalling information; it is being able to select important ideas, use a variety of sources to learn, and to describe concepts, theories and processes that are important to life sciences. The second specific aim is of a practical nature that is *doing investigations* which include interpreting and manipulating data. Specific aim 3 provides for *applications of life sciences in everyday life*, of understanding the history of scientific discoveries and the relationship between other cultures, indigenous knowledge and science (Johannes & Weisswange, 2018). Mpeta (2013, p.3) highlights learning outcome 3 by citing the DoE (2003a, p.13): "it raises learners' awareness of the existence of different viewpoints in a multicultural society, and encourages open-mindedness towards all viewpoints". In addition, learners are expected to demonstrate an understanding of adaptation and survival as well as creation and evolution. This provides learners with an opportunity to explore different views and to "emerge as citizens who are scientifically literate and who can contribute meaningfully to the socio-economic and technological developments". She argues that this is necessary in order to provide sustainable growth for a country, as well as to participate meaningfully in global contexts.

Dekkers & Mnisi (2003, cited in Fikeni 2014) asserts that the previous South African curriculum focused on 'learning of the product of science', rather than the process. She argues that science was taught as a body of knowledge with few arguments, little questioning and minmal critical thinking. However, the new curriculum's outcomes emphasise the teaching of both science as a product and science as a process. She concurs that the new curriculum for science is aimed to prepare learners to be critical thinkers and scientifically literate. In addition, life sciences not only equips learners to evaluate and apply scientific processes, but also to understand how biotechnology and life sciences are beneficial to mankind (Johannes & Weisswange, 2018). This view is supported by Mpeta (2013) and Preethlall (2015).

2.5 Being a Life Sciences Teacher

The NCS (DoE, 2000) defines seven roles that a teacher must be able to perform, and describes in detail the knowledge, skills and values that are necessary to perform these roles successfully.

According to Parker (cited in Govender, 2009, p.48) the seven roles are "learning mediator; interpreter and designer of learning programmes; leader, administrator and manager; assessor; scholar, researcher and lifelong learner; a pastoral role and a learning area specialist". In addition, Anderson (cited in Preethlall, 2015, p.67) argues that a teachers' role must change from a "dispenser of knowledge to one who acts as a coach and facilitator". The role of a life sciences teacher must be to help learners to process information instead of merely providing notes on a topic; to facilitate learners' thinking of concepts and how they fit into a wider whole; and to encourage the use of a variety of learning resources instead of the conventional textbook. This is essential to equip learners to read and write for understanding; to solve and explain complex problems; and to develop critical and creative thinkers (Fikeni, 2014; Mpeta, 2013; Preethlall, 2015).

A teacher's knowledge and belief system plays a pivotal role in classroom interaction and this in turn would influence the teaching and learning that takes place. It is clear that, what teachers acknowledge and believe have a major impact on their preparation, planning, decision-making,, and eventual execution of their tasks in a classroom (Mpeta, 2013; Preethlall, 2015; Zembylas, 2005a). In addition, Preethlall (2015) contends that a teachers' personal practical knowledge is important because firstly it provides teachers with a sense of personal control and confidence in them, and secondly, it ensures a sense of social location as a teacher, that is, being recognised as a teacher. This viewpoint directly orientates this study which seeks to explore how the identities of life sciences teachers influence their teaching of evolution in Grade 12 life sciences.

2.6 Challenges of teaching life sciences

Kunene (2009, p.141) contends that teachers should promote "reasoning and critical thinking, problem-solving, assimilation of knowledge and reflecting on experience." Similarly, Molefe, Stears and Hobden (2016) assert that the South African Department of Basic Education (DBE) places considerable weighting on the development of science process skills in science subjects. This requires life sciences teachers to not only teach theory and concepts, but in addition, to develop critical thinking and problem-solving skills in practical aspects of life sciences. This is definitely the case with the teaching of evolution. However, teachers need to be adequately resourced pedagogically, and draw on their personal and professional identities to develop problem solving and analytical skills in learners. Furthermore, Woods and Scharmaan (cited in

Fikeni, 2014) advocate that teachers must realise that teaching and learning cannot only be influenced by scientific views, but also the culture and religion of the learners under their influence.

2.7 Challenges of teaching evolution

According to Fikeni (2014), a fundamental opposition to Darwinian evolution occurred centuries ago when critics who perceived science as an inductive process and condemned Darwin for violating scientific methodology. They argued that evolution is just a hypothesis and that there is no laboratory proof to demonstrate the existence of random variation (Fikeni, 2014). This challenge to evolution was further exacerbated by Darwin's second book 'The Descent of Man' which included human evolution. People found it very difficult to believe that humans' evolved from an ancestor, more so one that resembled an ape.

Clitheroe et al. (2010) assert that many scientific papers have been published after Darwin's *The Origin of Species by Natural Selection* was reviewed, in support of the theory of evolution by natural selection. In order to teach evolution successfully, teachers need to have a conceptual understanding of the topic and adopt effective curricular teaching strategies. Berkeley (2018) contends that teachers who develop a depth of knowledge beyond what is actually expected of students will be able to confidently adjust their teaching in response to students' needs and inquiries. Furthermore, Fikeni (2014) states that teaching a concept like evolution with adequate depth requires not only the understanding of scientific literacy, but challenges deeply held belief systems of a religious and cultural nature. Teachers, therefore play a pivotal role in bridging the gap between scientists' understanding of evolution and learners resistance to it. In contrast, Holtman (2010) claims that the controversy around teaching the theory of evolution is teachers' lack of exposure to evolution, especially here in South Africa where there is limited knowledge of the theory amongst teachers in spite of the wealth of fossils available at the Cradle of Humankind (Mpeta, 2013). Holtman (2010) further highlights that data from surveys of teachers in some provinces lack teacher content knowledge, especially in evolution. It seems that most teacher colleges had minimal training in the concept of evolution, and yet teachers are expected to interpret and teach the curriculum efficiently.

Nelson (2008) argues that public resistance to accepting evolution has become stronger although the evidence supporting evolution has become more empirical and available.

Evidence supporting evolution can be derived not only from fossil records, but also from comparative anatomy, modification by descent, and genetics. Nelson (2008) further claims that evolution and in general, biology can be taught more effectively by utilising critical reasoning, effective strategies and dealing with misconceptions. Stears (2011) concurs that although evolution is well-supported in the scientific community, it is highly controversial within the general public and has evoked many debates with regard to being taught in schools. Furthermore, Sanders and Ngxolo (2009) contend that the lack of understanding of policy, curriculum and subject content knowledge by many South African teachers makes teaching evolution very challenging as they cannot implement what they are not familiar with. In addition, to teach the theory of evolution in the classroom, teachers require distinctive teaching approaches for dealing with potential controversy, and also to encourage open-mindedness and tolerance of other viewpoints (Sanders and Ngxolo, 2009).

De Beer (2016) asserts that the National Curriculum Statement (NCS) and the revised Curriculum and Assessment Policy Statement (CAPS) for life sciences presume that a life sciences teacher is inherently equipped to teach concepts such as Darwinism and natural selection, micro and macro-evolution, as well as human evolution. In addition, CAPS (2014, p.12) states that life sciences helps learners to understand the relationship between "social justice and societal development and the consequences of decisions that involve ethical issues". This denotes that teachers were expected to deal with controversial issues in the classroom, and to assist learners in resolving any ethical issues or objections to the content that was being taught. He further states that teachers had mixed reactions towards teaching evolution – some embraced this new theme, but many teachers were opposed to teaching evolution. De Beer (2016) elaborates that this was the case because many could not reconcile their religious faith with their teaching. He argues that although they taught the facts of evolution, they discredited evolution as a theory. In his investigation to explore the challenges in teaching evolution in the life sciences classroom, he posed a question about the value of teaching evolution to a teacher participant, and received the following response: "In conflict with my beliefs. I have no passion to teach it. It is unnecessary to teach [it] at school level, as it confuses learners with their religious beliefs" (p.72). De Beer (2016) adds that a further challenge to teaching evolution is that many teachers are not well trained to teach the topic as they do not have a well-developed pedagogical content knowledge (PCK) to do justice to teaching evolution. Another challenge

that he encountered was that South Africa is a young democracy and many older teachers still carried the scars of the apartheid regime. This filtered through in their teaching of evolution.

Barnes (2014) claims that one of the biggest challenges that teachers face in teaching evolution is that their religious beliefs were not compatible with the ideology of evolution. She further asserts that teaching evolution has been a challenge at the faculty where she teaches at the University of Arizona, in both K-12 and post-secondary education. She suggests that many of these challenges arise from pre-conceived conflicts not only between religion and evolution, but also the purpose and functionality of evolution being part of the classroom curriculum. Likewise, Pillay (2011, p.2) cites Miller, Scott & Okamuto who argue that the discernment of people, is that evolution is confused with atheism, whereby the topic challenges the religious views of learners. In addition, Clement (cited in Dempster et al., 2015) argues that many teachers in other African countries, Asia and in the United States of America also experienced problems with the teaching of evolution. Dempster et al (2015, p.1) elaborates that these problems included a lack of conceptual understanding and therefore the inability to effectively teach the topic. In addition, the teaching of evolution contradicts their religious beliefs and this posed a huge problem in accepting evolution as the "main organising principle in biology".

According to a census conducted in South Africa in 2001 by *Statistics South Africa*, there are many religions practised in South Africa including Christianity, Hinduism, Islam, Traditional African religion, Judaism and Buddhism (Fikeni, 2014), therefore it is fitting that South Africa is called a 'rainbow nation' because of its variety of people, religions and cultures. Dempster and Hugo (2006) point out that teachers themselves must face their own conflict between their personal beliefs or worldviews and evolution and this becomes a challenge in guiding the development of learners' scientific viewpoints without compromising their values, cultural and religious beliefs. Therefore, I was interested to explore whether this great diversity posed a challenge to teaching Grade 12 evolution.

Wadsworth (2015) undertook a qualitative study which examined how teachers' religious beliefs affected the choices they made in the classroom. She argued that every belief that a person has, shapes the choices that they made, and questions why this should not be true for religious beliefs as well. In her interviews with teachers at both private and public schools, she used the same list of questions for all of them. She concluded that Christian and Jewish teachers

were heavily influenced by their religious beliefs, while atheist teachers were not as influenced and kept religion out of the classroom as much as possible. Wadsworth (2015) contends that teachers have a strong influence on the learners that they teach and must, therefore be aware of the choices they make and their actions and words, as this greatly impacts the learners that they teach. This elucidates a subsidiary question for this research study: are life sciences teachers adequately trained and equipped to confidently teach all aspects of the curriculum related to evolution?

A study by Mpeta, Villiers and Fraser (2016) conducted in the Limpopo province of South Africa, showed that although one of the big hindrances affecting evolution education was the lack of approval of the theory, there was a second-rate acceptance of evolution by learners. They contend that religious beliefs, the time that they first heard of evolution and the age of the learner affected learners' attitudes towards learning evolution. These attitudes made it more challenging to life sciences teachers, with their own identities and emotional perspectives to effectively engage with the concepts that they are expected to teach to learners. In addition, Mpeta (2013) argues that each learner comes into a classroom with their own ideologies, viewpoints and philosophies. Their study highlighted, in secondary schools in the Vhembe District, Limpopo Province, that although some learners experienced conflict between their religious beliefs and evolution, they were still willing to learn about it. This raises the question whether this willingness to learn about evolution was to produce noteworthy academic results or was there a genuine interest in discovering more about humankind's history from a scientific perspective? This definitely poses a challenge to me in the classroom, as I constantly urge learners to not just superficially learn for the sake of passing the Grade 12 life sciences examination, but to understand the content in life sciences, so that it can be practically relevant and meaningful in their daily lives.

All of the above challenges to teaching evolution would largely impact the identities and emotions that teachers express in their own teaching of evolution in the classroom. It can be deduced from theoretical literature, that teaching and learning would be affected by the opposition to teaching a controversial topic such as evolution.

2.8 Teacher Identities

This study explored teacher identities in relation to their personal lives, professional stance and the situated context of a teacher in a classroom, to gain a richer understanding of how the identities of life sciences teachers affect their teaching. Day and Kington (2008) describe identity as the way in which we make sense of ourselves to our personal selves. They assert that identity also embraces the image of ourselves that we present to others. Similarly, Lasky (2005, p.901) contends that teacher professional identity is "how teachers define themselves to themselves and to others". According to Day and Kington (2008), personal identity is located outside school and is attached to family and social roles. This dimension involves being a parent, child or partner, and often these roles become a source of tension and an individual can find themselves with an unstable identity. They further explain that professional identity embraces the policy expectations of what an ideal teacher is and the educational aspirations of the teacher. Factors such as national policy, workload, continued professional development (CPD), as well as responsibilities of a teacher affects this dimension. Situated or socially located identity, Day and Kington (2008) assert, occurs within a school context, department or classroom. This is affected by on-site conditions such as leadership in the school, learner behaviour and the level of disadvantage of learners.

On the other hand, Cardwell (2000, cited in Govender, 2009, p.129) asserts that "identity is a multifarious concept" which encapsulates "a person's sense of self; an idea of one's self as a unique being that is developed out of various roles". Govender (2009, p.58) further asserts that personal identities are "self-designations and self-attributions" that come into play during their everyday interactions with different stakeholders. In addition, Jansen (2001, cited in Govender, 2009, p.242) defines teacher identities as their "sense of self as well as their knowledge and beliefs, dispositions, interests, and orientation towards work and change". The identity of a teacher encompasses the way they feel about themselves professionally, politically and emotionally in their school and home environment. This includes their formal qualifications, levels of training and subject content competence. Govender (2009) points out those teachers' personal formations of reality, based on their values provide a deep understanding of how they constitute themselves as professionals. Overall, teacher identity research engages with the question of why some teachers are resistant to changes, for example, in teaching evolution in the life sciences curriculum.

Jansen (2001, cited in Govender, 2009, p.243) argues that teacher images after the apartheid era, failed to take into account how teachers were affected by strategies utilised during this period. After the apartheid era, the image of the teacher was that of "liberator who would be able to transform the curriculum". The patterns of teaching, learning, and assessment strategies remained the same during and after apartheid. Lasky (2005) asserts that little is understood about the ways in which teacher identities are affected by changes in curriculum. Furthermore, Carrim (cited in Govender, 2009,p.51) argues that the "shifting policy terrain of post-apartheid South Africa and its related conceptions of teacher identity capture the history of the political and pedagogical struggle of the past, as well as that of the present challenges facing teachers in schools". Likewise, Day, Elliot, and Kington (2005) contend that the political basis for teacher identity refers to the ways in which teachers comprehend and embrace their individual circumstances, values, commitments and professional interests in the backdrop of transformation.

In addition, Beauchamp and Thomas (2009) in their examination of the development of professional identities in teachers emphasised the importance of teacher education programmes, as well as the development of a strong sense of professional identity. In a similar vein, O'Connor (cited by Altay, 2014) examined secondary school teachers' professional identity in terms of their interactions with learners and discovered that caring for learners was an important aspect of a teacher's work, and consequently provided motivation to continue in the teaching profession. Furthermore, Sammons et al. (2008) found that teachers who are committed believed that they could make a positive difference in the lives of learners through who they are (the teacher's identity), what they know (a teacher's knowledge, approaches and skills) and how they teach (a teacher's beliefs, manners, personal and professional values).

It is important to note that change has an influence on how teachers' work and feel about their profession. I have however, observed a shift in how some Life sciences teachers teach and assess learners with the implementation of the new curriculum in 2014 and the introduction of evolution in the syllabus. James Wilson (2001) suggests that the ways in which teachers form their professional identities are influenced both by how they feel about themselves and their students. This resonates with Nias (1996) and Hargreaves (1994) who contend that teacher identities are formed not only from technical and emotional aspects of teaching but also from their personal lives: social, cultural and political situations on a daily basis. Similarly, Rodgers

and Scott (2008) emphasise the emotional domain of teachers by stating that identity is formed in relationships with others and involves emotions. Furthermore, Rodgers and Scott (2008) argue that identity and indeed emotions, is dependent upon numerous contexts such as historical, social, cultural and political. These findings can be extrapolated to include life sciences teachers as they teach evolution as part of their curriculum coverage. It accentuates that teacher identity encompasses emotion, identity and power, with the space for transformation and development in a teacher's life.

2.9 Teacher Emotions

The teaching of a controversial topic such as evolution requires exploring teacher's identities as well as their emotions. Yin and Lee (2012, p.58) cites Hochschild's definition of emotion as "an awareness of four elements usually experienced at the same time: appraisal of a situation, changes in bodily sensations, the free or inhibited display of expressive gestures and a cultural label applied to specific constellations of the first three elements". Similarly, Rosiek (2003, p.399) agrees that "human experience is an emotional affair. This is as true for educational experience as it is for any other aspect of our lives". Hargreaves (1998, p.330) validates emotions as "deeply intertwined with the purposes of teaching, the political dynamics of educational policy and school life, the relationships that make up teaching, and the senses of self which teachers invest in their work". Furthermore, Barbosa (2018) concurs by citing Vygostky's (2011, p. 139) stance on emotions as being "responsible for the complexity and diversification of the behaviour of man, developing as man's interaction with the environment". In addition, Dias and Arachige (2014) assert that emotions are an integral part of our lives. They argue that the most important feature that distinguishes humans from all other life forms is that humans are the most emotional species in the animal kingdom.

Biesta (cited in Keltchermans, 2017, p.8) describes education as being "a beautiful risk". Keltchermans (2017) argues that teacher development does not only entail a technical dimension, but also a moral dimension, which is embedded in a relationship of care and responsibility, and this inevitably evokes an emotional dimension. Similarly, Nias (1996) identifies the need to study teachers' emotional experiences because teaching is not just a practical routine, but is closely linked to the life of a teachers. Nias (1996) asserts that teachers invest themselves in their work and thereby their sense of personal and professional identity is related. Consequently, she adds, their teaching and their classroom become the main source for

their self-esteem and fulfilment as well as their vulnerability. Nundkoomar (2016, p.2) contends that "human experiences occur through interaction with our internal and external environment and that these can powerfully influence one's life and this includes their chosen profession - teaching is no exception to this". She asserts that schools become "emotional arenas and the classroom a site for emotions" (Nundkoomar, 2016, p.2).

Zembylas (2002, 2003) contends that if teachers want to understand their role in teaching, they cannot leave out the emotional aspect, which he argues is often neglected and down played. He advocates that emotion is more than a simple affective response to teaching. He asserts that studies on teacher emotion emphasise how emotion is inextricably linked to teachers' lives. According to Zembylas (2004), a teacher's thoughts and emotional state determines his or her behaviour and effectiveness in the classroom. This is especially the case when dealing with science teaching. He argues that teacher emotions help to shape science learning at a much deeper level. Zemyblas (2005b, p.126) further asserts that "if we want to progress in science education, we need to look more carefully at the emotions of science teachers, both negative and positive emotions, and use this knowledge to improve the working environment of science teaching". The ultimate goal is to improve teaching and student learning.

Similarly, Cele (2017) cites the relationship between a classroom environment and teacher emotions that was investigated by Becker, Keller, Goetz, Frenzel and Taxer (2015). Their findings reveal that if the interaction between learners and teachers are 'positive and pleasing', then those emotions can be used as a resource that teachers can benefit from. Becker et al. (2015) also found that learner motivation is also influenced by the character of the teacher of a class. This means that if the teacher's emotional experiences are positive, then learning and teaching becomes successful. Nias (1996) concurs that teachers who feel happy, exuberant and inspired feel that they are effective in handling the various facets of teaching. In contrast, however, those teachers who experience emotions of fear, frustration, guilt and anxiety transfer these negative feelings to the learners they teach. Cele (2017) therefore concludes that teaching is a moral act that comes with emotional responsibilities towards learners, other teachers, the school and community at large.

Day (2004) asserts that teaching is not only concerned about the transfer of knowledge and skills, but also involves enthusiasm, passion and emotions that a teacher possesses.

Furthermore, Day and Leitch (cited in Nundkoomar, 2016) suggest that there are two ways of knowledge transfer and understanding: rationally and emotionally. The rational mind is logical and analytic whilst the emotional mind is impulsive, intuitive and sometimes illogical. This invariably impacts on teaching and learning in a classroom. On the other hand, Kitching (2009, p.141) suggests that displays of emotions are developed and only partly defines the teacher as "moral/caring agent, expert and purveyor of social control or social efficiency". He argues that platforms for multiple teacher identities and emotional displays must be recognised in teacher education (Hargreaves, 2001; Zembylas, 2003). He suggests that instead of wondering whether teachers are being true to themselves when experiencing negative emotions, we can ascertain how certain realities about teaching are restricting teachers in a specific emotional place.

2.10 Zembylas' views of teacher identities and emotions

Zembylas (2007) explores three views on teacher identity and emotions: Firstly, developmental research on identity formation, secondly, a socio-cultural approach on identity formation in education and thirdly, a post-structural view of identity based on the work of theorists such as Foucault. Zembylas's (2003) framework of genealogies of emotions as well as emotional suffering and emotional freedom is also reviewed. These views and genealogies are unfolded in the ensuing paragraphs. It will assist me to analyse the key research questions of this study which examines the extent to which teaching evolution in grade 12 life sciences is an emotional practice as well as how the identity of a teacher influences the teaching of evolution.

Zembylas' first view: developmental research on identity formation has direct relevance to this study and will be elaborated further. Zembylas (2003, p.213) contends that "issues of emotions and teacher identity inform each other and construct interpretations of each other both on a conceptual and on a personal level". He suggests that greater attention be afforded to both disciplines, that is, the "complexities of teacher identity through an understanding of the situatedness of teachers' emotions". He argues that emotion is the least investigated aspect of research in teaching, yet it is important and deserving of more attention. He emphasises the significance of how teachers feel and how these feelings impact on teaching and learning, and yet little has been done to incorporate effective concerns in a systematic way in the research of teaching. Most researchers prefer to ignore the affective domain and concentrate instead on developing information processing models of the cognitive domain. Zembylas (2003) argues that perhaps this is because the emotional aspect is much more complex and difficult to describe

than cognition. I endorse Zembylas's proposal of linking both the emotional domain with the identity of a teacher to highlight, transform and empower a teacher by focusing on their strengths as an individual. Connelly and Clandinin (cited in Zembylas, 2003, p.467) describe teachers' 'personal practical knowledge' and "seek to understand how teachers come to know, feel and make sense of teaching". These principles, beliefs and emotions come into play as teachers make decisions about their reasons for teaching.

Furthermore, Zembylas (2003) points out that with regard to the changing nature of teacher identity, it fluctuates due to power relations and is therefore dependent upon power and 'agency'. The 'agency' is understood as a teacher's ability to reflect and mediate upon their own actions. This knowledge allows a teacher to understand their objectives, motives and its consequences. This resonates with Gabrys`-Barker (2010, p.25) who contends that what teachers bring into the classroom is "temporary, it fluctuates and evolves with time until it reaches a stage of relative stability". Teachers hold beliefs that vary and change as they experience new encounters. More importantly, it gives a teacher room to re-evaluate their identities and adapt or improve where necessary. Zembylas (2005b, p.468) argues that an examination of the "emotional components" of a teacher will provide a rich, meaningful understanding of a teacher's self - identity. He postulates that teacher's emotions can become zones of "resistance and self-transformation" and that an exploration of emotion can allow for self-reflection and possibly changes within the teaching-learning environment. Furthermore, he asserts that 'identity transformation' takes place when the 'emotional salience' or control of a teacher's experiences change and that 'emotions' and 'emotional knowledge' is left out when dealing with different forms of knowledge. He uses the example of *Shulman's* (1987) *seven categories of teacher knowledge*, wherein emotional knowledge has been omitted. I agree with Zembylas (2005a) that emotions in education are not given a worthy platform. Teachers have to take immense personal and professional risks in their everyday teaching-learning environment.

Zembylas (2005a) argues that identity formation involves how the social operation of power and agency influences emotions and identity and vice versa. He asserts that the emotional domain reinforces identity formation. This has strong implications in the context of teaching, in particular, the teaching of challenging and controversial topics such as human evolution, natural selection and Darwinism. Zembylas (2003, p.468) advocates that emotions that teachers

experience and express, are not just matters of personal preference but are moulded in social relationships with their families, cultures, and school situations. These relationships and views tremendously influences how and when emotions are "constructed, expressed, and communicated". Teacher identity is formed from interaction with learners, parents, and colleagues and therefore identity is linked to the acknowledgement of others. Zembylas argues that if teachers are not recognised, this may cause them to assume a depreciating sense of who they are.

Research undertaken by Zembylas (2005b, p.468) on an elementary teacher's emotions in her science teaching, indicated that her emotions were "embedded in school culture, ideology and power relations". Catherine Meyers had been teaching for twenty enthusiastic –five years and is described as an exceptional teacher who is about teaching and who makes children feel excited about learning. She placed much emphasis on the role of emotions in teaching, however, it was not considered appropriate to speak about her feelings in school. She recalled feeling frustrated and shameful as these emotions were ignored by other teachers. This gave Catherine a 'tremendous sense of disempowerment' (Zembylas, 2005b, p.468). She felt that her feelings lacked recognition and this contributed to her sense of discouragement. The way in which these feelings were internalised resulted in 'emotional suffering'. Zembylas (2005b, p.475) points out that because Catherine objected to formal testing to achieve better standardised results, the penalty was the resultant feelings of marginalisation and rejection – that is, emotional suffering. In other words, "shame, guilt and low self-esteem" were the emotional retributions of Catherine having opposing values to the typical school standards. This emotional suffering led to her isolating herself from other teachers in school due to feelings of inferiority and powerlessness.

Zembylas (2007) argues that when our feelings are ignored, negatively criticised or belittled, it leads to the dismissal of the significance and value attached to a person's life. Shame has been accentuated in many teachers' careers because teachers are constantly exposed as having weaknesses. Teachers' feelings of shame highlights that they lack certain abilities or that their role in a classroom is not valued. Zembylas (2005b, p.474) draws on the research conducted on Catherine's emotions teaching, and highlights the following points: firstly, emotional suffering was inflicted on those individuals who did not conform to the norms of teaching, and secondly, there are severe penalties that occur as a result of this deviation from typical school

procedures. These pertinent points lend itself to my second research question on whether teaching evolution is an emotional practice. I do wonder whether life sciences teachers conform to the norm of formal standardised tests to achieve better marks in an examination or are there those who deviate from the mundane who believe, like Catherine that "learning science should be intellectually inspiring, and not fixed or determined by tests?" Are there life sciences teachers who pay the penalty of 'emotional suffering' due to their innovative methods of teaching and testing evolution?

Reddy (cited in Zembylas, 2005b, p.477) contends that emotional suffering and emotional freedom are not opposite to each other, that is, emotional freedom does not mean that there is no emotional suffering. He further asserts that "emotional freedom is at the core of a teachers' capacity to act as one chooses", without being restrained by rules and norms of an institution. Zembylas (2005b, p.477) describes how Catherine challenged the rules within her school; and shared that she "felt comfortable for the first time talking about my feelings and ideas". Catherine's emotional freedom involved her forging genuine relationships with learners in her class. This provided her with 'emotional refuge', which afforded Catherine the joy of being in school. In addition, she felt a sense of satisfaction and achievement when her learners displayed enthusiasm towards their learning. This indicated to Catherine that she was making worthwhile progress in her teaching. Jansen (cited in Zembylas, 2014) contends that teachers need to be aware that a classroom is a divided environment which creates complex challenges for teachers. Teachers need to be aware of how their emotions can either bring about emotional suffering or emotional freedom in their teaching career. Emotional freedom once again lends itself to my research question on whether teaching evolution is an emotional practise. Do life sciences teachers experience a sense of satisfaction and achievement when their learners express excitement towards learning evolution?

Haviland and Kahlbaugh (cited in Zembylas, 2007) assert that emotions connect people's thoughts and judgments by providing meaning to experiences. People organise their lives, to a large extent, in terms of the emotions that they experience in everyday situations. I therefore concur that emotion is key to the formation of identity, including that of a teacher in a classroom and that a teacher's emotions are linked to matters of social and governmental interest and the principles embodied by a teacher. Barbosa (2018) agrees that recent training programmes of

teachers in understanding issues such as the influence of emotions on teaching and how teachers' professional identities are formed are necessary.

2.11 Conceptual Framework

This research study adopts a conceptual framework which draws on Day and Gu's (2007) *professional, personal and situated dimensions of teacher identity* and Hargreaves's (2000) *emotions of teaching and educational change*: notions of emotional intelligence, emotional labour, emotional understanding and emotional geographies.

2.11.1 Day and Gu's (2007) Dimensions of teacher identity

Day and Gu (2007) explain the professional, situated and personal dimensions of teacher identity. In addition, their research identified connections between commitment and effectiveness found in the six professional life phases of a teacher. It also highlighted how different challenges experienced by teachers impacts on their identities, well-being and effectiveness. This framework, together with the six professional life phases proposed by Day and Gu (2007) will be adopted to address my first research question, that is, to explore how teacher's personal and professional identities influence their teaching of evolution in Grade 12 life sciences. Figure 2.1 below is an adaptation of Day and Gu's (2007) dimensions of identity:

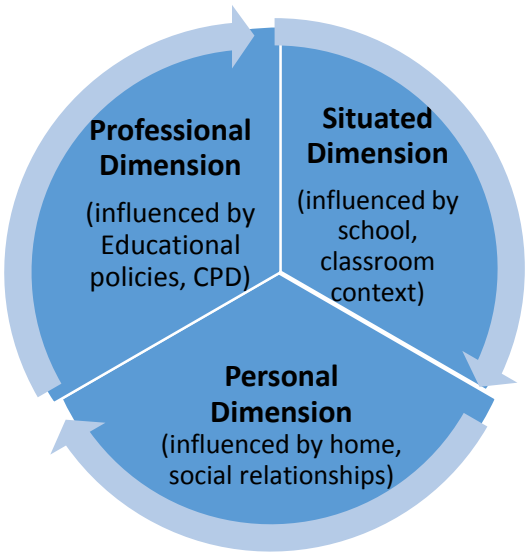

Figure 2.1: An adaptation of Day & Gu's (2007, p. 151) Dimensions of Identity

2.11.1.1 Professional dimension

Identity, defined by Day, Kington, Stobart and Sammons (2008) refers to the description and understanding that a teacher has of themself and how this identity is portrayed to others. This dimension in a teacher's life encapsulates the social and policy expectations of what a good teacher is. It encompasses the educational standards of a teacher. Factors such as national or local educational policies, Continued Professional Development (CPD), time-table and class allocations would impact the professional identity of a teacher. Kelchtermans (cited in Sammons et al., 2007), outlines five integrated components that the professional and personal dimension incorporates over time: job-impetus, self-image, self-esteem, task discernment and the future of teachers. Hargreaves and O'Connor (2018) recommend that professional collaboration and the development of 'social capital' are encouraged amongst teachers by discussing their knowledge with other teachers as this benefits the learning in the classroom. It improved teacher net-working as teachers realised that there were others who could support and identify with them. In addition, it increased the capacity to implement change as ideas could be discussed and verified amongst many teachers.

2.11.1.2 Personal dimension

This dimension in life is located peripheral to school and is related to the family and community. It involves factors such as being a spouse, parent and other relationships with extended family and friends. Sammons et al. (2007) asserts that one of the many challenges faced by teachers is the difficulty in striking a balance between pressures at work and those in their personal life. They must endeavour to consolidate their professional life, personal life and school setting to maintain a constructive identity. Sammons et al. (2007) further states that this determines a teacher's sense of 'agency' – that is, the proficiency to follow one's own ambitions, their well-being and strength.

2.11.1.3 Situated dimension

This dimension is also called socially-located identity because it entails what happens in a particular school, faculty or class. It is affected by factors such as the socio-economic background of a school; management; and learner conduct and allocation in a class. In order to manage the balance or imbalance of different identity situations, Day and Kington (2008)

suggest that the following approaches were embraced by teachers, either deliberately or unknowingly to cope with certain challenges in an environment. Many teachers adjusted their way of thinking to accommodate the views of others; others tolerated the imbalance and often injustice of the system that was caused by new situations; some teachers accepted the discrepancies positively and engaged in their work with full obligation. Some teachers, however, opposed change and separated 'school life' from other areas of their life.

Teaching is a demanding job (Hargreaves, 2000; Sammons et al., 2008) therefore resilience is an important component that would strengthen a teacher's make-up. Resilience is the capability to 'bounce back', to recover quickly and proactively in the face of challenges. It nurtures a powerful sense of 'vocation' and inspiration which is crucial to promote optimum learning in a school. Day and Kington (2008) assert that teachers need to be resilient to sustain their sense of effectiveness in the classroom. They further argue that whilst a teacher's experience can be governed in terms of professional, personal and situated influences, there are other components that can either 'support' or put additional 'pressure' on teachers. Identities may be stable or disintegrated at different times and in different ways according to the influence of these factors. Teachers, like everyone else, are likely to experience different needs and anxieties at different times during their careers.

2.11.2 Teachers' professional life phases

Day and Gu (2007) contend that identities are neither intrinsically stable nor unstable, but it depends on the abilities of teachers to manage their identities at different stages or career phases in their lives. Teachers' work and lives were found to cover six professional life phases, as outlined below:

Professional life phase 0 to 3 years: *Commitment: Support and Challenge*. A teacher's professional life phase (Day and Gu, 2007) begins with commitment and developing a sense of resourcefulness in the classroom. Support from the school management team is crucial at this stage.

Professional life phase 4 to 7 years: *Identity and efficacy in the classroom*. In this phase teachers display increased confidence about their role in the classroom. Many teachers take on

additional responsibilities and this strengthens their identity. Heavy workloads however, pose as a negative factor.

Professional life phase 8 to 15 years: *Managing changes in role and identity: Growing tensions and transitions.* In this phase, teachers have to manage changes in their roles and consequently their identity. Many teachers have roles of responsibility and this contributes to tension in their career. However, many teachers display sustained effectiveness in the classroom, whilst some show a loss of motivation and interest (Day and Gu, 2007).

Professional life phase 16 to 23 years: *Work – Life Tensions*: *Challenges to motivation and commitme*nt. At this stage, teachers are faced with increasing workloads in school as well as demands from family responsibilities. Teachers often struggle to reach a balance and this impacts negatively on their identity.

Professional life phase 24 to 30 years: *Challenges to sustaining motivation.* Teachers are faced with maintaining motivation at this stage, being exposed to factors such as declining learner behaviour and a lack of support from management teams.

Professional life phase 31 + years: *Sustaining/Declining motivation, ability to cope with change or looking to retire.* Teachers have to cope with change or look at the prospect of retiring. National policy, well-being issues and learner performance are seen as undesirable factors that influence teacher identity. Teachers in this phase were seen as either maintaining commitment or as being 'trapped and tired' (Day and Gu, 2007).

It was evident that in each of the six professional life phases of teachers, there were a number of different situations that tested their abilities to maintain their commitment. Day and Gu (2007) emphasised that there was an intricate link between teacher identity, well-being and effectiveness and argue that personal, professional and situated factors influence teacher identities and their welfare. Similarly, Sammons et al. (2007) agree that teachers' well-being and positive professional identity are crucial to a teacher's effectiveness, that is, teachers with a strong commitment and resilience are more effective.

Rodgers and Scott (2008, p.733) proposed a concept of identity based on four postulations that resonates with that of Day and Gu (2007) to a certain extent. Firstly, identity is moulded within

multiple circumstances which bring "social, cultural, political and historical" factors into play. Secondly, identity is formed through relationships with other people and emotions are involved. The third proposition is that identity fluctuates and is unstable (Hargreaves, 2001; Zembylas, 2005a; Gabrys`- Barker, 2010). Lastly, identity involves the creation of narratives by teachers as they gain experience. Table 2.3 below is an adaptation from Rodgers and Scott (2008, p. 740-741) which shows the development of teacher identity.

Stage	How does the teacher make sense of social, political and historical factors?	How does the teacher make sense of his/her relationships with others?	How does the teacher discover meaning through stories?
Stage 2: The instrumental knower (Imperial Balance)	Concrete, stays outside oneself	Teacher role concept formed. Rule-based interaction with others. Lack of perspective on those relations.	Artificial understanding of experiences. Black and white perceptions.
Stage 3: The socialising knower (Interpersonal Balance)	Conforming to outside forces and identifying with them. Also vulnerable to those that they cannot identify with.	The viewpoints of other people are important. Empathy for oneself and sympathy for others.	Focussed on emotions and feelings and reflect upon them. Relationships are important at different levels e.g. Teacher-learner. Stories are influenced by what the teacher thinks is expected of him/her.
Stage 4: The self-authoring knower (Institutional Balance)	Awareness of external forces and their influence. Developed one's own perspective of the world. Able to define	Clear indication of identity and accountability. Builds one's own standards and values. Reflects upon criticism constructively. Able to co-operate with others, mutual support.	Able to self-reflect on individual experiences. Aware of the impact of relationships on teaching and are able to regulate them.

Table 2.3: An adaptation from Rodger and Scott (2008, p. 740 – 741) showing the development of teacher identity from Stage 2 to Stage 4.

Sammons et al. (2007) explored a longitudinal study called 'Variations in Teachers' Work, Lives and Effectiveness' (VITAE). The VITAE study was conducted amongst three-hundred teachers in schools in England and was incorporated into the Teaching and Learning Research Programme (TLRP). The Department for Education and Skills (DoES) wanted to understand how teachers become "more effective over time" (p.683). It analysed influences on teachers' professional and personal lives, their identities and effectiveness. The VITAE study found that teachers' professional development is not simply a 'linear' skills development ladder that sees a teacher pass from initial 'novice' through to 'expert'. Their study found that although teachers' felt that they became more effective over time in their career, there was no concrete evidence that suggested that age or years of experience contributed to a teachers' effectiveness. In contrast, findings showed that teachers in the later PLPs showed increased 'vulnerability' and a decrease in obligation to their career, and this lead to them being less active in the classroom. Mok (2005, p.56) also argues that although teacher development is often seen as "successive, linear, hierarchical and progressive", this is not necessarily the case as the number of years spent teaching may not correspond to the phase in a teaching career. This research study is apt for my own research paper as it illuminates the professional life phases of a teacher's career, as well as the professional and personal identities of teachers.

2.11.3 Hargreaves' Emotions of Teaching and Educational Change

Hargreaves (2000, p.812) draws on concepts of emotions to emphasise the disregard of the emotional dimension in educational reform: "emotional intelligence, emotional labour, emotional understanding and emotional geographies". He further explains that teachers come into a classroom with their own ideologies and conceptions, come from different backgrounds: personal, educational and social and therefore, they have different standards and beliefs concerning the teaching and learning processes. They are different on the 'personal, educational and experiential levels' (Hargreaves, 2000). In addition, he argues that emotions are not separate entities in an individual's life, but together with reasoning and act, are intricately interwoven. This resonates with Gabrys-Barker (2010) who contends that teachers have their own ambitions and goals and come into the classroom with different backgrounds: personal, social and educational. They therefore embrace different views and strategies coming into the classroom. The relationship between teaching and emotion is complex and emotion is finely linked with teaching (Zembylas, 2005a). Furthermore, Govender (2009, p.30) endorses

Hargreaves' statement about the role of the teacher in educational change: "The teacher is the ultimate key to educational change. Teachers do not merely deliver the curriculum. They develop, define and reinterpret it too. It is what teachers think, what teachers believe and what they do at the level of the classroom that ultimately shapes the kind of learning that young people get".

2.11.3.1 Emotional intelligence

Hargreaves (2000) asserts that emotions have become popular in the workplace by an individual's emotional competence, literacy and intelligence. Goleman (1998) suggests five basic 'emotional competencies', that is, knowing how to: express your emotions, control your moods, feel for others' emotions, motivate yourself and others, and have a variety of social skills. Hargreaves (2000, p.814) argues that being able to master the five basic 'emotional competencies' is important to being an effective teacher, but that emotions "should not be reduced to technical competences".

2.11.3.2 Emotional labour

According to Tsang (2011, 153), "emotional labour is the forced emotion management in work for a wage". Many professions, including teaching require individuals to mask or 'put on' their emotions or feelings. Hargreaves' (2000) contends that a teacher's work is a form of emotional work or labour, for example preparing and delivering a lesson is challenging, especially when one has to remain calm and collected in the face of ill-disciplined learners. He questions whether the emotions displayed by teachers in a classroom or when faced with parents are 'artificial' - are teachers just 'acting'? Hochschild (1983, cited by Hargreaves, 2000) states that emotional labour becomes demanding and exhausting when individuals feel that they have to 'wear' certain emotions to please others. This resonates with Zembylas (2005b, p.477) who asserts that "emotional freedom is at the core of a teachers' capacity to act as one chooses" without being restricted to conform to the required emotional expectation of a school. In contrast, Tsang (2011) argues that in spite of teaching being portrayed as demanding and frustrating, studies conducted on the emotional labour of teaching revealed that there could be positive outcomes for teachers, such as job satisfaction, dedication and work productivity.

The views on emotional labour was pertinent to this study as it helped me to analyse whether life sciences teachers 'mask' their emotions to suit the needs of learners, parents and departmental organisations – is teaching evolution an emotional practice?

2.11.3.3 Emotional understanding

The emotional status of a person is shaped by various factors, including their upbringing, culture and environmental influences of people they associate with. Hargreaves (2000) contends that teachers' have an emotional understanding of their learners when they examine their learners to gauge their understanding or response in a classroom. On the other hand, he argues that teachers' can also experience emotional 'misunderstanding', for example, if teachers perceive a learner's attention as being interested, and this is wrong – the learner is merely bored, then this has dire negative consequences to learning! It is therefore important that emotional understanding be given a platform in schools to optimise the teacher-learner relationship.

2.11.3.4 Emotional geographies

Hargreaves (2001, p. 1061) describes emotional geographies of teaching as, "The pattern of closeness and or distance of human interactions or relationships that create or configure and colour the feelings and emotions about ourselves, our world and each other".

Hargreaves (2000) discusses the emotional politics of teaching and calls for the creation of emotional geographies of schooling. He accentuates the "spatial and experiential patterns of closeness or distance" in human interactions or relationships within the school, especially in the context of educational reforms (Hargreaves, 2000, p.815). He proposes five forms of emotional distance and closeness that can threaten the emotional well-being among teachers and other stakeholders. Figure 2.2 which follows provides an overview of Hargreaves' emotional geographies (2000):

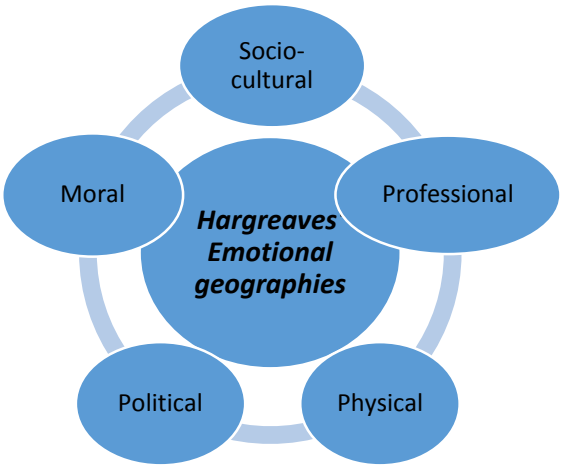

Figure 2.2: Hargreaves' Emotional Geographies (2000)

Sociocultural geographies arise when there is a difference in culture or style between teachers and their learners. This forms a barrier between parents, teachers and learners because they are unable to understand the background of each party. Moral geographies cause a division between a teachers' role and how this is carried out. Furthermore, there are no methods in place to find a solution to the problem at hand. Professional geographies highlight teacher professionalism being defined from a conventional, male-influenced dimension. This invokes prejudice amongst the female counterparts, where they are stereotyped as 'motherly, caring' figures. Political geographies are evident where hierarchy and power relations cause a rift in communication between teachers, parents and learners. Physical geographies show fragmentation and a disconnection between teachers and their learners, due to frequent negative episodes. This prevents the formation of sustained relationships between teachers, parents and learners. Hargreaves (2000) asserts that how these 'emotional geographies' of teaching are constructed, determines the effectiveness of teaching and learning.

2.12 Conclusion

This chapter summarised the key issues in the literature on teacher identities and teacher emotions. The chapter commenced with an overview of curriculum reform in the South African education context, followed by a discussion of the life sciences curriculum as outlined by the Department of Education's (DoE) Curriculum and Assessment Policy and the National Assessment Policy Document. Next, being a life sciences teacher and the challenges experienced by them were discussed. Teaching evolution education in South Africa and its

challenges were reviewed, as well as the biological evolution content taught in Grade 12 life sciences. A discussion of a teacher's professional, personal and situated identities followed. Thereafter, teacher emotions, with an emphasis on the intra-personal, inter-personal and socio-political contexts was outlined. The chapter concludes with a discussion of the conceptual frameworks, namely, Day and Gu's (2007) professional, personal and situated dimensions of teacher identity as well as Hargreaves' emotions of teaching and educational change: and notions of emotional intelligence, emotional labour, emotional understanding and emotional geographies. This provided the analytical framework to analyse the research questions fundamental to this study.

CHAPTER 3: RESEARCH METHODOLOGY AND DESIGN

Research is to see what everybody else has seen, and to think what nobody else has thought.

Albert Szent-Gyorgyi

3.1 Introduction

The purpose of this study was to explore the identities and emotions of Grade 12 life sciences teachers related to teaching evolution. This chapter outlines the research approach, methodology and paradigm that was adopted in this study. The chapter commences with an examination of the qualitative methodological approach and the interpretive paradigm that was drawn on to interpret the data that was assimilated. Thereafter, the narrative research design and its suitability for this study was discussed. Next, a discussion of the convenience and purposive sampling techniques, procedures and data generation instruments and the process of data analysis follows. The chapter concludes with an outline of ethical considerations, issues of trustworthiness, establishing rigour as well as limitations of the methodological approach.

3.2 Qualitative research approach

This research study adopted a qualitative research approach. Creswell and Creswell (2014) contends that in qualitative research, researchers use the literature and findings in a way that is in keeping with the points of view of the participant. They further add that the researcher does not prescribe the questions that need to be answered, but allows the participant to assert their own standpoint. One of the main reasons for conducting a qualitative study is to investigate and elaborate on a particular topic. This means that not much has been written about the topic, and the researcher endeavours to listen to the participants and builds an understanding based on what is relayed.

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 emphasise 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.

There are many uses of qualitative research which include explaining, describing, reporting, testing and generating theories (Cohen et al., 2018). Furthermore, Preissle (2006) contends that qualitative research is characterised by verbal, oral, tactile information which is enhanced by observations, audio-visual reports and graphics. She asserts that qualitative studies draw on direct experience but this may differ with different researchers. Preissle (2006) argues that often researchers cannot agree on the boundaries, terminology and purpose of qualitative analysis. Gonzalez et al. (2008, cited in Cohen et al., 2018) describe qualitative research as providing an in-depth, comprehensive understanding of experiences, attitudes and behaviours that may or may not be directly observed. They further clarify that it gives 'voice' to participants and investigates concerns that lie below the surface of the outward face of participants.

Bryman (2008) asserts that qualitative research focuses on the use of words instead of statistical numbers. This characteristic of qualitative research causes proponents of quantitative studies to argue that there is no empirical data that can be measured, analysed and interpreted. On the contrary, Cohen et al. (2018, p.288) counter that qualitative studies require data to be "weighted, downgraded, upgraded or excluded according to the evidence and sampling that they contain". Research, according to Geertz (1973, cited in Cohen et al., 2018), must include 'thick descriptions'. This implies that observations must be detailed and acquired from the natural, uninterrupted settings of the participant. In addition, research must be conducted in 'real-world' settings with as little interference from the researcher as possible. This resonates with Lincoln and Guba (1985, cited in Cohen et al., 2018) who suggest that qualitative studies must be undertaken in their natural settings. They state that humans are the research instruments, therefore a qualitative study is more suitable.

Tracy (2010) outlines the following criteria for noteworthy qualitative research: This is unfolded in no particular order but rather to ensure fluidity of one's thoughts. Firstly, the research topic must be worthy, one which is relevant, interesting and contributes to the greater

scope of the aspects being explored. Secondly, there must be 'rich rigour' which will provide adequate data collection, analysis and transparency. Ethical issues and credibility are the next criteria wherein the researcher protects the anonymity and confidentiality of participants at all times. The criterion of 'sincerity' indicates an openness and self-analysis of the researcher. 'Resonance' is a criterion where the researcher can identify with the participants' viewpoints and is able to depict this in words. The realisation of the purpose of the study, its connections with literature, together with a meaningful contribution to the field of research makes provision for the criteria of 'meaningful coherence' and 'significant contribution' (Tracy, 2010).

Qualitative research views participants as those who are able to find meanings of their environments. They "make sense of their world and act in it through such interpretation" (Cohen et al., 2018, p.288). People are methodical, purposeful and innovative in their actions and these result in meaningful engagements in social circumstances. These meanings are as a result of one's cultural and contextual affiliations. Participants and their experiences are unique and this adds to 'multiple realities'. In addition, Cohen et al. (2018, p.288) assert that behaviour and data are "context-related, context-dependent and context-rich". A researcher therefore, has to have a complete interpretation of a context because this will influence the outcome of the data collected and analysed. They will have to interpret and find meaning of the situation 'through the eyes' of the participant. This is corroborated by Yin (2011) who advocates that a qualitative approach allows the researcher to find out about the experience in its real world setting, that is, the participants are considered in their natural setting to see how they manage and succeed in their everyday situations. Furthermore, Yin (2011) emphasises that the data that emerges from qualitative research represents meaning given to situations that are real for the people who live in them. This may be contrary to the principles and opinions held by the researcher about a certain occurrence.

3.3 Interpretive Paradigm

Kuhn (1962, cited in Steyn, 2013, p. 35) defines paradigms as "systems of inter-related ontological, epistemological and methodological assumptions about the world". This resonates with Cohen et al (2018, p.23), who states that "a paradigm is a way of looking at or researching phenomena, a world view, a view of what counts as accepted or correct scientific knowledge or way of working, an accepted model or pattern". This echoes with Hammersley (2013) who claims that paradigms are not just methodologies, but are ways of looking at the world and our

interpretations of it. There are different types of paradigms that researchers could utilise. These include the positivist, post positivist, interpretive, critical, postmodern, naturalistic, normative and multi-paradigmatic paradigms. Pring (2015) evaluates two paradigms: the first highlights 'objective reality' and does not focus on the individual. It is scientifically based and employs quantitative, empirical data to measure phenomena. The second paradigm, however, employs a qualitative view point where researchers and participants are understood from a social, subjective angle. This resonates with Hammersley (2013) who contends that this type of paradigm uses verbal rather than statistical methods to understand experiences. Pring (2015) cautions researchers from adopting a viewpoint of either quantitative or qualitative too early in the research, as this oversimplifies actual experiences. Cohen et al. (2013), however, argue that paradigms have been streamlined to facilitate understanding and application. They have many differences in their organisation, but also share similarities and overlap in their approaches.

This research study is located within the interpretive paradigm. Cohen et al. (2018) assert that the interpretive paradigm is characterised by the study of the individual, that is, interpretive researchers begin with the individual and sets out to understand their view of the world. It is a shared belief system or set of principles that is used to accumulate knowledge on the problems to be investigated. In the same vein, Creswell and Creswell (2014) asserts that the researcher adopting an interpretive paradigm begins with the individual and sets out to understand their interpretations of the world around them. Bryman (2012) contends that the interpretive paradigm aims to understand the inner, subjective meanings and experiences of the participants, whilst Naidoo (2014) asserts that interpretive explanations describe the meaning of social interactions and promotes an understanding of how the world operates. She further adds that interpretive explanations are personal, since the socio-cultural background and experiences of teachers are accounted for.

Furthermore, Mack (2010) maintains that insight and a deeper understanding of people's behaviour based on their daily experiences are gauged. She suggests that the interpretive paradigm was developed as a reaction to positivism and is also referred to as constructivism as it emphasises an individual's ability to construct meaning. Challengers of positivism within the social science domain concur that to understand the social dimension of individuals, it should be from their perspective. The interpretive stance has the dual role of incorporating the rigour of natural science and of engaging in the analysis of human behaviour in social science. The

interpretive paradigm is epitomised by the concern for an individual. The main undertaking is to understand the subjective world of human experience (Cohen et al., 2018). Researchers therefore, go to great lengths to get inside the person and to understand from within. This is emphasised succinctly by Cohen et al. (2018, p. 19): "The imposition of external form and structure is resisted, since this reflects the viewpoints of the observer as opposed to that of the actor directly involved".

According to Marshall and Rossman, (2016, cited in Cohen et al., 2018) individuals make meaning of the world according to their own expressions. These elucidations are constructed within a socio-cultural, time-based or spatial dimension. Hammersley (2013) concurs by emphasising that researchers adjourn their own outlook on peoples' culture and traditional circumstances, but rather to understand their reactions and behaviour within their own context. It is important to note that in interpretive research, theory is 'emergent' and follows as data becomes available. Researchers must wait until substantial data is assimilated before drawing any conclusions or theories. Theory therefore becomes meaningful and produces insight and comprehension into people's behaviour (Cohen et al., 2018). Furthermore, they contend that an interpretive approach focuses on action. This can be seen as 'behaviour-with-meaning'. This behaviour is deliberate as experiences are shared in everyday interactions. There is an initiative to 'probe' a participant so that the researcher is able to holistically understand their point of view.

In addition, Gilliland (2014) contends that the interpretive paradigm is used in research that tries to make sense of phenomena through investigation of a participant's core values, culture and language in their social context. 'Multiple realities' are acknowledged and this becomes evident when different individuals, clusters or humanities are observed. It is important to note that interpretive researchers are not entirely impartial in their interpretations and are therefore expected to recognise their participation and involvement in the research process.

According to Gilliland (2014), the four primary philosophical platforms of researchers are: ontology, epistemology, methodology and axiology. Ontology is a replication of the essence of science or the 'nature of reality'. Instead of researchers only describing an experience, they undertake to understand and relay the mental thought processes of participants. In this research study it would entail an understanding of the teachers' emotions during the teaching of

evolution in life sciences. Epistemology, on the other hand, depicts the relationships between the 'inquirer and the object of inquiry'. It provides insight into how a researcher relates the exactness about his or her observations and conclusions. In this research context, how precise is the interpretation by the researcher of a teacher's identity and emotions in the classroom. When a researcher develops or constructs the impact of an investigation, this is referred to as 'methodology', whilst 'axiology' depicts the values embodied by a researcher in the context of their environment. Table 3.1 below summarises the four primary facets that govern philosophical research:

Ontology	Epistemology	Methodology	Axiology
• Multiple realities • Socially constructed	• Empathetic • Observer subjectivity	• Interactional • Interpretation • Qualitative	• Contextual understanding

Table 3.1: Interpretive paradigm: Philosophical assumptions (adapted from Gilliland, 2014, p.88).

The ontological assumptions of interpretivism are that social reality is seen by multiple people and is interpreted differently resulting in different perspectives of an issue. According to Mack (2010), epistemological assumptions of the interpretive paradigm include knowledge being obtained inductively and through the personal experience of participants. The ontological underpinning of this research study is therefore, observing teachers in their interactions and relationships with learners and other teachers as well as their social and cultural context, and how this unfolds in understanding and interpreting their reality. The researchers mould their findings from observations and verbal engagements with participants, in this case, Grade 12 life sciences teachers. This study, as far as possible, due to the COVID-19 restrictions, allowed for the interaction of teachers in their own context in their classrooms and an understanding of their knowledge and practices was gauged.

Epistemology explores why people behave in a certain way and data is collected through the observations, experiences, reflections and voices of the participants. In this study, the reflective journals and collages of teachers were intended to delve into understanding the emotions they experienced during teaching evolution in life sciences. Furthermore, the semi-structured interviews gave expression to their identities in a professional and personal stance. Their

experiences in the classroom and their engagements with learners and other teachers were interpreted and therefore, the interpretive epistemology was appropriate for this study.

3.3.1 Weaknesses of the interpretivist paradigm

There are however limitations to the interpretive paradigm. Firstly, Mack (2010) contends that proponents of the positivist paradigm question the overall value of interpretive research as there are no scientific procedures to verify results. Cohen et al. (2018, p. 23) argue that post-positivists have gone too far in "abandoning scientific procedures of verifications". They pronounce that if carefully collaborated interviews are flawed, how much more would less organised interviews be. Secondly, the ontological assumption of interpretivism is subjective and therefore poses a biased stance to interpretation. Rex (1974, cited in Cohen et al., 2018, p.23), argues that "there is the possibility that actors might be falsely conscious". He further asserts that social researchers have a responsibility to pursue an impartial standpoint. Furthermore, Bernstein (1974, cited in Cohen et al., 2018) asserts that each researcher can impose their own interpretations of circumstances on participants. Another criticism levied against the interpretive paradigm is that it fails to recognise the political and conceptual stimuli of social authenticity (Mack, 2010).

3.4 Narrative inquiry research design

A narrative analysis reports personal experiences or observations and brings fresh insights to often familiar situations. *(Cohen et al., 2018, p. 694)*

This study adopted a narrative inquiry research design. Creswell and Creswell (2014) defines narrative inquiry as a design of inquiry from the humanities in which the researcher studies the lives of individuals and asks one or more individuals to provide stories about their lives (Riessman, 2008). Clandinin and Connelly (2000 cited in Creswell and Creswell, 2014) contend that this information is then often re-told by the researcher into a narrative chronology. The study of teachers' narratives, that is, stories of teachers' own experiences, is increasingly being seen as crucial to the study of teachers' thinking, culture, and lifestyle. Polkinghorne (1995), cited by Cohen et al., (2018, p. 694) describes a narrative as "'a type of discourse composition that draws together diverse elements, happenings and actions of human lives into thematically unified goal-directed processes'". Connelly and Clandinin (2000, p.134) further

note that "narrative is concerned with specific, concrete events in a person's life" and aims to give an account of a person. Furthermore, through the construction of personal philosophies, images and narratives, the narrative method offers an interpretive reconstruction of parts of a person's life. In addition, Clandinin & Connelly, (2000, p.20) claim that narrative inquiry:

> *[is] a way of understanding experience. It is collaboration between researcher and participant over time, in a place or series of places, and in social interaction with milieus. An inquirer enters this matrix in the midst and progresses in the same spirit concluding the inquiry still in the midst of living and telling, reliving and retelling, the stories of the experiences that make up people's lives, both individual and social.*

Narrative research has become an important means for understanding teachers' culture, that is, teachers as knowers' of themselves, the learners that they teach, subject matter, teaching and learning strategies and the situated school context. If we need to understand teacher identities and emotions, then narrative research is an important way to report how environments shape the identity of a teacher. It facilitates teachers' exploration of their identities by highlighting the situated-ness of oneself, that is, through dialogue, practices and resources.

Naidoo (2018, p.7) further highlights the application of narrative research as she "blended Creswell's (2014) *seven steps of narrative research* and Fowler's (2006) *seven orbital's of narrative analysis* to develop a "narrative research labyrinth" (Naidoo, 2018) which outlined the stages in conducting and evaluating narrative research. I have therefore adopted a narrative inquiry research design within the interpretive paradigm for this qualitative study. I believe that it is most suitable for this study since this study explores identities and emotions of Grade 12 life sciences teachers. A narrative inquiry research design allowed for the exploration of the challenges that teachers face teaching evolution and how they managed the personal, professional and situated dimensions of their lives. The teaching of evolution was examined through the eyes of the participants. The main aim, as Creswell and Creswell (2014) asserts, was to understand the subjective world of the human experience.

Holstein and Gubrium (1998, cited in Zembylas, 2007, p.61) suggest the use of a narrative approach to study emotion. They argue that "emotions are major aspects of storytelling and allow us to link our motives, intentions, desires and actions." Teacher identities can be studied in classrooms, where teachers are engaged emotionally and their identity is being shaped.

3.5 Key research questions

This research study aimed to address the following research questions:

1. How do teachers' personal and professional identities influence their teaching of evolution in Grade 12 life sciences?

2. To what extent is teaching evolution in Grade 12 life sciences an emotional practice?

3.6 The research context: location of the study

The research setting or context broadly refers to the place where the data is collected and assimilated. This research study was located within the uMgungundlovu District in Pietermaritzburg. Six teachers representative of five public schools were selected from the Northdale and Howick Central circuits. There were no private schools located in these circuits. The selected schools varied in socio-economic status from Quintile 1, 2 and 3. All schools were situated in urban, residential areas and the learner population was representative of the residential area that they came from. The school learner affiliation was in line with the socio-economic background that the learners came from and this led to a varied school population. They were composed of learners from higher, middle and lower income groups. This inevitably impacted on learner attendance and behaviour; the availability of resources and parental involvement.

3.7 Sampling strategies

Sampling comprises selecting a group of people as the foundation of information for a study. There are two major categories of sampling techniques: *probability sampling* and *non-probability sampling*. Probability sampling is primarily constructed on random selection and everyone in the population has an equal chance of being included into the sample. The researcher can build generalisations, because people in the sample are representative of the population (Cohen et al., 2018). The main examples of probability sampling are random, systematic, stratified and cluster sampling. Non-probability sampling, on the other hand, concentrates on a specific group which does not represent the wider population (Cohen et al., 2018). Some individuals stand a better chance of being included in the sample than others and,

consequently, generalisations cannot be made. Common examples of non-probability sampling include quota, snowball, purposive and convenience sampling.

3.7.1 Convenience sampling of schools

The convenience sampling technique was used to select schools. Cohen et al., (2018) states that "the selectivity which is built into a non-probability sample derives from the researcher targeting a particular group, in the full knowledge that it does not represent the wider population". In this study, the five schools were selected from the Northdale and Howick Central circuits from the uMgungundlovu District of Pietermaritzburg. The schools are not revealed by their actual names to maintain confidentiality of the participants.I considered that the choice of these schools was suitable as they were conveniently situated within the same district as me and accessible within a reasonable time period. Convenience sampling, according to Cohen et al., (2018, p. 218) therefore describes this sampling technique as "opportunity sampling as it involves choosing the nearest individuals to serve as respondents, and also those who happen to be available and accessible at the time". The data gathered and findings generated from the sample group therefore, cannot be generalised as it is applicable only to that particular group of participants.

3.7.2 Purposive sampling of participants

The purposive sampling technique is typical of qualitative research, as the researcher selects participants to meet their specific needs (Cohen et al., 2014). Rule and John (2011, p.64) further assert that "purposive sampling is a technique used by researchers where participants are deliberately chosen because of their suitability in advancing the purpose of the research". In this study, the purposive sampling technique was used to select the teachers as participants. Rule and John (2011) define purposive sampling as a method chosen by researchers to facilitate the convenience of the research, as participants are selectively chosen. This resonates with Cohen et al. (2018, p.202) who contend that in purposive sampling, "researchers handpick the cases to be included in the sample on the basis of their judgement or possession of the particular characteristic being sought". In addition, Ball (1990, cited in Cohen et al., 2018) contends that purposive sampling is used in order to access 'knowledgeable people', that is, those who have in-depth knowledge about issues due to their professional role, expertise or experience. Purposive sampling is used for a specific purpose, where the researcher selects people who

have a wide knowledge base about the topic that is being researched (Curtis, Murphy & Shields, 2014). Purposive sampling is therefore aligned with the interpretive paradigm, as the researcher selects a specific group of participants who have extensive knowledge and experience on the subject that is being researched.

The purposive sampling was therefore, an appropriate method for this study, as participants were knowledgeable and had vast experience with the Grade 12 life sciences curriculum and in particular, the teaching of evolution. Teachers were purposively selected to meet the criteria required in this research study. Teachers were selected according to their Grade 12 life sciences experience, number of years teaching and their availability and willingness to participate in this study. Each school had a principal, deputy principal (s), HODs and teachers for different subjects. Each school, on average had an enrolment of around 1000 learners and 40 teachers. There were about three to five teachers per school teaching life sciences. The number of learners varied from twenty-one to forty in a classroom. Lesson times ranged from 45 to 55 minutes in length.

3.8 Data generation methods

The methodology of qualitative research includes the systematic collection of data and deductive analysis to mediate sound research. Research questions, objectives, the conceptual framework of the study and validity of the research are elements of a qualitative study that researchers must be cognisant of throughout the research process. It is crucial that the data determines the theory and that there are no pre-conceived outcomes. Lincoln and Guba (1985, cited in Cohen et al., 2018) agree that as data is acquired, theory and research designs emerge over time. They advocate the use of purposive sampling to explore a comprehensive range of issues. Hammersley (2013) suggests that situations should be viewed through 'wide-angle lenses' so that a multitude of factors are embraced during research. Furthermore, Cohen et al., (2018, p.648) states that researcher has to be selective in qualitative data as "data is so rich that analyses involves selecting and ordering on the part of the researcher".

Words and text are used to express qualitative data. Taylor and Gibbs (2010, cited by Cohen et al., 2018, p. 643) further describe qualitative data analysis as how the researcher shifts from "the data to understanding, explaining and interpreting the phenomenon in question. It includes

organizing, describing, understanding, accounting for and making sense of data in terms of the participants' definitions of the situation".

Data generation is a fundamental part of any research study. It is focused on people in situations and is "inductive, interactive and flexible" (Gilliland, 2014, p. 89). Data generation methods are therefore as important as the choice of research approach and are further directed by the research paradigm employed in the study. Gilliland (2014) asserts that for data generation to be meaningful, the aim of the data generation methods needs to be identified. Maxwell (2005, cited in Gilliland, 2014) differentiates between structured and unstructured data generation approaches. Structured approaches focus on comparability between people, settings and time. An unstructured approach focuses on the phenomenon being studied and embodies validity and understanding. In this research study, the focus was to understand the data generation environment and how people fit into it. My research would therefore, according to Maxwell's (2005) description be considered as an unstructured approach.

Data can be separated into primary and secondary data sources. Primary data is new data that has not been interpreted before, for example, original data generated from participants during interviews. Secondary data is obtained from sources that already exist, that is, it has been examined and interpreted before. Gilliland (2014, p.99) argues that primary data generation serves the purpose of "added value and credibility". I have therefore generated data using collages, semi-structured interviews and reflective journals in this study. Initially, I planned to use lesson observations as one of my data generation methods, however, physical visits to schools were not allowed, due to the COVID -19 pandemic in 2020. This posed a great challenge as face-to face lesson observations and interviews were not possible.

Qualitative research allowed me to collect data using methods such as semi-structured interviews, collages and reflective journals of participants. This afforded credibility and trustworthiness to this study (Yin, 2011). Teachers were interviewed telephonically or via email due to the COVID-19 pandemic which restricted gatherings and advocated social distancing. They were also given criteria to compile their collage via email. Initially, lesson observations were set out as one of the data collection instruments, however, this was prohibited by the University of KwaZulu –Natal Research Department, due to the COVID-19 pandemic. I consequently, undertook 'reflective journals', under the guidance of my

supervisor, as an appropriate method of data collection that involved narrative inquiry. Therefore, a qualitative approach allowed me to obtain rich data by understanding the perceptions and explanations of the participants as they revealed their input on teaching evolution to Grade 12's in life sciences.

Semi-structured interviews, collages and lesson reflections were planned in such a way that they did not disrupt the normal running of the school and I was cognisant of the COVID-19 restrictions which encouraged social distancing. Semi-structured interviews, collages and lesson reflections addressed both research questions. When clarification was needed for the collage and interview responses, a follow-up e-mail was sent. The questions to the semi-structured interviews and collage guidelines were e-mailed to participants during Level 3 of the COVID-19 lockdown, but lesson reflections on Darwin's theory of evolution by natural selection was only implemented under Level 2 of the lockdown. This correlated with the teaching of this topic before the preparatory examination for Grade 12 life sciences learners.

A template providing guidelines to create a collage was e-mailed to participants so that the first data collection method could be realised (Appendix7). In addition, reflective journal guidelines were also e-mailed to participants. It was regrettable that the non-verbal responses such as facial expression and body language of participants could not be seen. Similarly, additional questions, the probing of participants' reasoning and clarifications could not be undertaken immediately. The response of the semi-structured interviews was transcribed and sent to the participants for their personal verification before they were analysed.

3.8.1 Semi-structured interviews

Interviews are suitable data-collection method because detailed information can be acquired and the emotions, feelings and experiences of the participants can be explored on a deeper level. Oates (2006, as cited in Gilliland, 2014) contends that interviews can be used to gather detailed information wherein a researcher examines sensitive social issues; therefore questions have to flexible and be adapted to suit different people in complex situations. Interviews are intended to obtain rich descriptive data, which can assist the researcher with understanding how participants construct their knowledge and their social realities. Interviews allow for multi-sensory channels to be used, namely verbal, nonverbal, spoken and heard (Cohen et al., 2018),

and they are constructed and planned, as they have a specific purpose (Dyer, as cited in Cohen et al., 2018).

Meyers and Newman (2007, as cited in Gilliland, 2014) provide the following parameters to conduct a qualitative interview: The researcher should set their role and position before the interview; be aware of social and cultural barriers; ensure a good representation of participants as people differ in their outlook and interpretation of their situation; focus on the participant's world through listening skills and uses sensitive prompting that directs the conversation (Gilliland, 2014). The researcher should also obtain permission from participants, treat everyone with respect, honour pre-arranged time frames and keep all information confidential, in a safe, secure place.

Interviews can be classified into four main types: open-ended or unstructured, semi-structured, structured and group interviews (Rogers et al., 2011). Structured interviews generate rich investigative data since participants are allowed to talk without much intervention from the researcher. This type of interview consists of identical, pre-determined questions for every participant, normally with pre -determined answers (Rogers et al., 2011).

Semi-structured interviews were used in this study. Semi-structured interviews allowed me to probe the teacher participants for clarification (Cohen et al., 2018) and I was able to deduce the emotions of participants. I therefore used this type of interview to address the second research question which explored the extent to which teaching life sciences is an emotional practice? I prepared open-ended and closed-ended questions that allowed participants the opportunity to share information, feelings, experiences and emotions related to the teaching of Darwin's evolution by natural selection. Leedy and Ormrod (2010) agree that semi-structured interviews consist of predesigned questions; therefore a set of pre-designed questions formed the basis of the interview schedule (Appendix 5).

Some of the strengths of semi-structured interviews are that they allow the interviewer and the interviewee to meet face-to-face in order to enable the interviewer to probe and encourage the participant so that rich data is obtained. They allow the researcher to observe the participant's behaviour and offer a relaxed environment for generating data. This encourages an open relationship between the two parties, which adds strength and trustworthiness to the research (Brynard et al., 2014; Patton, as cited in Cohen et al., 2018). On the other hand, some of the

limitations of the semi-structured interview include time constraints, financial costs, a lack of openness and honesty, cultural or language barriers, as well as the Hawthorne effect, that is, the presence of the interviewer having an effect on the participant (Myers, 2009, as cited in Gilliland, 2014). In addition, participants can provide biased responses and this can reduce the comparability of the responses, and thus the outcomes of the interviews cannot be generalised (Patton, as cited in Cohen et al., 2018).

3.8.2 Visual media in educational research: Collages

Eisner (2008, as cited in Cohen et al., 2018, p.703) states that we are "surrounded by visual data; knowledge comes in various forms and is not reducible to language alone". This is endorsed by Clark et al. (2010) who contend that visual methods such as images or collages can provide rich data that words alone cannot do. Visual data is therefore a useful source in obtaining data, but is further enhanced when coupled with other forms of data generation. Researchers can therefore draw on a variety of visual media including film, photographs, advertisements, pictures, artefacts, memorabilia, still images, media images and everyday objects. Cohen et al. (2018) assert that, in essence, anything we see, watch or look at counts as a visual image. Visual media portray messages and people can interpret them in different ways, for example participants' perspectives can vary in terms of social events and power relations. Rose (2007, as cited in Cohen et al., 2018, p.705) makes a claim that "we bring our own values, biographies, cultures and background to bear on images".

Prosser and Loxley (2008) categorise the main types of visual data as follows: research – created data, respondent – created data, found data and 'representations'. Research that uses images may be either participatory or collaborative (Cohen et al., 2018) that involves individuals in the compilation, creativity and interpretation of the images. The researcher can provide already assembled images or ask participants to bring their own images. In this research study, participants were requested to create a collage that reflected their identities and emotions when teaching evolution. I chose to use respondent – created data in the form of collages as this was a way of empowering participants to have the freedom of expression in composing their own collages in terms of their values and feelings when teaching evolution. It is important that the researcher provides the participant with guidelines to compiling their visual data. This was achieved by stipulating guidelines for the collage (Appendix 8).

Similarly, Torres and Murphy (2015, p.6) assert that "researchers and participants become equal partners in the construction of meaning". Harper (2002, as cited in Cohen et al., 2018, p.230) suggests that in the evolution of the human brain, visual processing evolved before verbal processing and is "located deeply in the brain and this evokes 'deeper elements of human consciousness than words'" (p.13). This resonates with Cohen et al. (2018, p. 631) who assert that photographs carry meanings that words alone, spoken or written, cannot. They "catch the texture, the mood, the atmosphere of real life places and the emotions and flesh-and-blood drama".

A collage is a form whereby visual data will be used to allow participants to talk about their experiences that cannot be expressed through written or verbal methods. Furthermore, Butler-Kisber and Poldma (2008) and Pillay, Ramkelewan and Hiralaal (2017) describe a collage as the process of using pieces, images, photographs or materials that are glued on a flat surface to highlight certain relevant events in one's life. Butler-Kisber and Poldma (2008) contends that a collage can be used in inquiry in three basic ways – on a reflective level, a form of elicitation and a way of developing ideas. Pillay et al. (2017) agree that a collage is a hands-on activity and anyone can participate, irrespective of age or artistic ability. An image can have different meanings to different participants and there is no one "correct" way of interpreting it. Collages were therefore used to generate data for both research questions which explores teachers' identities and emotions. It will help the participant to focus, clarify and explain an issue as well as to bring an emotional dimension to the interview. Cohen et al., (2018, p.702) state that analysing visual data is not simple, "images concern meaning making and interpretation". Furthermore, the researcher has to be wary not to "over-interpret" (p.707) photographs or analyse that which is not meant to be portrayed by the participant. To safe-guard this from happening, participants were asked to write a brief description of what the image means to them. It was therefore important for me, as the researcher to ascertain how the images in each collage were significant to participants. Cohen et al., (2018, p. 713) corroborates that "analysis and interpretation of images are often inextricably linked, raising the need for considerable reflexivity on the part of the researcher".

3.8.3 Lesson Observations

Observation is a method of collecting data through direct contact with the participant so that the participant's behaviour, facial expressions, body language and other non-verbal gestures are observed (Cohen et al., 2018). It complements and extends interviews. Observations can reveal interactions, emotions and the identities of teachers with their learners in the classroom.

According to Cohen et al. (2018), observations can vary from unstructured to structured observations. They elaborate that in unstructured observation, the researcher does not have a well-defined idea of what they are seeking to find, and consequently records whatever is observed and then decides if the information is noteworthy for the research. In contrast, semi-structured observation includes some patterns of specified behaviour, however, the researcher gathers and records information and clarifies them further. In structured observation, on the other hand, the researcher is aware of their outcomes and therefore comes into the setting with pre-specified patterns of behaviour and prepares observation categories beforehand in an observation schedule to confirm or reject them (Cohen et al., 2018).

Lesson observations (Appendix 6) were initially the third method of data generation for this study. It verified the first research question which explored how the identity of a teacher influenced their teaching of evolution in life sciences. I would have noted first-hand the behaviour, setting, routine and indeed the emotions of the participant. Cohen et al. (2018) assert that observations provide rich contextual information and reveal routine activities to be documented verbally and non-verbally In addition, Brynard et al. (2014) contend that observations have strengths, which include providing first hand data, confirming information obtained from the interview, displaying real-life behaviour and capturing natural behaviour. Furthermore, McMillan and Schumacher (2001) assert that observations are most likely to produce valid or reliable data. However, Brynard et al. (2014) draw attention to the following limitations of observations: it is difficult to exclude the observer's bias, anonymity is compromised, opportunity to probe for clarity is not available, the participants' behaviour can be affected by the presence of the observer, and participants become uncomfortable and feel that the outsider is interrupting. However, due to Covid-19 restrictions, I did not use lessons observations as a data generation method.

3.8.4 Reflective Journals

The complex nature of educational concerns and the ongoing challenges of classroom teaching ensure that a teacher is continually working, within or outside of the classroom. Pollard (2005) asserts that reflective action involves a willingness to engage in consistent self-appraisal and development. It encapsulates self-criticism, rigorous analysis and flexibility to change and adapt on the part of the teacher. The key characteristics of reflective action, as developed by Pollard (2005), include an active concern by the teacher, with efficiency, aims and consequences. Pollard (2005) adds that it should be applied in a cyclical process in which teachers monitor, evaluate and revise their own practices on an ongoing basis. It requires open-mindedness and responsible actions. Life sciences teacher participants were required to compile a reflective journal wherein they recorded their thoughts, emotions, challenges and consequent developments, if any. This was not an easy task as teachers were required to reflect upon themselves and to challenge their thought patterns, emotions and prejudices. Teachers were encouraged to be honest and open in their reflective journals as this could pave the way for possible growth within the greater educational circle. The reflective process, adapted from Pollard (2005, p.17) can be represented as follows:

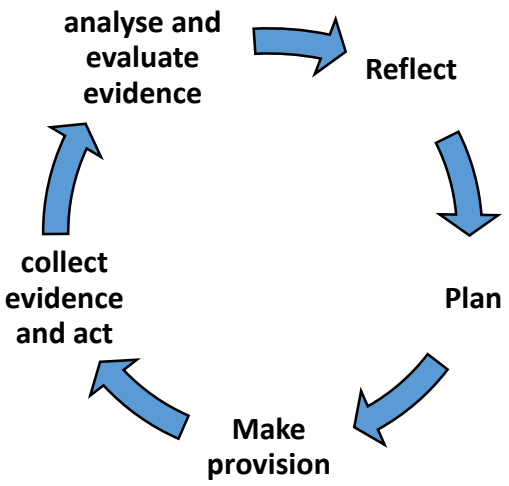

Figure 3.1: The reflective process (adapted from Pollard, 2005, p. 17)

The Department of Education for Northern Ireland (1999, as cited in Pollard, 2005, p.82) explains in the Teacher Education Partnership Handbook:

> "At the heart of becoming a teacher is above all, being a learner – a lifelong learner. To learn, one has to ask questions of oneself and of others, and to know that this process is valued and shared across the school. Reflecting on teaching provides a focus for analysing and developing learning and teaching".

The process of reflective teaching, argues Pollard (2005), supports the development of professional expertise. A reflective journal is a record of one's work in progress. It could provide an opportunity for critical engagement and analysis of a teacher's experience. Reflective teaching should be personally rewarding for teachers as the learning-teaching environment should improve in terms of understanding and quality.

3.9 Data analysis

After completing the data generation, the results needed to be translated and understood in order for it to be meaningful and to contribute to this research. Boeije (2010) defines data analysis as the process of breaking up the segments of data into parts and reassembling the parts again into a coherent whole. There were many ways to analyse the data and this depended on the data generation methods that were used. Zikmund et al. (2013) outlined the stages of data analysis as editing, coding, and creating an electronic data file. During editing the data was checked and aligned; coding was used to represent and simplify data. Symbols in different colours were attached to raw data to assist in categorising and interpreting data.

3.9.1 Qualitative data analysis

Qualitative data can be stored in files or data fields. Zikmund et al. (2013) asserts that the purpose of coding qualitative responses has two basic rules: firstly, a coding category should exist for all feasible responses and secondly, coding categories should be mutually exclusive. In addition, Oates (2006) contends that qualitative data is usually analysed by highlighting categories or patterns of response. Rogers et al. (2011) suggest that typical examples of qualitative interview data are participants' responses to open-ended questions. After data has been assimilated, it can be classified, compared and combined with responses from other participants. This is done to extract meaning and patterns that can form a meaningful narrative. Zikmund et al. (2013) maintain that in unstructured responses, word counts can be used to derive a code or area of interest in the research. Furthermore, Oates (2006) differentiates

between the analysis of textual and non-textual data, and suggests that data can be classified using a deductive approach to analyse theories that already exist or that a researcher has developed. In addition, a researcher can use an inductive approach to identify areas from data that has been collected. One can then enhance the wealth of information into themes and sub-categories. Rule and John (2011, p.77) assert that "Good qualitative research would allow some codes to be brought to the data (deductive analysis) but ensure that ample room is created for the data to 'speak' and 'name' additional codes (inductive analysis)". In this study, an inductive approach to qualitative data analysis was used.

Oates (2006) contends that during qualitative data analysis themes and patterns are conceptualised from verbal, visual and auditory data. Zikmund et al. (2013) concur that words and phrases are used to highlight patterns and themes in qualitative data. Lazar et al. (2010) outline three stages of qualitative data analysis. In the initial stage, information about the research idea is brainstormed; during the second stage the properties and magnitude of each component is analysed and the final stage ensues when the evaluated information is used to enhance the criteria being researched.

Methods of data analysis for qualitative data include transcribing data and categorising data. The researcher can transcribe verbatim quotes from participants as this conveys succinctly the viewpoints of participants. Cohen et al. (2018, p.657) contend that quotations are selected for their ability to "crystallise or exemplify an issue really well". In addition, memos can be used to analyse data as this provides an accumulation of ideas, comments and reflections. Thematic analysis with an inductive approach was employed to determine relationships between categories of data and summaries were written. Ultimately, an overarching relationship was established from the assimilated data. In addition, the conceptual frameworks of Day et al. (2006); Zembylas (2003) and Hargreaves (2000) were used to analyse data, together with relevant literature.

3.9.2 Narrative analysis

According to Gee (2005, as cited in Cohen et al., 2018), narrative analysis encompasses different approaches which adopt varying ontological and epistemological positions on the community and how it is understood. A narrative is a story with a personal perspective, written in the participant's own voice. It therefore embodies the participant's identity and emotions as

he or she controls what is written and in which sequence. Cohen et al. (2018) assert that narratives evoke emotional and aesthetic responses. In addition, narrative analysis brings fresh interpretations when encountering personal experiences. Riessman (2008) suggests that narrative analysis can use thematic analysis by identifying categories and themes; or structural analysis by interpreting how the language and structure of the narrative is related. Furthermore, Riessman (2008) explains that in examining a narrative, the researcher can look for what is happening, what are the main stories being related, what behaviours are displayed and other extrapolations that the data may provide.

3.9.3 Thematic analysis

According to Braun and Clarke (2006, p.4) "thematic analysis is a poorly demarcated, rarely-acknowledged, yet widely-used qualitative analytic method that offers an accessible and theoretically-flexible approach to analysing qualitative data". Furthermore, it is a method for categorising, examining, and recording patterns and themes within data. Thematic analysis was therefore used in this study for analysing semi-structured interviews and the reflective journals of participants. It was used to relate the experiences, and significance thereof to participants. In addition, thematic analysis in this study, examined the way in which events and experiences had an effect on participants in their personal everyday lives and teaching context terms of their identities and emotions during the teaching of evolution.

Braun and Clark (2006, p. 12) argue that "thematic analysis is not just a collection of extracts strung together with little or no analytic narrative, nor is it a selection of extracts with analytic comment that simply or primarily paraphrases their content". Thematic analysis depicts the analytic points the researcher makes about the data, and should be used to support and verify the data. Thematic analysis involves a number of choices and considerations before, during and after data is collected. According to Braun and Clark, (2006, p. 10) a theme "captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set". In thematic analysis, there needs to be an "ongoing reflexive dialogue on the part of the researcher" (Braun and Clarke, 2006, p.9). Themes were therefore established from the semi-structured interviews and collages to answer both research questions.

McMillan and Schumacher (2001, p.373) contend that the "ultimate goal of qualitative research is to make general statements about relationships among categories by discovering patterns in the data". Finding patterns entails examining the data in many ways. In this way, researchers try to understand the intricate links that connect people's situations, thought patterns, emotions and beliefs. Patterns can therefore take on different forms depending on the purpose of the research. This study utilised the 'building patterns of meanings' framework shown below:

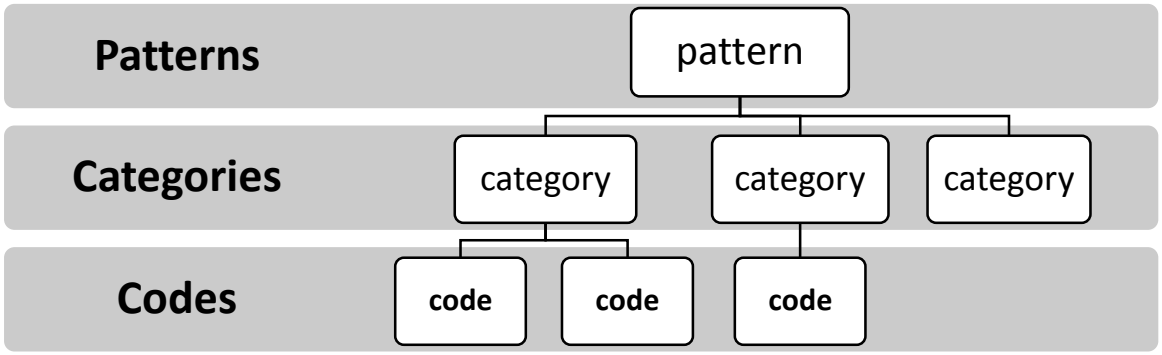

Figure 3.2: Building patterns of Meanings (adapted from McMillan & Schumacher, 2001)

In this research study, thematic data analysis was used to analyse data from the semi -structured interviews in the following way: the written responses of the interviews were transcribed and common phrases or words were identified and coded. This allowed me to find familiar ideas and concepts to make implications of the data. Rogers et al. (2011) contend that coding is a method widely used with interviews and reflective journals whereby codes or tags are used to group data according to themes or patterns. The coded concepts were therefore classified so that themes in the data could emerge. This led to discovering the patterns and trends in the data. These findings were corroborated with the participants to ensure that their responses were correctly portrayed. Thematic analysis occurred after coding and this involved identifying themes and patterns, which were grouped into logical categories. Rule and John (2011) argue that the discussion of the themes and the relationship between them is fundamental to interpreting the research topic at hand. In addition, mapping was used to describe superordinate categories and to group related items to demonstrate their view. Other ideas and themes that emerged were reflected on to determine if they were meaningful or redundant for this study.

3.9.4 Visual media analysis

Visual media offers an abundance of data in a single image. Cohen et al. (2018) contend that images influence how we think, that is, they can reflect our thoughts as well as encourage further reflective development. They can be used together with other sources of data and text and to ensure triangulation and trustworthiness. In analysing visual data, it is necessary that the researcher considers the extent to which the images are normal or contrived. I encouraged participants to be as natural and transparent as possible when creating and interpreting their collages. According to Cohen et al. (2018), a single image can have a variety of meanings and there is no one 'correct' way of interpreting it. Elliot et al. (2016, as cited in Cohen et al., 2018) argue that the researcher has the mammoth task of ascertaining the significance of the image to the participant. It is vital for the researcher to prompt a discussion from the participant to explain the image as it may contain multiple messages. I therefore requested participants to write a phrase or short explanation to describe each image in the collage. This provided me with greater clarity and direction.

In addition, Kaufmann (2011, as cited in Cohen et al., 2018) suggests that visual data can be divided into four levels of analysis namely: the image being analysed through the technology that produced it; the theoretical frameworks used to interpret the image; the medium and meanings of the message and ultimately the personal view of the researcher. Cohen et al. (2018) state that analytical tools such as content and discourse analysis can be used by the researcher. I used content analysis to interpret the collages assembled by participants. Using this method, visual images could be analysed in a similar way to that of analysing texts by 'reading' through for meaning, perspectives and values of the participant. To analyse the second research question: To what extent is teaching evolution in Grade 12 life sciences an emotional practice? I identified which images could be used in the analysis. A coding system was used to code the images, together with their frequencies (Cohen et al., 2018). I looked for patterns in the data, comparing and contrasting the organisation of patterns. Visual data analysis was therefore a useful tool in examining collages; however, limitations also ensued such as overlooking an ideological-critical way of viewing the image (Cohen et al., 2018).

3.10 Ethical considerations

Cohen et al., (2018, p.111) states that "ethical considerations are contextually situated – socially, politically, institutionally, culturally, personally – and each piece of research raises ethical issues and dilemmas for the researcher". Ethics, according to Cavan (1977, as cited in Cohen et al., 2018, p.112) is defined as "a matter of principled sensitivity to the rights of other". In other words, Gilliland (2015) asserts, it is concerned with what is approved and appropriate when conducting research. In addition, research ethics has a two-fold purpose: it may apply to research pertaining to humans and the environment or it may question the credibility and reliability of the researcher. It is fundamental that researchers are cognisant of the effects of the research on participants. They are accountable for conducting their research in a manner that preserves the dignity of the participant. In the same vein, Lazar et al. (2010) argue that participants should be treated fairly and with respect. Researchers have to provide participants with the relevant information pertaining to the research. Rule and John (2011) concede that values of rigour, transparency and professional ethics is crucial in any research project. The principle of informed consent, Cohen et al. (2018) contend, concerns autonomy, and it is the right of a participant to freedom, confidentiality and to withdraw at any time since participation is voluntary. In addition, Creswell and Creswell (2014) emphasises the four instances that ethics must be taken into consideration: firstly, before the study is conducted; secondly, at the initial stages of the study; thirdly, during the collection and analysis of the data; and finally in verifying, sharing, storing and reporting of the study.

The following guidelines on research ethics by Rule and John (2011) were implemented in conducting research for this study: Firstly, a detailed and trustworthy description of how activities and proceedings happened during data generation was necessary. Secondly, descriptions were verified with participants, whereby participants were given the opportunity to review and confirm their verbal or written contributions. Next, an audit trail was important and this was achieved by tracing back original sources of data. With the guidance of my supervisor, I was able to verify how data was interpreted.

There are ethical issues that need to be considered when using data generation methods such as semi-structured interviews, visual methods and observation. Firstly, it was necessary to obtain ethical clearance from the ethics committee in the higher education institution in which this study is taking place in order to obtain gatekeeper's permission and to conduct the research

with teachers (Cohen et al., 2018). This was done by applying and obtaining the ethical clearance from the University of KwaZulu- Natal to do research (Appendix 2). Permission from the Department of Basic Education (DBE) to conduct the research in schools (Appendix 1) was also obtained by submitting a proposal with the relevant documents to allow me to carry out my research study in the sample of schools selected. These permission letters were emailed to the principal and teacher participant of each school in this study.

3.10.1 Gaining access to the schools

It was critical that I contacted the five principals and gained consent from them. Letters explaining the reason for my research, my identity, contact details and the university I am associated with, was provided to each principal (Permission letter from Principal, Appendix 3). The letters clearly stated that participation by teachers was voluntary, confidential and that participants could withdraw at any time if they wished to do so. The letter to each principal obtaining permission to conduct research was signed and approved.

After being granted permission by the school principals, I contacted the selected life sciences teachers, by e-mail, in compliance with the recommended COVID-19 regulations. Cohen et al. (2018) contend that the researcher has to obtain informed consent from the participants to participate in the research study. This was achieved by clearly explaining the objective of the research study to the participants in an informed consent letter (Appendix 4). In this letter, the participants were cognisant that they had a choice to withdraw at any time if they were not comfortable with participating in this study and that their participation was voluntary. The informed consent letters were consequently explained and signed.

Anonymity of participants is an important ethical issue to be considered when doing research (McMillan and Schumacher, 2001; Cohen et al., 2018). The identities of the participants and their schools were not published in order to safeguard them. This was accomplished by giving pseudonyms to the participants and their schools. Any differentiating features that could have identified the participants were also altered. Confidentiality is another important ethical principle that needs to be incorporated when doing research (McMillan and Schumacher, 2006; Cohen et al., 2018). Data provided by the participants must be protected by not revealing or communicating it to other individuals. This confidentiality was achieved by safely storing all

the transcripts in my supervisor's office at the university for a minimum of five years, and thereafter, it will be disposed of.

3.11 Ensuring Rigour and Trustworthiness in the study

Rule and John (2011, p. 108) assert that "triangulation is a process of investigation in research, whereby more than one data collection source or techniques are used to ensure that rigor, reliability, validity and good quality is achieved during data-collection procedures". In addition, triangulation of data sources was utilised by using multiple data techniques to consolidate and provide weightiness to this study. Crystallisation ensures that more facets of the nature of reality are included in the research through the use of additional materials and methods (Rule and John, 2011, p. 109). Various approaches were employed to ensure that this research study was trustworthy. Data was therefore generated using semi-structured interviews, collages and reflective journals. These data generation methods were suitable to collect the qualitative data to address the research questions in this study. Furthermore, the trustworthiness of this study was verified when participants clarified their findings and added to or corrected any statements that was erroneously interpreted (Rule & John, 2011). Furthermore, I stated my position as a Grade 12 life sciences teacher and my own bias towards teaching evolution. I assured participants that my experience will not influence the information that they provide, but rather would enrich the validity and outcome of the research.

Pseudonyms were used in order to protect the identities of the participants (Cohen et al., 2018). Participants were informed about the ethical issues pertaining to the research, such as voluntary participation, anonymity, confidentiality and the free will to withdraw if the case arises. The principals' consent letters (Appendix 3) and the teachers'consent letters (Appendix 4) clearly stated that the identity of their schools was to remain anonymous and all the information was to be treated with confidentiality in accordance with the code of ethics as stipulated by UKZN Research Committee. Permission was therefore sought from the UKZN Humanities & Social Sciences Research Ethics Committee (Appendix 2) and the Department of Education (Appendix 1) to conduct the research. Trust had to be established to uphold the integrity of the research, and to prevent any negative reflections on the learning institution. I ensured that all the information they offered was treated with the utmost discretion and regard. All principals and participants signed a letter of informed consent.

I did not dwell on participants' personal matters such as religious affiliation or questions with regard to their emotional stance towards teaching evolution, when I observed that the participant was intentionally avoiding a detailed response. I engaged with the school counsellor to offer assistance to my participants in the event of them being negatively affected by sharing their identities and emotions towards teaching evolution. It was pleasing to note that none of my participants revealed that they were affected and that they needed assistance in the form of counselling. I was on the contrary, encouraged by their resilient spirit and commitment towards achieving their lesson outcomes with learners and overcoming challenges along the way.

I also had to consider ethical procedures when using visual media. Participants were required to compose collages and this was subject to the same ethical concerns as other forms of data generation instruments. Images such as photographs often identify people, therefore ethical issues of identification and anonymity of individuals was pivotal in ensuring rigour. Prosser et al. (2008, as cited in Cohen et al., 2018) contend that visual media raises issues of informed consent and confidentiality. This may be problematic as the details of a person or place lies in the picture and if one obliterates the identifying features, then one destroys the very essence of what is needed in the research. It was therefore crucial that participants understood the purpose of this study and what they were giving consent to. A key principle in image-based research is *primum non nocere*: 'first of all, do no harm' (Cohen et al., 2018, p. 633). Participants were encouraged to be creative in their compilations and interpretations of their collages, but to be mindful of not causing harm to any individual or institution.

3.12 Conclusion

In this chapter, the research methodology and design of the study was outlined. The qualitative research approach and the interpretive paradigm were explained. The ontological and epistemological underpinnings of qualitative research and narrative inquiry were discussed. In addition, the strengths and criticisms of the interpretive paradigm were considered. The research context and location of the study as well as sampling techniques such as convenience sampling of schools and purposive sampling of participants were described next. Data generation procedures and data analysis of the various data generation methods used in this study including semi-structured interviews, collages, lesson observations and reflective journals were defined and discussed. The chapter ended by discussing the ethical considerations of the study and ensuring the trustworthiness and rigour to this research study.

The next chapter presents the data and research findings located in the wider scope of the experiences of the life sciences teachers in the teaching of evolution in Grade 12 life sciences.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

I want to understand the world from your point of view. I want to know what you know in the way you know it. I want to understand the meaning of your experience, to walk in your shoes, to feel things as you feel them, to explain things as you explain them.

In the end we come up with a conclusion that we need to start from somewhere.

Deyth Banger

4.1 Introduction

The preceding chapter discussed the methodology and research design of this study. The chapter focussed on the data presentation and analysis. After data was collected, it was coded, analysed and interpreted. Verbatim quotes from participants were included in the presentation of narrative data as this succinctly conveyed their viewpoints. Quotations were selected for their ability to "crystallise or exemplify an issue really well" (Cohen et al., 2018, p.522). Thematic analysis with an inductive approach was employed in this qualitative study to determine relationships between categories of data and themes before summaries were written. A number of coherent themes emerged that were used to address research questions 1 and 2 outlined below:

1. How do teachers' personal and professional identities influence their teaching of evolution in Grade 12 Life sciences?
2. To what extent is teaching evolution in Grade 12 Life sciences an emotional practice?

In addition, the conceptual frameworks of Day and Gu (2007), Hargreaves (2000) and Zembylas (2003) were used to analyse data, together with a plethora of relevant literature. This chapter commences with a brief biographical description of the six Grade 12 life sciences teachers who participated in this study. This information includes the teachers' age group, their teaching experience and their qualifications. All participants were given pseudonyms to

maintain confidentiality of their identities. This is followed by a discussion of teachers' perceptions of Evolution as a platform to catapult the research questions above. I then tabulated significant themes that emerged from the data to provide the reader with an overarching sense of this research study. This is subsequently followed by an in depth analysis of the themes in keeping with the rationale of this research. Fundamental themes explored the personal and professional identities of teachers and how this core facet of their lives influenced their teaching. In addition, their emotions were considered to establish the extent to which teachers' emotions affected their teaching of evolution in Grade 12 life sciences. Data is presented according to research questions 1 and 2 using semi-structured interviews, collages and reflective journals. Participants' verbatim responses are integrated in the narrative and represented in italics.

4.2 Profiles of participants

A brief synopsis of each teacher participant follows. For each participant, I used a pseudonym to maintain confidentiality. My position as a life sciences teacher and teaching Grade 12 evolution at the time of this study, inspired me to use names from a biological evolution background in keeping with the level that the teacher participant was at, in terms of experience in their teaching career. I have also elaborated on the name of the fossil or discoverer to provide a deeper understanding of each participant, once again stemming as a reflexive practise of being a life sciences teacher. According to Creswell (2013, p. 56) "narrative researchers position individual stories within participant's personal involvements (their occupations, their families), their culture (racial or indigenous), and their historic contexts (time and location)".

4.2.1 Participant 1: Naledi: service to learners and the school

Homo naledi belongs to a species of archaic humans and dates back to the Middle Pleistocene era. *Homo naledi* is the youngest, most recent fossil and was discovered by Professor Lee Berger in the Dinaledi Chamber of the Rising Star Cave in the Cradle of Humankind, South Africa in October 2013.

Naledi is a young female teacher in the age category below 30 years with five years of teaching experience at FET level. At the time of this study, she was teaching grades 11 and 12 life sciences and Grade 9 natural science in a school in an urban area that had learners coming from

predominantly underprivileged socio-economic backgrounds. Her qualifications included a Bachelor of Education specialising in life sciences.

Naledi believed that as a life sciences teacher, "my primary priority is to ensure that I pass on subject content but also engage learners. There are some aspects where I do engage with learners on a personal level and that helps because it relates with learners and helps them understand better".

4.2.2 Participant 2: Karabo: personally and professionally, I am a learner always

'Karabo' is the common name given to the genus *Australopithecus,* species s*ediba.* She was discovered by Mathew Berger in 2008, in the Malapa Cave in Maropeng. The unique feature of this fossil is that it is a transitional fossil between *Australopithecines* and the genus *Homo.* This fossil is intermediate because it has a cranial capacity that is at the upper end of *Australopithecines* but indicates good upright locomotion and short, powerful hands similar to that of *Homo* species.

Karabo is a young female teacher in the age category of between 30–40 years with 12 years of teaching experience. At the time of this study, she was teaching grades 10, 11 and 12 at her school which is a well–resourced urban school located in a more affluent part of Pietermaritzburg. Her qualifications included a Bachelor of Education (Senior and FET phase) with majors in life sciences, natural science, geography and life orientation. Karabo is currently the Subject Head of life sciences at the school she teaches at.

Karabo explained her personal and professional identity as a life sciences teacher as follows:

> *Personally I invite learners to interact and feel comfortable in the classroom. I do allow learners access to my personality as it helps them relate better to me as a teacher and leader. Professionally, I always set goals and outcomes with learners and I am always transparent with regard to Life sciences and the teaching and assessment of it. I strive towards being consistent in my professionalism in and out of the classroom. Both personally and professionally, I am a learner always.*

4.2.3 Participant 3: Laetoli: knowledge is power

From an evolutionary background, the *Laetoli* footprints was discovered by Mary Leakey in 1978 in Tanzania. They provide evidence that bipedalism, that is, the ability to walk upright on two limbs, must have evolved at least 3.6 million years ago.

Laetoli is a female participant in the age group of 30 to 50 years with 9 years of teaching experience at both secondary schools and at tertiary level in life sciences. She is currently completing a Doctor of Philosophy degree which explores genetics in life sciences.

Laetoli explained her personal and professional identity as follows:

> *Personally, I believe that knowledge is power. I am always willing to learn more and be open to other people's point of view. I think these are values that were instilled in me through my family and formal education. Professionally, I apply the same principles. My students have some views/ understanding when they enter my classroom. Therefore, I start from there and aim for the correct scientific understanding. I respect my learners' views/ beliefs, but am ready to challenge them for their own conceptual understanding of the topic I am teaching.*

4.2.4 Participant 4: Ardi: a well-prepared, knowledgeable and responsible teacher

Ardi belongs to the group *Ardipithecus ramidus*, and is given the common name of "*Ardi".* Fossils of this group was discovered by Tim White in 1992 in the Middle Awash river valley in Ethiopia. The unique feature of this fossil is that it is the oldest hominid fossil discovered in Africa. It displays climbing hands with broad palms and a small cranium equivalent to the size of a modern chimpanzee. Characteristics shared with humans was evident in the primitive form of bipedalism and there was no evidence of knuckle – walking.

Ardi is a female teacher in the age category 50 to 65 years with 36 years of teaching experience. At the time of this study, she was teaching grades 10, 11 and 12 in an urban school which is moderately resourced. Her qualifications included a Bachelor of Physical Education, Higher Diploma in Education, a Diploma in Education Management and a Diploma in ACDE Mathematics. She has taught physical education, health education, natural science and biology at her previous school and currently teaches mathematics, mathematical literacy and life

sciences in the FET phase. Ardi was very interested in sports, having been the sports mistress for twenty-one years at her previous school. She has been the volleyball convenor at her present school for six years.

As Ardi reflected upon her teaching career she had the following to share:

> *I am a well-prepared, knowledgeable and responsible teacher. I set the tone and culture in the class based on my values, attitudes and belief system. My learners have the opportunity to discuss challenges and talk in my class about work that is being taught. I believe that in my class, learners must be responsible, respectful and disciplined. Learners are empowered and learn to appreciate and understand others in terms of respect, manners and discipline.*

4.2.5 Participant 5: Lucy: an understanding, fair and reasonable educator

"Lucy" is an example of *Australopithecus afarensis.* The fossil of Lucy was discovered by Don Johanson in 1974 in Ethiopia. This fossil was named after the Beetles' song "Lucy in the sky with diamonds" because it was discovered around the same time period. The unique feature displayed by "Lucy" is that it is the most complete skeleton of *Australopithecus afarensis* ever found. "Lucy" was short averaging about 1, 1 metre tall and only weighed 30 kilograms, with a small cranium. She displayed definite bipedalism which was gauged from the S-shape of the spine, the short, wide pelvis and the forward position of the foramen magnum.

Lucy is a female teacher in the age group 50 to 65 years. She has been teaching natural sciences in grades 8 and 9 and life sciences in grades 10, 11 and 12 at her current school since 1993, but actually started teaching way back in 1981. She graduated from Springfield College of Education, and is a UNISA graduate with a Bachelor of Arts degree. At the time of this study, she was the Deputy Principal at her school. Lucy described herself as:

> *An understanding, fair and reasonable educator, but I do expect a lot from my students. No doubt, biology, now called life sciences involves both understanding and memorisation. It is my expectation that a learner should be interested in science and that there is a decent chance that he/she will pursue life sciences in the FET phase, and hopefully continue at tertiary level.*

Lucy went on to relate her "teacher biography" as follows:

> *Aside from teaching, my husband and I have two children, both girls. They have completed matric and are currently completing their studies through UNISA, so things can be pretty chaotic, especially around exam times. I enjoy spending time with my family, travelling, reading, watching TV/ movies, listening to music, being with my friends and family.*

4.2.6 Participant 6: Eve: what you see is what you get

According to Bridgelall et al. (2020, p. 94):

> Analysis of mitochondrial DNA suggested that all humans have been linked to a common ancestor termed 'African' or 'Mitochondrial Eve". A mutation in the mitochondrial DNA of a female hominid that lived in Africa about 150 000 years ago is present in all humans living today.

I have chosen the pseudonym 'Eve' for my final participant as she has a phenomenal teaching career of 47 years having taught in six different schools in Durban and Pietermaritzburg collectively. She is also a female teacher in the age group 50 to 65 years. Her qualifications included a National Certificate in Teacher Education. She is fondly known as the "Matriarch of life sciences" at the well-resourced, diverse school she currently teaches at. Eve emphatically and confidently asserted that, "*what you see is what you get – my identity as a person and as a professional are the same. My personality comes through clearly as I work seriously but also share humorous moments, but at no time am I derailed from accomplishing the task I set myself"*.

From the profile of participants described above, it is clear that the six participants share a common thread in the field of education and are suitably qualified as secondary school teachers, especially in teaching life sciences. They all held appropriate diplomas or degrees in the field of science and education and were employed by the Department of Education or the governing body at their school. They have taught life sciences in Grades 10, 11 and 12 for a minimum of five years and were still currently teaching these grades, at the time of this study. These

participants were therefore appropriate as they displayed both knowledge and insight into Grade 12 life sciences.

4.3 Participants' perspectives on evolution

I began this section on the interpretation of the theory of evolution by reviewing Charles Robert Darwin (1809- 1882):

> These laws, taken in the largest sense, being growth with reproduction; Inheritance which is almost implied by reproduction; variability from indirect action of the conditions of life; and from use and disuse: a ratio of increase so high as to lead to a struggle for life; and as a consequence to natural selection' entailing divergence of character and the extinction of less improved forms.

Next I outlined how two textbooks that are currently used by Grade 12 life sciences teachers and learners describe the concept of evolution:

According to Bridgelall et al. (2020, p.72):

> Evolution refers to the process by which populations change over time, in response to a change in their environment. The process of evolution can occur rapidly, for example different flu vaccines are needed each year because the RNA of the flu virus is continually mutating in response to new vaccines; or evolution can occur very slowly: modern crocodiles closely resemble their ancestors from the Mesozoic era, over 65 million years ago.

In addition, Bowie et al. (2018, p.288) corroborates that:

> Evidence for evolution and natural selection is found in the fossil record, modification by descent, biogeography, genetics and anatomy. Darwin's theory of natural selection says that living things adapt to their environment, with the best adapted organisms surviving and gradually changing over time. Evidence is growing for the theory of common ancestors for living hominids, including humans.

I then captured the understanding and perceptions that participants had of evolution. This was important as it provided a platform from which to apply and understand the data collected from the two research questions based on teachers' identities and their emotions in teaching evolution. Teacher participants had the following perspectives to share on evolution: Naledi believed that, *Evolution is the biological change in living organisms over time, through a process of Natural Selection.* Naledi's view on how life on Earth began was, *as a Hindu, I believe the universe and life was created by the divine beings Brahma and Vishnu. Essentially, all life exists through God.*

Karabo, on the other hand, explained her understanding of evolution as follows, *My idea of evolution is that it is a combination of scientific hypotheses and theories which are partially supported by evidence that was found throughout the history of life with regard to the origin and divergence of various species*. In addition, Karabo emphasised that, *it comprises of ever-changing information in which facts are altered based on new findings which are not necessarily linked to previous evidence and knowledge researched by scientists before*. Karabo felt strongly that, *in some cases, where information is built on evidence from earlier research, it could be controversial and abstract and I feel that there are many grey areas in the study of and the basis of evolution*. She asserted that, *the theory of Natural Selection is the only theory which is consistent and viable*. In addition, Karabo believed that, *life on earth and the earth itself was created and perfected by God alone. I also believe that in the process of creation, God gave humans wisdom in science in order to question and make inferences, but not to do so in a way that takes away from His Sovereignty*.

Laetoli described her understanding of evolution simply as, "*The change in characteristics of populations and species over generations".* Lucy's understanding of the theory of evolution was congruent with that of Karabo, as she elaborated:

> *As a result of natural selection, characteristics of organisms change over time due to competition and environmental changes. Over time, new species develop through speciation – especially when a group of organisms change so much that they cannot interbreed with the original species. Hence, natural selection and speciation are two processes responsible for the diversity of living things we see today and are an integral part to evolution. Therefore, this framework of understanding recognises that – change*

occurs over time. Various theories have been put forth regarding evolution – Lamarck in 1700's, Darwin in 1800's and a more recent theory to explain evolution is punctuated equilibrium in 1900's – therefore evolution has been the subject of much discussion.

Ardi had parallel views to Laetoli and Lucy and believed that according to the theory of evolution, *all species change over time. Understanding evolution helps us solve biological problems that impact on our lives, for example in the field of Medicine, researchers are able to understand the evolutionary patterns of disease-causing organisms*. In addition, Ardi believed that life on earth was created by a "superpower". She embraced the theories of natural selection and Darwin's theories.

Eve conceded that Evolution is, *the progressive change in species over time*. She however, went on to clarify: *I believe that not all organisms developed to the same extent – some linear progression and others, dichotomous or branched progression*. In addition, Eve, in accord with Karabo's viewpoint echoed that, *God created the world and everything in it – it is the time frame that I'm not sure about. How long was a day?*

4.4 Analysis of emerging themes

The ensuing themes arose from the data collected through semi-structured interviews, collages and reflective journals. It is categorised according to the two key research questions and is analysed using the conceptual frameworks of Day and Gu (2006), Hargreaves (2001) and Zembylas (2001, 2004). I first present the themes that emerged from the data collected in response to research question 1. This is presented in Table 4.1 using brief responses from participants gathered from semi-structured interviews, reflective journals and a synopsis of teacher identities extracted from their collages. This is followed by a broader discussion of each theme adopting the relevant conceptual framework/s and literature to analyse each theme. This will enable the reader to gain an overview of this research analysis as well as a deeper perspective. Table 4.1 below is a summary of the themes that emerged from the data generated in relation to research question 1: How do teachers' personal and professional identities influence their teaching of evolution in Grade 12 Life sciences?

Themes	Synopsis of teacher responses to Personal, Professional and Situated identities	Conceptual framework
Equipped to teach: • Delivery of curriculum • Become a better teacher • Always give the best you can • I've opened the doors wide • Pass the desire to learn more	**Naledi:** The young, anxious, challenged teacher who wants to become better. Equipped to teach, delivery of the curriculum is important. My primary priority is to ensure that I pass on subject content. I want to become a better teacher. Sense of responsibility for others. **Karabo:** The life-long learner filled with optimism and hope**.** Equipped to teach, always give the best of you. I try to teach as passionately as I can. **Lucy:** Epitomises dedication to the teaching profession. Researcher/ life-long learner. Plan how to teach your material. Networking, communicate more, ask, learn, refine, improve. Passion is infectious. Pass this desire to learn more to my learners. **Laetoli**: I believe that knowledge is power. **Ardi:** Life-long dream was to become a teacher. Equipped. It was my dream from a very young age to become a teacher. I am a well-prepared, knowledgeable and	Day and Gu Personal, situated and Professional identities

	responsible teacher. I've opened the doors wide.	
Conformed and compromised identities? .	**Naledi**: A quiet, pragmatic and serious person. It did not change my identity as a person because my beliefs and perspectives did not change. **Karabo:** Live a healthy, colourful life. Wellness for everybody. Challenged **Lucy:** Be a teacher not a friend. **Laetoli**: My identity is up-held because I am a product of evolution. Teaching evolution has nothing to do with my identity. Open to other people's point of view. **Ardi:** I set the tone and culture in the class based on my values, attitudes and belief system. I had to be clear, knowledgeable and unbiased. **Eve**: Was not affected – if questioned I would say I don't actually care where I came from but rather where I am going. It's imperative to be different.	Day and Gu's Personal and Professional identity
Conflicting Religious identities versus teaching evolution	**Naled**i: As a Hindu, I believe the universe and life was created by the divine beings Brahma and Vishnu.	

	Karabo: I am a very spiritual person and my beliefs are contrasting to both topics. Is there any truth to evolution? **Laetoli:** We need to distinguish between science and religion. **Ardi:** Many concepts go against learners' religion and values, therefore some learners may not accept this knowledge	
Resilient identities Teacher first, then friend Adapt to become a better teacher When you make mistakes, learn from it Emotional maturity	**Naledi:** Service to learners and the school **Karabo**: it has challenged me, it has made me a better teacher. That's my dream – to become better and better. My goal was always to win. When you make mistakes, you learn from it. Discovery is important. **Eve:** The matriarch, support to other teachers in Life sciences. What you see is what you get, at no time am I derailed from accomplishing my task. Tried and tested. Responsibility, be better **Ardi**: Doubling your chances of getting to the final. I think you need to be mentally tough to win. I want women to embrace ageing, and be proud of it and do it well. **Lucy**: Never quit.	Zembylas: teacher resilience

Table 4.1 Teachers' responses to the research question 1 (using semi-structured interviews and collages) with emerging themes and conceptual frameworks

4.4.1 Equipped to teach

My teacher identity is one of passion, purpose, perseverance, patience and being a perpetual learner. I am a teacher because of MY teachers – that is a teacher's legacy.

Lara Searcy

Naledi is a young, anxious teacher with an introverted personality who has a love for the planet and a sense of responsibility for her learners. This comes across clearly as she points out that, "*my priority is to pass on subject knowledge, service to school and learners and to become a better teacher".* It is clear that her personality influenced her teaching of evolution when she said, "*I feel challenged and perplexed, but just want to complete the syllabus"*. The latter part of her statement shows her commitment towards her learners and 'service delivery' and her aim to become a better teacher. She however faces challenges in teaching evolution stemming from her personal identity. Her shy, non-confrontational nature coupled with a sense of eagerness to succeed in the classroom, poses a dilemma when teaching the contentious topic of evolution. Naledi's personal identity comes through when she refrains from debatable issues with her learners. However, her professional identity comes to the fore when she places her learners first and prioritises their learning of subject content and willingness to share her time and resources beyond school notational time.

Karabo, on the other hand, has an outgoing, extroverted personality with a passion for life who wants "*to live a colourful, healthy life"*. Her goal as a professional, however is similar to that of Naledi - to "*give the best of you".* She stated that "*both personally and professionally, I am a learner always".* This facet of Karabo being "*a life-long learner"* and her positive, optimistic personal identity enables her to improvise and be willing to adapt and learn more about the evolution content so she is able to meaningfully cascade this to her learners. She felt that she was "*equipped to teach"* and in addition, tries to teach "*as passionately as I can".* However, Karabo also displayed another facet of her personal identity when she questioned, "*Is there any truth to evolution?"* Karabo felt strongly that, "*in some cases, where information is built on evidence from earlier research, it could be controversial and abstract and I feel that there are many grey areas in the study of and the basis of evolution".* This highlights the dilemma that Karabo, and many teachers face when teaching a controversial topic such as

evolution. Certainly, teachers' personal and professional identities do influence their teaching of evolution in Grade 12 Life sciences.

Lucy, on a personal level is a mother and wife who enjoys spending time with family and friends. She also engages in various hobbies when time is available. Professionally, she shares the passion to teach similar to that of Karabo, and hopes to "*pass this desire to learn more to my learners"*. Lucy described herself as a life sciences teacher in the classroom as follows:

> *I have a passion for my subject matter. I have good communication skills as well. I am friendly and approachable, yet a strict disciplinarian. I am passionate about teaching effectively. Lessons have to be 'curriculum-centred'. It is important to foster a positive learning environment and to be able to establish trust, respect and rapport. I believe that every student has the ability to achieve if they work to their full potential.*

Lucy's response exhibited a genuine concern and love for her profession and her students. Lucy also pointed out that at her school, there is an open door policy with regards to support from the School Management Team, but it was important to follow protocol. She emphasised that it is important to *"plan how to teach your material, to network, communicate more, to ask, learn, refine and to improve".* This demonstrates that most teachers are "equipped to teach'. Lucy epitomises dedication to the teaching profession, however, according to Sammons et al. (2007) one of the many challenges faced by teachers is the difficulty in striking a balance between pressures at work and those in their personal life. They must endeavour to consolidate their professional life, personal life and school setting to maintain a constructive identity.

Finley (2001, cited in Cele, 2017, p.29)) outlines the effectiveness of using collages to highlight a teacher's identity, "The structures of collage simultaneously emphasises personal meanings, history, culture and traditions in such a way as to bring disparate voices of the internal-personal and external contextual to a common place". This is vividly captured in Lucy's collage that is depicted as an example below. I have included the collages of the remaining participants under *Appendices*.

Figure 4.1: Collage compiled by Lucy

Figure 4.2: Collage complied by Karabo

Laetoli is both a mother and wife who believed "in being open to other people's point of view". She felt that her innate values were instilled in me through my family and formal education. On a professional level, "I aim for the correct scientific understanding. I respect my learners' views and beliefs, but am ready to challenge them for their own conceptual understanding of the topic I am teaching". This quality of Laetoli demonstrates that both her personal and professional identity profoundly impacts her teaching of evolution, in that she is able to appreciate her learners' views but also equips them to think broadly and critically. Indeed, she encourages her learners that "knowledge is power".

Ardi's life-long dream was to become a teacher. She emphasises this by saying, "It was my dream from a very young age to become a teacher". Ardi further adds that "I am a well-prepared, knowledgeable and responsible teacher. I am equipped to teach". Ardi embodied her passion to teach from a young age into her professional identity where she felt that she had accomplished her life-long goal of being a teacher, "I've opened the doors wide". She clearly believed that she has carried out her responsibilities of being a teacher well and have opened the way for many learners to excel. She has fulfilled the duties as expected by the DoE (2000) as cited by Govender (2009, p.48): "learning mediator; interpreter and designer of learning programmes; leader, administrator and manager; assessor; researcher and life-long learner; a pastoral role and a learning area specialist". This view is further supported by Mpeta (2013) who contends that teachers' understanding and outlooks about what establishes meaningful learning often relates to an undeniable identity which emanates from within the teacher and is replicated in their choice of classroom communication. In addition, Mpeta (2013) asserts that the identities and beliefs systems of teachers influence how they plan and bring into effect certain instructional approaches which will influence how learning unfolds.

4.4.2 Conformed and compromised identities

Naledi found that personally her identity was negatively affected during the teaching of evolution, "It was upsetting because my views on creation of life is purely based on religious belief, however; it did not change my identity as a person because my beliefs and perspectives did not change". On a professional level, she simply stated that, "I had to teach evolution and natural selection as prescribe". Karabo, on the other hand, indicated that her personal identity was not affected on a personal level during the teaching of evolution. On a professional level,

however, “it has challenged me as I have had to research current data relating to the topics and make it more reliable”.

Laetoli was emphatic that her identity was not compromised. She asserted, “on the contrary, my identity is up-held because I am a product of evolution, a human being who shared a common ancestor with other beings who roamed the earth millions of years before me”. However, she also said that teaching evolution has nothing to do with my identity. Does this imply a conflicting identity? In addition, Laetoli believed that she:

> *[k]nows how science works, the nature of science. Therefore, teaching evolution has nothing to do with my identity. I understand that evolution is a theory which scientists use to explain natural phenomenon that exists in nature. There is enormous evidence to support the theory of evolution not just in biology/life sciences, but from geology, astronomy, physics and chemistry.*

Laetoli believed that her role as a teacher is to, “communicate science to my students to enhance their scientific literacy. In the classroom I want my learners to understand evolution based on evidence, and not just to believe in it. I think as a teacher, you should teach some ideas/concepts even if you are not in favour of them”. Eve confidently proclaimed that her identity as a person and life sciences teacher, “was not affected – if questioned I would say I don’t actually care where I came from but rather where I am going”.

On a personal level, Ardi lives life in “*full colour”* and emulates health, fitness, sport and a love for her home and pets. On a professional level she feels equipped and is passionate about teaching. She believes that she has *opened the doors wide* for many learners. It is however, worthy to note that she “*sets the tone and culture in the class based on my (her) values, attitudes and belief system”*. This indicated a classroom environment where learners are inclined to learn and behave according to Ardi’s belief system which embraces strict discipline and an authoritarian teaching style, which is in contradiction to her saying, “*learners are allowed to ask questions and share their views”*. As in the case of Laetoli, does this indicate a conflicting identity? It is evident that her personal identity overflows into her professional identity. Zembylas (2003) describes this learning context as a “power play” where the teacher exercises their authority over learners, for example when a teacher influences a learner’s notion of evolution based on their own religious beliefs. Naidoo (2014) asserts that teachers occupy

positions of influence and dominance in their classrooms, and as such, are in control of the knowledge chosen to be taught, the expedition of learning activities and orchestrating correction. In the classroom, the teacher acts 'in loco parentis', together with being a learning mediator, leader and a pastor (Govender, 2009). This suggests, therefore, that the personal and professional identity overlap. It is, however, essential to assume the role of a responsible adult, ensuring tone and discipline in the classroom to enhance the well-being and educational needs of each learner under their guardianship.

In contrast to Ardi's professional identity, Laetoli is the rewarded, fulfilled teacher who stimulates learners' interest and accountability for their own learning. On a personal level, she is a serious-minded, thoughtful individual who has deep- seated values that were instilled by her family. These values include respect for others and a hunger for knowledge. This is evident when she said, "*I believe knowledge is power. I am open to other peoples' point of view"*. She stated that "*professionally, I apply the same principles"*. This not only shows the profound link between a teacher's personal and professional identity but also that it does indeed influence their teaching of evolution. The clear link in Laetoli's case is also seen when she "*challenged her learners' beliefs"* and emphasised that this was for their own understanding and development. Her personal desire to learn more being cascaded and filtered down to her learners.

In a similar way, Eve stated that, "*my identity as a person and as a professional are the same"*. The collage compiled by Eve depicted her personal identity with phrases such as: "you make it beautiful" and "a love for words". With a wealth of experience and a robust personality, Eve does not withhold from expressing herself boldly. Her strong personal character comes across in her interaction with her learners when she stated that, "*my personality comes through clearly as I work seriously but also share humorous moments, but at no time am I derailed from accomplishing the task I set myself"*. Once again, this highlights that a teacher's personal identity is streamlined with that of their professional identity and this flows into his/her classroom. This resonates with Govender (2009) who asserts that the identity of a teacher includes the way they feel about themselves professionally, personally and emotionally at home or in the school environment.

Teacher identities, according to Jansen (2001, cited in Naidoo, 2014, p.81) refers to "the way teachers feel about themselves professionally, emotionally and politically given the conditions of their work". According to the MacMillan English Dictionary (2007), a teacher is defined as one whose occupation is to instruct and impart knowledge. However, Govender (2015) argues that this is not an adequate definition, as the teacher today is a highly complicated individual – personally and professionally. It is evident from Table 4.1 presented earlier that the personal and professional dimensions of most teachers are complicated and overlap in the sense that a participant's personal identity influences their professional identity and consequently their teaching in the classroom. Naidoo (2014, p.25) asserts that the professional identity of a teacher is:

> *manifested in their classroom practices by way of deliberate choices made in planning lessons, style of teaching, activities with which they engage learners in the classroom, their discipline measures, engagement with school activities … partially influenced by their feelings about themselves in the context of the school and society's recognition of them, as well as their feelings about their learners*.

This correlates with Wadsworth (2015) who argued that every belief that a person has, shapes the choices that they make. She further emphasises that teachers have a strong influence on the learners that they teach and must be aware of their actions, words and choices.

Shulman (2004) contends that one of the seven domains of knowledge is content knowledge. If teachers are not adequately developed professionally, then their delivery of content to learners is compromised. This resonates with Berkeley (2018) who claims that teachers who develop a depth of knowledge beyond what is actually required of learners, will be empowered to confidently adapt their teaching according to the needs of their learners. The question arises: are teachers adequately trained and prepared to address the topic of evolution in the curriculum, not just in terms of content delivery, but contentious issues that learners grapple with. Are the identities of teachers comprised in the classroom? Are some teachers, perhaps due to a young age, such as Naledi was not adequately equipped professionally to teach evolution, and therefore experienced emotions of anxiety and despair? At this stage I was prompted to deliberate: "a variety of years in teaching – does age matter?" This study suggests that age is an indicator of professional development that might be a factor in influencing how the topic of

evolution is taught in the classroom. Naledi, who falls into the professional life phase category 4 to 7 years (Day and Gu, 2007), indicated a comprised professional identity who is challenged by heavy workloads. She embraced a 'rote style of learning' by simply transferring knowledge from textbooks to her learners. Lucy, Ardi and Eve falls into the Professional life phase category (Day and Gu, 2007) 24 to 30 years. They endeavoured to expand their knowledge base by researching and reading material on evolution that was attainable. Their professional identity therefore seemed to be more stable and consequently had a positive effect on their teaching. Their teaching style embraced research and a broader depth of information that was assimilated and discussed with learners. Govender (2009) concurs that the mastery of subject content, levels of training and formal qualifications collectively play a role in shaping a teacher's professional identity which would invariably influence their teaching of evolution.

Day and Kington (2008) suggested that the following approaches were embraced by teachers, either deliberately or unknowingly to cope with challenges in the school environment. Many teachers adjusted their way of thinking to accommodate the views of others as in the case of Naledi when she received instruction from more experienced life sciences teachers; others tolerated the imbalance and inequalities of the system that stemmed from biased environments as in the case of Laetoli who still defended her rights as an individual. Some teachers such as Lucy and Ardi accepted the discrepancies positively and engaged in their work with full obligation. According to Day and Kington (2008), some teachers, however, battled with the change and tended to separate 'school life' from other areas of their life. I have not found this to be the case in my study. All participants embraced change and their personal identities were embedded in their professional identities.

4.4.3. Conflicting religious identity versus teaching evolution

"Science without religion is lame, religion without science is blind". (Albert Einstein)

Naledi stated that, "as a Hindu, I believe the universe and life was created by the divine beings Brahma and Vishnu. Essentially, all life exists through God". Naledi found that personally her identity was negatively affected during the teaching of evolution, "it was upsetting because my views on creation of life is purely based on religious belief". This positioning of Naledi impacted her teaching of evolution in the classroom. Her teaching methodology was mainly rote learning as alluded to earlier in this discussion, and minimal exposure were afforded to

learners for open dialogue and critical thinking. This definitely negatively impacted learners' understanding of evolution.

Ardi, like Naledi, is a Hindu but adopted a broader view. She described herself as being a: Universal believer. I am open –minded but I know that the Supreme Being created the universe and all organisms I had to ensure that I did not make mention of any statement that will infringe on the learners' religious beliefs. She was however, cautious in her approach to teaching evolution. Ardi stated that the concept of evolution is not accepted by learners as it clashes with their religious belief. Ardi's concern about her learners' socio-cultural, religious background resonated with Hargreaves (2001), who pointed out that some teachers do not understand the socio-cultural viewpoint of their learners. This adversely impacted teaching a contentious topic such as evolution (Barnes, 2014; De Beer, 2016) as many learners came into the classroom with pre-conceived ideas of evolution according to their societal norms and culture. Religious affiliation also played a major role in influencing the openness of learners towards teachers teaching the topic of evolution. In addition, Mpeta, Villiers and Fraser (2016) argued that the religious beliefs and age of a learner impacts their attitudes towards learning evolution. These attitudes make it more challenging for life sciences teachers, with their own identities to effectively teach the prescribed concepts in evolution

Karabo belonged to another religious faith but also indicated that she felt emotions of dread and frustration towards teaching evolution, "*the reason for these emotions is that I am a very spiritual person and my beliefs are contrasting to both topics. Being a Christian, my relationship with the Creator has made me reject every idea that takes away from His masterpiece of creation"*. Karabo found that her religious views conflicted with that of evolution. This resonated with Cele (2017, p.65) who pointed out in her study that teacher participants felt the need for other teachers to support them because they encountered problems in understanding evolution and how to teach it since the topic contradicted their beliefs.

Howard (2018, p. 336) describes the dilemma faced by many teachers, especially those who belong to the Christian faith, with regards to too much information on evolution contrasted with religious affirmations in the following passage:

> *In this same epoch scientists delved into Earth's bowels and found fossil bones and mangled stones that told tales of remote antiquity and primeval violence, of storied*

> *beasts reigning over a planet untouched by humankind. Then came new theories about life history and relations between species. Christians wondered if the scientists had lost their minds: scientists wondered if they would lose their biblical faith. The debate continues today.*

It is evident from the preceding discussion that religion influences the teaching of evolution, either in a negative or positive way. Cele (2017) contends that learners often developed hostility against teaching because it went against their prior beliefs and religious background. Invariably, these negative feelings spilt over to the teacher. The teacher in turn, experienced negative emotions such as anxiety and hopelessness. Hargreaves (2000) contends that *sociocultural geographies*, that is, differences in culture between teachers and learners often makes both parties incomprehensible to each other. This is supported by Cele (2017) who found that teacher participants in her study felt frustrated when they were not confident with the theory of evolution, but had to teach learners in a way that they understood the content. In addition, she argued that this lack of confidence negatively affected the performance and self-esteem of teachers. Teachers felt that when learners fail, it was an indictment on their reputation as a teacher. Cele (2017) contends that if teachers are not happy, then they cannot be effective. She asserted that there is a deep-seated connection between what goes on within a teacher and how teaching takes place. In addition, her findings correlate with the participants in my study who argued that amongst the challenges encountered in life sciences is teaching the concept of evolution because it contradicted their religious beliefs.

A teacher's religious orientation and culture is a subsidiary of the personal identity. It is one of the core components of a teacher's identity and in this research study it was clear from participants' responses that their religious orientation influenced their teaching of evolution. This resonates with Barnes (2014) who claimed that one of the biggest challenges that teachers face in teaching evolution is that their religious beliefs do not conform to the theory of evolution. This view is further supported by Mpeta (2013) who argued that a teacher's affiliation to a religion and their scientific beliefs, both affected their teaching as teachers embrace strategies that would enhance the understanding of evolution. Mpeta (2013, p. 342) claimed that "the more that teachers accepted the concept of evolution, the less conflicted they were and less uncomfortable with teaching about evolution". This is the case in the next teacher participant, Laetoli.

Laetoli's views, on the other hand, are different from that of Naledi and Karabo. Laetoli believed that being affiliated to a certain religious group should not affect one's teaching in a classroom. She clarified this by saying:

> *Not for me personally. We need to distinguish between science and religion. Science and religion are two different ways of knowing the world. Evolution is a theory scientists use to explain natural phenomena that exist in nature. Science develops explanations for the natural world by gathering evidence. On the other hand, religion is a system of beliefs based on faith, not bound by evidence from nature. I don't feel I need to choose between the two. Beliefs provide meaning and spiritual guidance to my life. They form the basis of my values, something science cannot do. Laetoli further added that, "in South Africa, evolution is allowed to be taught in schools but not religion. I am asking learners to understand evolution and the evidence that supports this theory, not to believe in it.*

Laetoli added that:

> *Race would not be an issue for teaching evolution. I understand evolution and research in human population genetics. Science has been previously misused to try and prove that one race is more superior to the other. If race issues crop up in my classroom, I will use it as a teaching moment.*

Laetoli's view on race interested me as teacher participants belonged to the different race groups in South Africa, but Laetoli's view stemmed from a historically disadvantaged racially educated background. I was fascinated by her quest for knowledge and forthright responses, together with her deep understanding of genetics and her contention that all races are equal.

Lucy related that she is a devout Muslim, and viewed herself as being very religious. Similar to Laetoli's stance on teaching evolution, she indicated that her religious affiliation did not pose a challenge in the teaching of evolution at all:

> *It is a topic that must be dealt with according to the Examination Guidelines. Learners will be assessed on it – in particular their understanding of evolutionary phenomena,*

which will then lead to them passing and exiting the system. So it is of necessity that learners must be exposed to it and be knowledgeable.

So for Lucy, evolution was taught as every other topic in life sciences. It was necessary for learners to master in order to pass their grade 12 NSC examinations. However, in Laetoli's classes, it was not just a matter of passing an examination, but critical thinking and dialogue was encouraged.

4.4.4 Resilient identities

She understood that the hardest times in life to go through were when you were transitioning from one version of yourself to another. (Sarah Addison Allen).

Naledi was serious when she articulated her main priority: *"I was sorely focussed on completing the section".* At the time of this study, Naledi had been teaching life sciences for five years. Clearly she was developing a sense of resourcefulness in her classroom, but was also daunted by the heavy workload and responsibility of teaching Grade 12 learners. As a relatively young teacher, Naledi often experienced emotions of powerlessness or anxiety as she felt that her learners did not take her seriously. At one point during our interview, she asked "*Ma'am* (being her ex-life sciences teacher) *how do you get learners so keenly absorbed in your lessons? Does it come with age?"* This indicated that Naledi was willing to grow and acknowledged that experience and maturity was a developmental process and that it took time to reach fruition. She exhibited resilience and the ability to persevere when she openly acknowledged her call as a teacher was a "*service to learners and the school".* Professional and moral support from departmental heads and senior teachers is crucial in early teaching careers to nurture and 'water' the developing teacher in this budding stage.

Karabo, when faced with difficult situations she recommended, "W*hen you make mistakes, you learn from it".* Exercising her strength of character, she further stated, "A*lways give the best of you. That's my dream – to become better and better".* Having taught for twelve years, Karabo exemplified a relatively young teacher who showed resilience and commitment in the face of change and who embraced her new roles with diligence in spite of the increased responsibilities. Similar to *Australopithecus sediba* – a transitional fossil, Karabo exhibited a transformation in her role as an in-service teacher and laboratory assistant to a life sciences

teacher and now Head of Department of life sciences at her school. Sammons et al. (2007, p. 696) contends that commitment refers to the "degree of psychological attachment teachers have to their profession". It's a noticeable manifestation that is seen in "teachers who are motivated, willing to learn and believe that they can make a difference to the learning and achievements" (p. 696) of their learners. This is evident in Karabo's response, "*I try to teach as passionately as I can".* She displays enthusiasm and passion for her teaching and strived to increase her knowledge of evolution to better engage her learners by adding, "*discovery is important".* In addition, according to Day and Gu (2007), at the professional life phase of 8 to 15 years into which is the category Karabo falls into, teachers have to manage changes in role and identity due to mounting tensions and transitions in the school environment. They have to manage changes in their roles and consequently, their identity. Many teachers have roles of responsibility and this contributes to tension in their career. However, Karabo displayed sustained effectiveness and resilience in the classroom.

Laetoli fits into the Professional life phase: 16 to 23 years: Day and Gu (2007) contend that at this stage, teachers are faced with increasing workloads in school as well as demands from family responsibilities. Teachers often struggle to reach a balance and this impacts negatively on their professional and personal identity. Laetoli defied this challenging stage in her life by exuding a zest for life and wanting to always learn more, "*I believe knowledge is power".* This can be validated by her currently pursuing her Doctor of Philosophy in genetics. She portrayed resilience in the face of obstacles and this is attributed to her strong personal identity being founded and moulded by a stable upbringing and an emphasis on the value of education. This in turn, reinforced her professional identity as a teacher by shaping learners to think for themselves and to broaden their perceptions on evolution and the origin of life.

Ardi displayed a tenacious spirit when she said, "*I think you need to be mentally tough to win. This doubles your chances of getting to the final".* This personality trait of Ardi's was filtered down into the classroom when she said, "*I set the tone and culture in the class".* By adopting her own way of thinking in the class, Ardi believed that she was able to accomplish her task as a teacher in the classroom; being a facilitator and assessor of knowledge, in this case teaching evolution, as expected by the DoE. She also expressed strength when she said, "*I want women to embrace ageing, and be proud of it and do it well".* This shows that she identified with other 'older' teachers and recognised the wealth of experience they had to share. This is also verified

by Lucy who wants to "*learn more, refine and improve herself"*. She also portrayed a tough spirit when she urged teachers to "*never quit"*. Lucy recommended networking and said, "*When we stand together and lean on each other, we are stronger and more resilient"*. Hargreaves and O'Connor (2018) recommend the professional collaboration and the development of 'social capital' amongst teachers and discussing their knowledge with other teachers as this benefits the learning in the classroom. They assert that this improves teacher net-working as teachers come to realise that there are others who can support and identify with them. In addition, it increases the capacity to implement change as ideas can be discussed and verified amongst many teachers.

Eve stated in her interview, "*What you see is what you get, at no time am I derailed from accomplishing my task"*. She emulated a teacher who has been "t*ried and tested"* through many years of teaching but has withstood significant changes in education including a shift away from the Apartheid system, various changes in curriculum and an amalgamation of different racial groups in schools. She further demonstrated resilience in declining learner behaviour at her school by advocating strict rules and discipline. Her prior established upbringing and transition through the historical changes in South Africa, entrenched her unwavering personal identity and ability to teach evolution with vigour and resolution. In addition, Eve had accumulated a treasury of life sciences resources and was therefore pivotal in supporting and guiding younger teachers in their classrooms. However, although willing to help others, she also stated that "*it's imperative to be different"*. This suggests that teachers therefore also display uniqueness in their collectiveness.

Resilience, according to Sammons et al. (2007, p. 694) is the capacity to continue to 'bounce back', to recover strength or spirit quickly and efficiently in the face of adversity". Day and Gu (2007) emphasised that there is an intricate link between teacher identity, well-being and effectiveness arguing that personal, professional and situated factors influence teacher identities and their well-being. Similarly, Sammons et al. (2007) agree that teachers' well-being and positive professional identity are crucial to a teacher's effectiveness, that is, teachers with a strong commitment and resilience are more effective. In addition, Sammons et al. (2007) assert that this determines a teacher's sense of 'agency' – that is, the proficiency to follow one's own ambitions, their well-being and strengths.

The findings in this study therefore suggest that participants at a later stage in their teaching career were resilient, motivated and satisfied with their professional development. This resonates with Sammons et al. (2007) who challenged the traditional notion that teachers at the later phase in their teaching career feel disinterested and exhausted and are ready to stop working. Furthermore, according to the VITAE study of Day and Gu (2007, p.686), teachers' do not move through a linear professional development from a 'novice' to 'expert' teacher according to their number of years in teaching. They argued that teachers' professional life phases fluctuate and changes according to 'dimensions of balance' in their lives (p.688). This suggests that many teachers sustain their commitment instead of declining motivation – they demonstrated the ability to cope with change according to Day and Gu (2007). It was evident that in each of the six professional life phases of teachers, there were a number of different situations such as a lack of experience, conflict with one's own belief system, learner dissonance, a lack of appropriate learning resources, responsibilities at home and health issues that challenged the abilities of teacher participants to maintain their commitment. However, I concluded that there was an overall consensus of participants, especially those in the later years of their teaching career who exhibited resilience and a strong affiliation towards their career. These teachers had chosen to adopt a mentally strong frame of mind so that they can give of their best. Teaching is a demanding job (Hargreaves, 2000; Sammons et al., 2007), therefore resilience is an important component that would strengthen a teacher's character. This valuable trait of their professional identity enabled the productive delivery of evolution in the classroom. Day and Kington (2008) assert that teachers need to be resilient to sustain their sense of effectiveness in the classroom. It nurtures a powerful sense of 'vocation' and inspiration which is crucial to promote optimum learning in a school.

4.5 Emerging themes from the second research question

Next, I present the themes that emerged from the second research question and a summary of emotions expressed by teacher participants in Table 4.2. This is followed by an in-depth analysis of each theme, drawing on the conceptual frameworks of Hargreaves' Emotional Geographies (2000) and Zembylas' Genealogies of Emotion (2002; 2003). Table 2 below is a summary of the themes that emerged from the data generated for the second research question: To what extent is teaching evolution in Grade 12 Life sciences an emotional practice?

Themes	Teacher responses from collages, interviews and reflective journals	Conceptual framework
1.A descent to anxiety, frustration and indifference: • "Emotional Goliaths": anxiety, fear and frustration • Inadequate knowledge and experience or support from school management and DoE	Naledi: indifferent, challenged, anxiety, perplexed, frustration. I feel challenged and perplexed because I don't see the relevance of evolution in the syllabus. Learners were interested only in certain topics such as natural selection. I believe that a topic must change the learners' understanding, but evolution is cut and dry. The concept of evolution is not accepted by learners as it clashes with their religious beliefs and no topic should question or make learners doubt their religious upbringing, values and beliefs. Teaching resources are very limited as we only have access to worksheets and textbook material. Karabo*:* Frustrated, dread. I felt very uncomfortable and disconnected. I feel dread and frustration towards this topic and just want to get it over with. Some learners were interested and others were not. Some learners are very disinterested and despondent and it's difficult to get them to be more responsive.	Hargreaves' Emotional geographies Zembylas' Genealogy of emotions

• Learners' disinterest influences a teacher's emotions in the classroom • Lack of resources, financial restraints • Pressure to perform and produce better results	Ardi*:* Challenged, frustrated. Not enough time to teach all the concepts properly; large class sizes, language barriers and inadequate resources to conduct practical investigations. Lucy: Exhaustion and burn-out Pressure from administration to perform – teachers are held accountable for learner performance; unavailability of appropriate textbooks; teaching is fun but can cause exhaustion and burn-out, too much of paperwork, learner discipline and large numbers, some learners are very respectful, but some try your patience. Eve: Challenged, indifferent. I have to teach evolution as every other topic. I experience no emotions because both natural selection and human evolution are logical to explain, however I feel that there are more questions than answers, especially in human evolution. Learners tend to think that we are implying they developed from apes – which they don't like. Some learners even went to sleep in spite of my booming voice. Laetoli: No negative emotions. Teaching evolution has nothing to do with my identity or emotions. I communicate science (evolution) to my students to enhance their scientific literacy.	

2. A kaleidoscope of positive emotions • Hope, rewarded and appreciation • Wellness for everybody • Happy at this stage of my life, satisfied, celebrating life	Naledi: Love for the planet, interesting to teach Love for the planet. It was interesting to teach and learn about because it offers new perspectives. Karabo: Hope, interest, passion Hope for the future that learners may be more interested. I try to teach as passionately as I can. Laetoli: Hope, excitement, appreciation, fulfilment. One of the most interesting topics in life sciences. Evolution is the root/basis of life sciences. Lucy: hope, excitement, interest, rewarded, appreciation. One needs to focus on students' understanding, not whether students accept or believe in evolution. Ardi: satisfied, passion. Live life in full colour. Celebrating life. So thankful. Eve: surprise, contentment. Happy at this stage of my teaching career, rewarded. You make it beautiful. Joy and jewels. I love words.	Hargreaves' Emotional geographies Zembylas' Genealogy of emotions

Table 4.2 Teachers' responses to the research question 2 and emerging themes and conceptual frameworks.

4.5.1 A descent to anxiety, frustration and indifference:

> *Teaching is also and always an emotional practice of engagement with learning, relationships with students and adults, and attachment to the purposes and the work that teaching achieves (Hargreaves, 2000, p. 117).*

Naledi experienced mainly negative emotions during the teaching of her evolution lessons. She experienced feelings of anxiety and indifference. I termed this 'emotional Goliaths' because of the huge challenges she faced, similar to that of the young David facing the towering Goliath, according to biblical scripture. (My personal identity as a Christian and life sciences teacher came to the fore, and this highlighted to me that a teacher's personal identity would certainly affect their teaching of evolution in the classroom, either positively or negatively). Naledi described her experience as, *"I feel challenged and perplexed because I don't see the relevance of evolution in the syllabus".* She went on to justify that: *I don't teach evolution from a personal perspective, I just teach it as prescribed in the syllabus and support documents".* Does this make Naledi a 'bad' teacher? She certainly complies with her role as a facilitator of knowledge.

Furthermore, Naledi described some challenges in her classroom such as "teaching resources are very limited as we only have access to worksheets and textbook material". She felt that "learners were interested only in certain topics such as natural selection. During this time learners were more: "interactive". She also found that learners' curiosity was awakened when they studied the: "similarities between African apes and humans". This spurred her on to become 'a better teacher'. However, when she felt that she was not acknowledged by her learners and peers, she experienced negative emotions. Hargreaves (2001) claims that when teachers feel their 'power' has been diminished or not acknowledged, they become anxious and feel hopeless. On the other hand, if teachers are empowered by management and recognised by learners as worthy facilitators, they experience emotions of fulfilment and hope.

Kelchtermans (2005, cited in Nundkoomar, 2016) contends that teachers experienced a loss of self-confidence and self-esteem, when there were changes and challenges in their working conditions. He argued that although teachers did not explicitly mention the term vulnerability, the negative emotions they displayed conveyed a sense of loss of the practices that they were familiar with and this made them feel vulnerable. This resonates with Naidoo (2014) who contends that teachers felt helpless and vulnerable when questioned by others about their

responsibility as teachers towards their learners. Similarly, Zembylas (2013) draws attention to the plight of vulnerable teachers and suggests that education systems should cultivate compassion and pay heed to the emotional complexities of teaching. Zembylas (2013, p.505) proposed "critical pedagogies of compassion", that probe the cases of vulnerable people, in this case teachers, to make a positive difference in their lives.

Karabo:

> *Felt like I could understand why the theory of natural selection was accepted and from a scientific perspective. I found common ground. However, when it came to human evolution, I felt very uncomfortable and disconnected. I feel dread and frustration towards this topic and just want to get it over with. I try not to involve my emotions in this topic.*

Furthermore, she reflected that:

> *Some learners were interested and others were not. I could gauge this from their responses to questions or interactions or lack thereof. However, it is important to note that some learners may only show interest because of their passion to progress or succeed and get good marks for life sciences or to not fail the section that is tested.*

Karabo also indicated that challenges in the classroom spanned two extremes:

> *One is where learners are very disinterested and despondent and it's difficult to get them to be more responsive. The second is where some learners will want to have lengthy discussions to argue or elaborate on some of the theories discussed. I overcome these challenges by bringing in variety in my teaching resources. Having a balance of discussion with visual aids and videos that broaden learners' perspectives and expose them to new information that is not necessarily content to be tested, but rather be made aware of. This reduces pressure on learners in terms of content they have to learn.*

Karabo's sentiments are endorsed by Hargreaves (2000, p812) where he asserts that both teachers and learners, at varying times "worry, hope, enthuse, become bored, doubt, envy, brood, love, feel proud, get anxious, are despondent and become frustrated" Hargreaves contends that "emotions are an integral part of education" (2000, p. 812). He described

emotional geographies of teaching as the "patterns of closeness and/or distance of human interactions or relationships that help create or configure and colour the feelings and emotions about ourselves, our world and each other" (2001, p. 1061). Emotions, therefore play a significant role in the teaching of evolution. In addition, Mpeta (2013) argues that each learner enters the classroom with their own set of ideas, values, beliefs and needs; similar to the learners in Karabo's class, and these factors can influence the teaching and learning process and ultimately, the emotions experienced by both parties.

Lucy listed the following challenges in her classroom as a life sciences teacher:

> *Availability of appropriate textbooks; exhaustion and burn-out – teaching is fun but can cause burn-out; too much of paperwork; pressure from administration to perform – teachers are held accountable for learner performance; too many learners – sometimes close onto fifty per class – although social distancing due to COVID -19 has reduced class sizes.*

In addition, Lucy felt the following factors also negatively influenced her emotions and consequently her teaching of evolution in the classroom:

> *Lack of proper funding – teacher needs to pay sometimes from their own pocket to fund resources. Also coping with learners from diverse backgrounds and learning needs adds strain on the teacher to look at different strategies such as visual methods to enhance learning.*

As the Deputy Principal at her school, as well as a life sciences teacher, Lucy is very aware that there are limitations to discipline learners. She openly shares that, "*some learners are very respectful, but some try your patience. This can be difficult for the educator especially because disciplinary measures favour and safeguards the learner and not the educator"*.

Hargreaves (1998, p. 141) contends that from a teacher's point of view the focus is on emotions of "anxiety, frustration and guilt",…we know much less about how teachers feel while they teach, about their emotions and desires which motivate and moderate their work". In addition, Hargreaves (2001, p.1060) adds that "…emotional misunderstanding strikes at the foundations of teaching and learning, lowering standards and depressing the quality of results". According

to Trigwell (2011, cited in Cele, 2017), when a school or classroom environment is full of uncertainties and lacks consistency, then teaching and learning is negatively impacted. This in turn, leads to a high failure rate in the final NSC examinations. This has serious repercussions for life sciences, especially when a challenging topic such as evolution that carries a weighting of about 35% is not adequately taught. This highlights, once again, that teachers are often made accountable for the performance of their learners in the final examinations. Hargreaves (1998, p.812) points out that teachers are responsible for "planning, management, skills, targets, performance, problem-solving, accountability, decision-making and measurable results". Furthermore, Hargreaves' (2000) *moral geographies* highlighted the situation where level 1 teachers are not on the same professional level with management and higher authorities and therefore it became difficult to resolve conflicts. In addition, he argued that *political-geographies* cause a divide between teachers because of 'hierarchical power' relationships.

Hargreaves' (2000) *professional geographies* defines a teacher's professionalism according to the typical masculine stereotype. There is somehow a bias towards the gender of a teacher: female teachers are perceived as 'caring' and 'emotional' and may not always enjoy the rank and discipline afforded to their male counterparts. This is significant in this research study as all the participants were female. This was not by choice, but only female teachers consented to being part of this study. Borrachero, Bridido, Costillo and Mellado (2014) contend that the male teachers reported more positive emotions than their female counterparts. They argued that some female teachers felt that they are emotionally vulnerable and therefore experienced stronger negative emotions. Lucy, however, indicated that she did not allow her gender to influence her teaching. When it came to teaching evolution to her learners, Lucy was confident in saying that it was not a difficult topic to teach. She asserted:

Teaching evolution actually has potential value for students. Evolution explains how pathogens developed resistance to drugs that were originally effective against them. It also suggests ways of dealing with this problem. Students can relate to the fact that evolution still continues even today.

She encouraged learners not just to "rote-learn, but to be able to explain concepts in their own words. They must be able to elaborate on the material more intensively and deeply".

Ardi, in contrast to Lucy, felt that teaching evolution was a challenge because:

> *Many concepts go against learners' religion and values, therefore some learners may not accept this knowledge. As an educator I need to be sensitive to their beliefs. I have to explain the theory of evolution without labelling learners.*

Ardi also pointed out some logistical challenges such as "a lack of finances; not enough time to teach all the concepts properly; large class sizes, language barriers and inadequate resources to conduct practical investigations". The challenge that Eve experienced was learners' pre-conceived views on evolution that hindered the teaching of the topic. She stated that:

> *Learners tend to think that we are implying they developed from apes – which they don't like. I therefore just supply the information and they can make up their own minds. Some learners are totally disinterested – I emphasise that it is part of the curriculum and is going to be tested so they need to pay attention.*

Eve also felt *"indifference" in her emotions as she stated that, "I have to teach evolution as every other topic. I experience no emotions because both natural selection and human evolution are logical to explain".* She did however, indicate that she sometimes felt challenged and surprised at learners' reactions to the content being taught "I feel that there are more questions than answers, especially in human evolution".

Ardi, contrary to Eve, felt strongly that it is her role as a teacher to engage learners and to hold their interest, *"I had to be clear, knowledgeable and unbiased".* She felt responsible for maintaining the tone in the classroom and not be controlled by her emotions as a reaction to learner appraisal or dissonance. This resonates with Nundkoomar (2016) who claimed that when pupils felt their responses were valued, the emotional tone was maintained and learning could take place. A teachers' demonstration of interest in learners' input helped to maintain the emotional tone during the lesson and this facilitated the learning process. Furthermore, both teacher and pupils became responsible for creating an environment where teaching and learning could take place. These findings are further supported by Yin and Lee (2012) who declare that teacher emotions helped to motivate pupils and thus enhance the effectiveness of teaching.

4.5.2 A kaleidoscope of positive emotions

All teacher participants displayed some form of positive emotion and this ranged from interest, hope, passion, excitement, fulfilment and appreciation – hence the use of the word 'kaleidoscope' to encompass the positive emotions that emerged. The beauty of a kaleidoscope is that one can take all the moments in your life – in this case the emotions of teachers and shuffle the assortment of everyday experiences to collectively form a beautiful image. This image of a 'kaleidoscope' is therefore fitting to portray the multiple aspects of participants' emotions, and has significance for answering the second research question.

Naledi offered some positive light, when she said, "it was interesting to teach and learn about because it offers new perspectives". She did however, stress that, "I did not get emotional as I was solely focussed on completing the section". Similar to that of Naledi, Karabo also indicated that she had hope for the future that learners may be more interested. She highlighted that:

> *I try to teach as passionately as I can and not to show any emotion. It has made me a better teacher in that I was able to disconnect my emotions from the topic as I do not believe in human evolution.*

This expression of 'disconnection of emotions and not getting emotional' indicated a contradiction from both Naledi and Karabo as showing interest and teaching passionately is certainly showing some positive emotion.

I pondered about the effect on the teaching-learning environment if teachers believed that they did not show any emotions in the teaching of evolution. Would learners be inspired to learn more or was it simply a case of rote learning to pass an examination? In the case of teachers, how do they stimulate interest in a topic that they themselves are resistant to. It is crucial to be cognisant that some teachers, such as Naledi and Karabo in this study, may have engaged in 'emotional labour' to conceal their true feelings in the presence of their learners. Yin and Lee (2012) define emotional labour as an act in which teachers deliberately inhibit, conceal or manage their feelings and emotions, whilst Tsang (2011, p. 1312) describes emotional labour as: "*the forced emotion management in work for a wage".* In addition, Winograde (2003, cited in Tsang, 2011)) describe the emotional rules of teaching. One such rule is to avoid the display of extreme emotions. Hargreaves (2000) endorses the notion of 'emotional labour' and claims

that teachers 'manufacture and mask' their emotions in various situations. He muses whether teachers' emotions are artificial and just a professional performance? Zembylas (2007) disagrees that emotional labour is negative to teaching and argues that emotional labour may contribute to effective teaching and self-fulfilment as in the case of Karabo who posed: *it has made me a better teacher*. Albeit, both Naledi and Karabo attempted to master the content that they had to teach for the benefit of their learners. This is evident when Karabo said, "*I choose to rather teach the content the best way possible to enable learners to remember what is necessary"*. Once again, displaying the qualities envisaged by the DoE in facilitating learning.

Laetoli experienced mainly positive emotions during her lessons on evolution, namely: hope, excitement, appreciation and fulfilment. She believed that evolution is "*one of the most interesting topics in life sciences. Evolution is the root or basis of life sciences"*. In addition, Laetoli validated her positive emotions by asserting that *teaching evolution using authentic examples like TB resistance, coronavirus and artificial selection makes it more understandable to learners.* Lucy, like Laetoli, also experienced the following positive emotions: Hope, excitement, interest, appreciation and reward. She highlighted that, "*one needs to focus on students' understanding, not whether students accept or believe in evolution. But, there still needs to be sensitivity to concerns of students' religious affiliations"*. Ardi expressed passion, satisfaction and gratitude when she depicted in her collage "*live life in full colour, celebrate life* and *I am so thankful"*. Eve also indicated, contentment at this stage of her life. This was illuminated when she noted in her collage, "*happy at this stage of my teaching career* and *rewarded"*.

Zembylas (2003) argued that if teachers achieved their goals within the classroom, and this certainly applied to the teacher participants in this study teaching evolution, they experienced positive emotions of satisfaction and reward. These positive emotions were notably felt by Laetoli, Lucy and Ardi. Furthermore, Zembylas (2005b, p. 937) contends that teachers' expressions of emotions can be productive: "it makes individuals into socially and culturally specific persons engaged in complex webs of power relations". According to Zembylas' "genealogy of emotions", the individual or intrapersonal level describes how "teachers experience and express emotions", the social or interpersonal level refers to how teachers engage with their emotions in their social interaction with others, while the socio-political or intergroup level sheds light on the relation between teachers' emotions and social and cultural

dynamics within the "classroom or school setting" (2002, p. 84). I agree with Zembylas and therefore validate that teaching evolution is an emotional practise and the emotions experienced – negative or positive is of an extent that would tangibly affect the teaching-learning environment in a classroom. This view resonated with that of Nundkoomar's (2016) in that teacher emotions are interwoven in their job and that teaching is an emotional practice as teachers exhibit either positive or negative emotions during their teaching of evolution. Furthermore, Kelly (2006, cited in Van Blerk, 2019) contends that the teaching-learning context is complex, introspective and emotional.

The following citation by Naidoo (2014) where Nias proposed three explanations why teachers engaged emotionally in their teaching, validates my opinion that the extent to which teaching evolution is an emotional practise is substantial: firstly, teachers carry their feelings into the classroom, and this increases the emotional dimension of their interaction with learners. Although some teachers such as Naledi and Karabo believe that they don't show any emotion, they actually do to a noticeable extent. Lucy, Laetoli and Ardi displayed positive emotions in the classroom and this made the classroom a space for building their self-esteem and performance, therefore feelings of reward and satisfaction came through. These positive emotions would favourably shape their teaching of evolution. Thirdly, teachers spend a large amount of time with their learners, and therefore build significant relationships with them, encouraging and appreciating their development and successes. Teachers therefore invest emotionally in their work, taking into account the considerable amount of time and effort afforded by them. This is evident in teachers such as Lucy, Ardi and Eve who have spent most of their professional lives as teachers in a classroom. Zembylas (2002) asserts that if teachers cannot manage their emotions appropriately, then they will be regarded as unprofessional. Furthermore, Zembylas (2005a, p.937) asserts that "emotion functions as a discursive practice in which emotional expression is productive – that is to say, it makes individuals into socially and culturally specific persons engaged in complex webs of power relations". Interestingly, when emotions do emerge, they are often governed by a set of 'invisible rules' laid down by education departments as the image a teacher should portray. This may affect their professional performance, dedication and passion towards teaching. I contend that this emotional investment affects a teacher's professional performance in teaching evolution and this is projected onto the Grade 12 learners that they teach.

Nias (1996 cited in Naidoo, 2014, p. 295) asserts that teachers experience positive emotions of "joy, excitement, exhilaration and deep satisfaction", which enhance their self-esteem and are closely related to their ethical goals, values and beliefs and sense of self. However, when teachers are inefficient and unable to assist learners, this results in them experiencing negative emotions and feeling "afraid, frustrated, guilty, anxious and angry" Therefore, emotions - both positive and negative, play an important role in influencing teachers' cognition, action and reflection while teaching evolution in the life sciences classroom. The analysis of emotions experienced by teachers during the teaching of evolution suggested that there were both positive and negative emotions. However, when looked at comparatively, it seemed that more positive emotions such as reward, fulfilment and hope were expressed by teachers who had more years of experience in life sciences. The less experienced teachers, who had been teaching for fewer years noticeably displayed more negative emotions such as anxiety and mounting disillusionment. This suggests that age makes a difference in teaching competence and emotional well-being and that there is a link between experienced and novice teachers to the career phases described by Day and Gu.

4.6 Teachers reflections after their lesson - what would they change?

In their reflective journals, teacher participants noted changes that they would implement in their lessons. Naledi felt that she needed to change her method of teaching by: "*introducing interesting videos and activities and demonstrations".* Karabo's views on her lesson was similar to that of Naledi. She reflected that:

> *For natural selection I prefer to use more practical examples, that is, simulation of natural selection involving learners doing a practical and discussions on it. For human evolution, I prefer learners watching a video of the timeline and the various fossils and have it all visual and I could pause the video and explain important points.*

Ardi also felt that the use of videos and visual aids would enhance the understanding of evolution. She said that:

> *I try and use diagrams and pictures to make learners aware of how species change over time, but learners must be taught at a time when they are more mature to accept this*

kind of knowledge without feeling that the information is against their beliefs and values and that the educator is insensitive.

Eve's reflections about her lesson resonated with the other teacher participants: "I would like to incorporate more practical aspects regarding Natural selection as they are fun and interesting. I would like to teach Human evolution at the local museum using practical, "hands on" models". This suggests that the teaching of evolution is too theory-based and a practical component needs to be introduced.

4.7 Teachers' response to human evolution and natural selection being included in the life sciences curriculum

Participants shared different views on whether evolution and natural selection should be included in the curriculum. Naledi believed that evolution should be removed from the life sciences curriculum. She shared her views:

It is not important. It has no relevance to the betterment of learners compared to other topics such as nutrition, microbiology, reproduction, genetics etc. I believe that a topic must change the learners' understanding, but evolution is cut and dry. It also clashes with learners' beliefs, and no topic should question or make learners doubt their religious upbringing, values and beliefs.

This view is contrary to Berkeley (2018) who argues that studying evolution at school is essential to scientific literacy. He claimed that to acquire an overall understanding of life sciences, learners need to understand life on earth in terms of its history, its future and changing life forms.

Karabo indicated that:

It is necessary to include the history and various theories of evolution, however, the detail that learners are expected to learn is futile. Learners should only learn what the ideas were, how the information was linked and how inferences were made. Fossil detail (names, characteristics etc.) are irrelevant. Information is ever-changing and so this topic is also abstract in many ways. This history of life and evolution should inspire learners to be provoking scientists, and not just to learn content.

Laetoli, on the other hand was convinced that evolution should be included in the Grade 12 curriculum. She however emphasised that it could be "*introduced gradually from lower grades. Some of the concepts in the topic are abstract and difficult to comprehend. However, Grade 12 is the right cognitive level to understand evolution".* This foundation could perhaps prepare learners for critical thinking skills and academic debate at tertiary level. She went on to elaborate that:

> *Evolution is the basis of biology, nothing in life sciences will make sense except in the light of evolution. It makes sense in the understanding of topics such as diversity of plants and animals, morphology, classification of organisms, and genetic similarities and differences among living things.*

Lucy suggested that if she was approached by the Life sciences Subject Advisor to implement changes to the current Grade12 evolution curriculum, she would advise the following:

> *There is too much of detail for learners to remember in the Major Phases in Hominid Evolution for example, when did the organisms exist, names of fossils, fossil sites, who fossils where discovered by and lengthy characteristics. Please reduce some content.*

In addition, she referred to the Theory of Lamarck, "*It has two laws which does not make sense to learners. They think that it's a joke".* Eve, on the other hand, stated that:

> *Personally, I don't think that it is necessary to include evolution in the Grade 12 curriculum. It can be introduced in grade 10 and 11 to create awareness – there could be learners who would like to pursue it as a career path. I just think there is so much detail (useful) that can be added to other topics.*

It is evident that there is a link between Lucy and Eve who suggest that evolution should be introduced in earlier years and lengthy, unnecessary detail be removed from the syllabus. These views once again, suggest that teaching evolution is an emotional experience and is influenced by a teacher's personal and professional identity.

4.8 Support to life sciences Teachers from the Department of Education and the teaching of evolution in Grade 12

When participants were asked whether they received sufficient support and training from the Department of Education to teach evolution in life sciences, Lucy responded as follows:

> *At cluster meetings, we are addressed on issues of how the section should be taught. It is a forum for educators teaching Grade 12 to share their ideas as well. The key focus is the content for the final NSC examinations and preparation of learners.*

Ardi on the other hand, said that she received no support from her school management team and from the Department of Education. This was supported by her saying, *"There was no special training from the department except what I learnt as part of my own studying".* The huge sacrifices made by life sciences teachers in trying to implement the new curriculum once again displays teachers' utmost concern for the educational needs of their learners. They believed that this was necessary for delivering quality education to their learners.

4.9 Suggestions by life sciences teachers to the Department of Education to enhance the teaching of evolution in Grade 12

I have included the following rich data from Life sciences teachers to the DoE on the teaching of evolution in Grade 12 as it impacts either directly or indirectly on their teaching and emotions during the facilitation of this topic. The Life sciences teacher participants in this study held the following views in implementing and coping with the prescribed content in Grade 12 evolution:

Naledi felt strongly that:

> *Evolution is an irrelevant topic that should not be part of the syllabus. Many learners are often disinterested. Learners interact better when they can conduct investigations and studies to validate what they have been taught. Learners generally believe what they see.*

Karabo, true to her pioneering academic stance and determined nature, suggested that:

Evolution should be taught to make learners aware of indigenous knowledge and to awaken critical thinking about theories and inferences from a scientific viewpoint. The detail on timescales, fossils and application of laws is not going to make them better scientists for the future. Evolution should be in the syllabus, however, the assessment of evolution needs to be reviewed.

In addition, Karabo proposed that:

Darwinism be taught in the light of evolution in present times to broaden learners' perspectives. Furthermore, human evolution should be reduced to the main events, ideas and evidence without the detail that learners are required to know.

Laetoli, believed that:

A lack of understanding how science works (Nature of Science) in mostly America and slowly in other parts of the world has led to opposition of teaching evolution and the proposal to teach Creationism in the classroom. Therefore, more time should be allocated for the ***explicit teaching of NOS*** *and its continuous integration during teaching in every other topic across all science disciplines.*

Furthermore, she advised that:

The department should guard against the evolution/ creationism controversy. Life sciences teachers should be trained on how to deal with this controversy if they emerge in the classroom. This is because, the legitimacy and value of both religion and science is undermined when a religious belief is called science. Laetoli also suggested that: evolution should be introduced gradually from lower grades at school culminating in grade 12. This is because based on research, learners struggle to understand this topic.

Lucy firmly indicated that the present Grade 12 evolution syllabus had too much of content for learners to assimilate:

Too content driven! Learners should be taught core evolutionary concepts instead such as Natural Selection and Speciation which can then be used to explain how humans have evolved as well as the diversity we see today.

Ardi clearly suggested the following:

> *Teachers need to be work-shopped on the teaching of evolution, perhaps during in-service training. I also believe that the department needs to be selective about which sections need to be taught in school. The maturity of the learners to accept and understand concepts in evolution, needs to be taken into account.*

Eve succinctly suggested that:

> *If evolution remains in the curriculum, the department must reduce the content as well as the mark allocation in exams. I think that short, thought-provoking and interesting videos supplying relevant information should be made available so that all learners are exposed to the same facts and knowledge.*

It was evident from teacher suggestions that certain sections of the evolution syllabus were too lengthy, abstract and irrelevant and this complicated the study of this topic. Teachers thus proposed that human evolution should be limited to the main events and only focal, relevant information be examinable to learners. In addition, they felt that more time should be allocated to teaching evolution and it should be introduced gradually from earlier grades at school. Teacher participants also requested that more training and support be afforded to life sciences teachers on teaching evolution.

4. 10 Conclusion

This chapter commenced with a brief biographical overview of the six grade 12 life sciences teachers who participated in this study, followed by a discussion of teachers' perceptions of evolution as a platform to answer the research questions of this study. In this chapter, I presented the findings and an analysis of the data generated from the six life sciences participants to explore how teachers' identities influenced their teaching of evolution in Grade 12 life sciences. In addition, I analysed data to determine the extent that teachers' emotions influenced their teaching of evolution. The conceptual frameworks of Day and Gu (2007), Hargreaves (2000) and Zembylas (2007) were used to analyse data, together with relevant literature.

A number of coherent themes emerged that were used to address the research questions of this study. For question one: how do teachers' personal and professional identities influence their teaching of evolution in Grade 12 life sciences, the following themes emerged: firstly, equipped to teach, where teachers highlighted the importance of curriculum delivery and becoming a better teacher; secondly: conformed and compromised identities where a teacher either conformed to the expectations of the DoE or their uniqueness was not totally accepted. The third theme was: conflicting religious identities versus the teaching of evolution where teachers' religious beliefs conflicted with the theory of evolution. The fourth theme was resilient identities that discussed the strong, resilient spirit of teachers and their ability to adapt, to persevere and become better teachers.

The themes that emerged from the second research question: To what extent is teaching evolution in Grade 12 life sciences an emotional practice were as follows: A descent to anxiety, frustration and indifference where teachers portrayed negative emotions towards teaching evolution. In addition, inadequate support and resources from the school management and DoE and still expecting teachers to perform optimally under adverse teaching conditions, led to apathy and a lack of enthusiasm. The second theme, a kaleidoscope of positive emotions, discussed the positive aspects of teaching evolution that teachers experienced such as hope, reward, appreciation and fulfilment.

The chapter ended by reviewing some participant reflections after their lessons and finally a glimpse at teachers' responses to human evolution and natural selection being included in the life sciences curriculum. To conclude this chapter, Riessman (2009, p.154) succinctly narrates

Individuals interpret events and experiences in the stories they construct collaboratively with listeners. As investigators we, in turn, interpret their interpretations, constructing analytic stories from (and ideally with) those we study. The next concluding chapter presents a discussion of the findings together with recommendations, limitations of this research study as well as areas for future research.

CHAPTER 5: DISCUSSION, RECOMMENDATIONS AND CONCLUSION

It is not the strongest of the species that survives, not the most intelligent that survives. It is the one that is most adaptable to change, that lives within the means available and works co-operatively against common threats. *Charles Darwin*

5.1 Introduction

This research study explored the influence of teacher identities and emotions in the teaching of evolution in Grade 12 life sciences. This concluding chapter commences by providing an overview of this study which also highlights how the different chapters are linked together, including the purpose, rationale, research background and the key research questions that motivated this study. A brief synopsis of the literature review and conceptual frameworks that were adopted ensues. Thereafter, I reflect on the research methodology that was adopted which includes the sampling procedures and data collection methods in this study. Next, I probe the key findings of this research to analyse and answer the research questions of this study. The chapter draws to a close with the observed strengths and weaknesses encountered in this journey, as well as recommendations and suggestions for further research.

I begin by re-encapsulating the purpose of this study, with a brief outline of each chapter and how they related to each other. The purpose of this research study was to explore how teachers' personal and professional identities influenced their teaching of evolution in Grade 12 life sciences. In addition, this study aimed to examine the extent to which teaching evolution in Grade 12 life sciences was an emotional practice. Furthermore, gaps evident in recent literature about teacher identities in the teaching of evolution in Grade 12 life sciences was explored. This study endeavoured to establish whether the teaching of Evolution is purely empirical and

'fact-based' or whether the identities and emotions of teachers influence their teaching of evolution in the classroom. The weighting of evolution, as a topic in the Grade 12 Life NSC Examination Life Sciences Paper 2, claims a substantial percentage (44%) and it was therefore important for me, as a life sciences teacher, to embark on this study. I believe that this study is important in contributing towards traditional literacy on the effective teaching of evolution in schools. Furthermore, to gain an understanding of how the identities and emotions of life sciences teachers influence their teaching, an area that has been neglected when the DoE has tabled the curriculum and implementation thereof since the introduction of evolution in the South African curriculum.

This research study strived to address the following research questions:

1. How do teachers' personal and professional identities influence their teaching of evolution in Grade 12 life sciences?

2. To what extent is teaching evolution in Grade 12 life sciences an emotional practice?

This research study exploring teacher identities and emotions in the teaching of evolution in Grade 12 life sciences was presented in five chapters. Chapter 1 outlined the focus and purpose of this study, the rationale and background information. It introduced the key research questions and provided an overview of the literature review and conceptual frameworks. The research methodology is addressed and finally the chapter concluded with an overview of the structure of this thesis.

Chapter 2 provided a detailed description of the literature reviewed in this thesis. It engaged the views and arguments of various authors of life sciences and the teaching of evolution; teacher identities and an enquiry of the emotional nature of teachers. It commenced with a broad outlook of the South African education system and then delved into the life sciences curriculum and the challenges of teaching the subject, with particular emphasis on teaching evolution in Grade 12. The conceptual framework of Day and Gu's (2007)personal, professional and situated dimensions on teacher identity is elaborated to provide meaning about the identities of teachers and how it influences their teaching of evolution. In addition, Hargreaves'(2000) notion of emotional geographies is discussed to highlight the emotional aspects of teaching evolution. Zembylas's genealogy of emotions also lent support to

understanding the role of emotions and how it shapes a teacher's professional identity in a school environment.

Chapter 3 outlined the study's methodological approach. Qualitative research methodology that is underpinned by an interpretive paradigm and a narrative research approach is outlined. Purposive sampling of six grade 12 life sciences teachers that had taught life sciences for a minimum of five years who were currently teaching evolution were selected. The data collection methods used were discussed and included semi-structured interviews which allowed for probing and clarifications; collages that visually expressed the identities and emotions of participants and reflective journals which captured the emotions and deliberations of teachers after their lessons on evolution. Ethical considerations, rigour and trustworthiness were also addressed in this chapter.

Chapter 4 provided an analysis of data and pertinent findings. My positioning as a Life Sciences teacher presently teaching Evolution at grade 12 level prompted me to use names from a biological evolution - based context. This would give the reader a sense of my positionality and interest in evolution, as well as a wider background to each teacher participant. Coding and thematic, inductive analysis were used together with the conceptual frameworks of Day and Gu (2007) and Hargreaves (2000) to develop meaning to the key research questions in this thesis. The following themes emerged and were analysed for research question 1: equipped to teach; conformed and compromised identities; conflicting religious identities versus teaching evolution and resilient identities. For research question 2, the following themes emerged: a descent into anxiety, frustration and indifference; and a kaleidoscope of positive emotions.

Chapter 5 brings closure to this thesis by evaluating, clarifying and responding to the research questions and data that was assimilated to make this a meaningful study. I presented the key findings of this study: the influence of teacher identities, both professional and personal, on the teaching of evolution; the extent to which teacher emotions affect the teaching of evolution and the amalgamation of teacher identities, and their emotions as "evolutionary partners". I concluded by delineating the strengths and limitations of this study as well as recommendations for further study.

5.2 Key findings of this study

This section unravels the key findings and the potential significance of this study. I envision that these findings will bring some clarity, not only to Grade 12 Life Sciences teachers, but also the Department of Education and relevant stakeholders to a better understanding of how a teacher's identity and emotions influence their teaching. This study also pointed out the misconceptions and challenges faced by teachers and parents around evolution and suggests how these hindrances can be alleviated to some extent, in the future.

The following discussion summarises three key findings of this study.

5.2.1 The intricate link between teacher identities and teaching evolution

Day and Kington (2000) describe identity as the way in which we make sense of our identity to ourselves. Similarly, Lasky (2005, p.901) contends that teacher professional identity is "how teachers define themselves to themselves and to others". In terms of teacher identities being compromised during the teaching of evolution, some teachers maintained that their personal identities did not change because their beliefs and perspectives did not change. This is supported by Laetoli who clearly articulated "*teaching evolution has nothing to do with my identity"*. On the other hand, findings indicated that a teacher's personal identity, that is their associations with family and social orientations, is intricately linked to their professional identity as a teacher in the classroom and in the school context. This was evident when Eve stated that "*her personal life created my professional life, one cannot exist without the other"*. This infers that one merges into the other, and this in turn directly or indirectly influences their teaching of evolution to learners – either positively or negatively. This resonates with Nundkoomar (2016) who also concluded that teachers' personal and professional identities are closely entwined. This study also suggested that introverted teachers exhibit a serious demeanour in the classroom with their primary goal to complete the syllabus. These teachers conform to the typical expectations of what a 'good' teacher should be as outlined by the DoE. On the other hand, teachers with a more out-going and robust personality allowed their learners a greater sense of 'freedom' in the classroom in terms of engaging in questions, debating and probing conflicting issues.

All teachers in this study exhibited they were "*equipped to" teach* in knowing their subject knowledge, delivery of the curriculum, being good role models and complying with assessment requirements. In addition, teachers revealed that they wanted to "*become better teachers"* and were open to networking with others to refine and improve themselves. Some believed that "*they opened the doors wide"* for their learners and created a sound platform to further their career choices. However, I did note that some younger teachers did not maintain the same degree of confidence than the more experienced teachers demonstrated.

This paved the way forward for the next key finding: conformed and compromised identities. According to De Beer (2016) some teachers embraced the teaching of evolution but many opposed teaching it. Furthermore, he highlighted that the NCS and CAPS for life sciences envisages a teacher that complies with using evolution terminology and the biological evidence of it. This however, was not always the case in this study. Some participants conformed to what was expected of them in being a 'good' teacher; however, others felt that their identities were compromised as they had to teach a topic that they themselves did not believe in, as Karabo questioned, "*Is there any truth in evolution?"*

This question lead to another key finding that teachers' religious identities conflicted with teaching evolution. The engagement during semi-structured interviews and collages revealed that some teachers' religious affiliations posed a challenge in accepting and teaching the theory of evolution. Although some participants taught evolution in a similar way to other topics, that is, purely on a scientific basis; others struggled with the delivery because it conflicted with their religious beliefs. Furthermore, this challenge is augmented by learners' attitudes towards learning evolution. This situation is supported by Mpeta, Villiers and Fraser (2016) who argued that the religious beliefs and the age of the learner influenced learning evolution. This in turn, filtered into the classroom and made it more difficult for teachers to effectively engage with learners on the subject of evolution, when both parties held their own personal viewpoints, reservations and religious beliefs about evolution.

It was clear that all teachers in this study revealed resilient identities, to varying degrees. Teachers were focused on completing the syllabus; maintaining discipline by setting the tone in the classroom and delivery of the curriculum; in spite of a lack of teaching resources, large numbers of learners in a class and minimal support from school management teams. This is

supported by Nundkoomar (2016) who contended that some teachers had to negotiate conflicts and tensions in their professional relationships with parents and learners and this required employing strategies of resilience. Furthermore, it became evident that teachers in the later years of teaching displayed determination, a zeal for teaching, in spite of burn-out; and were certainly not ready to give up or retire! This tenacity of spirit was contrary to the postulation by Day and Gu in their *Professional Life phases* that some teachers in their later years are 'trapped and tired' and looking to retire.

5.2.2 Teaching evolution is an emotional practice

The second research question analysed the extent to which teaching evolution is an emotional practice. As a point of departure, in summing up my key findings, I re-iterate Hoschild's definition of emotion (1983, cited in Yin & Lee, 2012, p.58)

An awareness of four elements usually experienced at the same time: appraisal of a situation, changes in bodily sensations, the free or inhibited display of expressive gestures and a cultural label applied to specific constellations of the first three elements.

The first theme that emerged from this study on teacher emotions was the descent to anxiety, frustration and indifference. Most participants revealed that inadequate training in the topic of evolution, together with insufficient support from school management teams and the DoE made them feel anxious and frustrated. In addition, a lack of resources and financial constraints with the incessant pressure to perform and produce good results lead many teachers to feel challenged and apathetic in the classroom, which culminated in exhaustion and burn-out. The large number of learners in a class, language barriers and inadequate contact time with learners also contributed to their negative feelings towards teaching evolution. Furthermore, when learners displayed negativity and disinterest towards learning about the theory of evolution, this heightened the negative emotions that some teachers already felt.

This study revealed that it was not only negative emotions that teachers felt, but also a 'kaleidoscope of positive emotions'. Teachers at different stages of teaching evolution felt hope, rewarded, appreciation, fulfilment and excitement. Karabo felt that she did not show any emotions during their lessons and that she detached herself personally from the theory of evolution and taught it logically. She however contradicted herself by saying that she teaches

"*as passionately as I can"*. Indeed, passion denotes an emotion. Furthermore, Eve claimed that she experienced no emotion because both natural selection and human evolution was logical to explain, "*I have to teach Evolution as every other topic"*. In her collage, however she indicated that she sometimes felt 'surprised at her learners' responses and enquiring minds. She also pointed out that she was, "*happy at this stage of my life, satisfied and celebrating life"*. These suggest positive emotions that Eve experienced.

Hargreaves (2000) emphasised that gender, cultural identity and the life or career phase of teachers influenced the way in which they experience and show their emotions. He further contended that: "Teaching is also and always an emotional practice of engagement with learning, relationships with students and adults, and attachment to the purposes and the work that teaching achieves" (p. 117). From the display of both negative and positive emotions by teachers, it can be deduced that teaching evolution, is indeed an emotional practice, and the extent to which it is manifested in the classroom is substantial, affecting both teachers and learners. The findings of this study point clearly towards teacher emotions being closely interwoven in the teaching of evolution, and contrary to the perception that teachers seldom display emotions, this study suggests otherwise.

5.2.3 Teacher's personal and professional identities and their emotions are "evolutionary partners"

This study highlighted that there is a complex link between teachers' identities and their emotions. I therefore used the term '*evolutionary partners*' to accentuate the intertwined relationship between these two elements. This is corroborated by Rogers and Scott (2008) who assert that identity is formed through relationships with other people and emotions are involved. O' Connor (2008, as cited in Nundkoomar, 2016) contends that since teachers have a personal obligation towards their profession, it is therefore their emotions that mould and guide their professional actions. She further points out that a teacher's feelings and understanding cannot be seen in isolation from the social, cultural and political factors prevalent in teaching (O'Connor, 2008; Gabrys-Barker, 2010). In addition, Rodgers and Scott (2008, as cited in Gabrys-Barker, 2010, p. 27) argue that "identity is formed in relationships with others and involves emotions'.

This suggests that the role of emotion is not merely the affective product of teaching but that teaching science is embedded in the complexities of emotional issues (Zembylas (2004, Nundkoomar, 2016). Emotions are therefore not remote entities in isolation, but influence all relationships in the teaching-learning dynamic of the classroom. Furthermore, Zembylas asserts that teachers' emotions are fundamental to understand how they build their identities, that is, "emotion is a discursive practice", and that teachers' emotions are "performative - that is, the ways in which teachers understand, experience, perform and talk about emotions are highly related to their sense of identity" (2005b, pp. 937-938). Effective teaching, particularly the teaching of evolution in life sciences, involves social relationships between teachers and learners, and teachers forming emotional links with the topics they teach. His framework suggests that teachers' emotional lives and how they organise and perform their teaching is related to individual, social and socio-political components (Zembylas, 2002). He argues that 'genealogies of emotions' highlight how teachers' emotions are grafted in their teaching as well as their personal and professional development. Zembylas (2002, p. 83) phrases it this way:

Genealogies of teachers' emotions describe events, objects, and persons and the relationships among them...and the ways in which these emotions are experienced in relation to the teacher-self (individual reality), the others (social interactions) and the school culture in general (socio-political context).

In addition, Naidoo (2014) asserts that emotions and identity are inter-connected. She cited Nias (1996) who claimed that teachers' stories or narratives provide a substantial, enabling instrument for teachers to explore their 'politics of identity' and their social, cultural, political and emotional contexts: their beliefs, values and principles. Moreover, Naidoo (2014) contends that teachers' narratives of their emotions, power relations, conflict and contexts related to their teaching in the classroom. Clandinin and Connelly (2000) concur that teaching a specified curriculum such as evolution in life sciences, influences teachers in complex ways: institutional contexts or stories critically influence teachers' identity, which together with their work experience, emotions and 'teaching' of the prescribed content influences their teaching. This echoes with Govender (2009) who asserts that the identity of a teacher is linked to the emotions that they portray and the way they feel about themselves professionally and emotionally in their home and school contexts. According to Hargreaves (2001a), expressions of emotional

experiences vary among different cultures and distinctly influences identities and teaching in the classroom. Similarly, Zembylas (2002) argues that emotions are social, collective formations which vary for different cultures and are inseparably linked with teaching. This study endorses the views of Naidoo (2014), Govender (2009), Hargreaves (2001) and Zembylas (2002) in providing an rich account of teacher identities and how these are related to their emotions and teaching of evolution in Grade 12 life sciences.

5.3 Recommendations for further research

The following recommendations emerged during this study and was guided by participants' viewpoints and my reflections.

5.3.1 Teacher professional development to support teaching evolution in Grade 12

Participants suggested that life sciences subject advisors and departmental officials who are involved in planning and support, need to be cognisant of the significance of teacher identities and emotions in the teaching-learning process. De Beer (2016) asserts that teachers' pedagogical content knowledge (PCK) in teaching evolution should be developed. Teachers need assistance in teaching evolution in their classroom, both in terms of pedagogy and biological content. Findings in this study suggest that some participants were not exposed to adequate training in the topic of evolution, in terms of content knowledge and how to effectively manage conflicting dilemmas within themselves and when dealing with learners' different worldviews. Majozi (2018) concedes that effective professional development workshops are therefore fundamental to develop teachers' content knowledge and expose them to deal with conflict situations. In addition, teachers need to resolve religious objectives and misconceptions that they hold. Subject advisors should assist in identifying challenges and addressing them at workshops and moderation sessions. Similarly, Day and Kington (2008) suggest that policy- makers at school, and education departments at local and national levels, factor into their planning these potential barriers upon teacher' professional identities, for successful school environments.

I endorse the following suggestions by Sammons et al. (2007) for policy making and improvement at school level: Firstly, local and national education authorities and schools need to target strategies for professional learning and development to support teachers in their later

years of experience. According to Sammons et al. (2007) their VITAE study suggested that teachers, especially in their last phase of their life sciences careers required in-school support to remain engaged and active in their profession. They questioned whether teachers became better over time, "although teachers' perceptions suggested that they became more effective over time in their career" (p. 692), there was no substantial evidence to indicate an association between the age or experience of a teacher and their effectiveness in the classroom. Secondly, policy makers and national teachers' professional associations need to address the association between ateachers' well-being, commitment, resilience and effectiveness by providing extended personnel support structures. Thirdly, efforts to support and enhance teacher quality should focus upon building and sustaining commitment. Therefore, this study recommends that teachers are given adequate training, support, recognition and guidance in teaching the theory of evolution.

5.3.2 Provision of resources

Most participants indicated a lack of resources in their schools. In order for teachers to effectively teach evolution, a variety of teaching strategies and tools are necessary. A further recommendation is that the school management team, together with the DoE assist in providing materials such as videos, Power Point presentations, textbooks, visual media and internet facilities that would enhance the teaching of evolution in Grade 12 life sciences.

5.3.3 Time allocation and structure within the Life Sciences syllabus

Responses from participants suggested that evolution is taught hurriedly in the third term, just before the trial examination and this does not justify the large weighting of marks in Life Sciences Paper 2. This study therefore recommends that more notational time be allocated to the topic of evolution, in order for teachers to complete this section thoroughly. In addition, it would be advisable to re-structure the Grade 12 life sciences syllabus, so that evolution is taught earlier in the year.

5.3.4 Allowances for on-site visits and excursions

South Africa has a vast wealth of heritage sites where fossils and various evolutionary paraphernalia are displayed. These can be viewed first-hand by both teachers and learners to

develop their interest and to enhance their understanding of the topic. Learners can be afforded the opportunity for on-site visits to the local museums and science exhibition centres if an excursion to the 'Cradle of Mankind' World Heritage site in Maropeng is not possible. This study therefore recommends that both learners and teachers be given the opportunity to engage in on-site visits to museums and places of interest.

5.3.5 Recommendations for future research

This study broadly explored how teachers' identities and their emotions influenced their teaching of evolution. This forms only one part of the teaching-learning relationship. Future research could explore the identities of learners and how this influences their attitude, emotions and success towards the learning of evolution in Grade 12 life sciences. I therefore recommend that a further study be undertaken from the perspective of learners and the theory of evolution.

5.4 Strengths of the study

This study provided a platform for teachers to voice and express their emotions on a sensitive, controversial topic. This indicates that these teachers were not isolated, but collectively shared common hindrances in their role in the classroom. On a personal level, as a life sciences teacher, this study equipped me with invaluable insight into the teaching experiences of others, enthusiasm to persevere in teaching evolution and to experiment with different teaching strategies to enhance the understanding of this topic. It also gave me a sense of 'camaraderie' knowing that there are other teachers who share my sentiments, more experienced teachers to imbibe a wealth of knowledge from and furthermore – to be an oasis of replenishment to younger, less experienced teachers facing impediments in the teaching of evolution.

I hope that the findings of this study increase the awareness of the Department of Education to assist in providing much needed support to life sciences teachers, not only materially but in terms of emotional support too.

5.5 Limitations of this study

The following challenges and limitations were encountered during this study. Participant teachers were not available for the scheduled interviews due to the COVID -19 pandemic, therefore, interview questions were made available via email and responses collated and

analysed thereafter. Identities, emotions and evolution are sensitive issues, therefore some participants may have been reluctant to share their stories. Some participants also lacked confidence to represent their emotions through visual media such as collages. Lasky (2005, p.902) asserts that "vulnerability can also develop due to feelings of powerlessness, betrayal, or defencelessness in a situation of high anxiety." I therefore provided a personal example of a collage, using photographs and images that represented my own identities and emotions when teaching evolution.

This study involved a small sample of six teachers that were purposively selected from the uMgungundlovu District in Pietermaritzburg. This therefore limited the participants who were not representative of the population of Grade 12 life sciences teachers. The findings of the study consequently cannot be generalised, but can only be applied to other similar scenarios. There was also a limitation with respect to the schools used in this study. This study was conducted in five secondary schools in urban areas of Pietermaritzburg. Future research could include schools from rural and semi-rural areas.

Another limitation was that the participants only comprised of female teachers. As noted earlier, this was not by choice, but only female teachers committed to being part of this research study. Male teachers teaching Grade 12 Life Sciences in the uMgungundlovu district were approached to participate. It would be interesting for future research to examine the influence of male teachers' identities and their emotions related to teaching evolution, compared to their female counter-parts. Thus a comparative study of male and female emotional orientation may prove beneficial as it may help to determine whether male and female teachers respond differently to teaching evolution and how they differ.

5.6 Conclusion

In this concluding chapter, I have outlined the purpose of this study and highlighted how each chapter is linked to amalgamate a meaningful whole. I reviewed the literature and conceptual frameworks adopted in this study as well as the methodological and analytical tools used to delve into the findings. I also discussed the strengths, limitations and possible directions for future research. The key findings of this study showed the *intricate link between teacher identities and teaching evolution* and that *teaching is an emotional practice*. The analysis of the findings therefore indicated that teaching evolution is influenced by a teacher's personal

and professional identity and that it is influenced by teachers' emotions which affects every facet of their lives. In closing, I leave you with the following thoughts from the 'Father of Evolution', Charles Robert Darwin (1809 -1882):

> These laws, taken in the largest sense, being *Growth with Reproduction, Inheritance and Variability* from indirect action of the conditions of life, and from use and disuse: a ratio of increase so high as to lead to a Struggle for Life, and as a consequence to *Natural Selection* which entails *Divergence of Character* and the extinction of less-improved forms.

I conclude by saluting life sciences teachers of evolution in Grade 12, who shape and lay the foundation for their learners. Teachers, who navigate past hurdles in the classroom; find a balance between their personal and professional lives; and who emulate adaptability in the face of change, as portrayed by Charles Darwin:

> *It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change, that lives within the means available and works co-operatively against common threats.*

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Appendices

Appendix 1: Letter from the Department of Education granting permission to undertake this research

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Enquiries: Phindile Duma **Tel:** 033 392 1063 **Ref.**:2/4/8/4005

Mrs Anastasia Paulette Baijnath
22 Pearl Crescent
Raisethorpe
PIETERMARITZBURG
3201

Dear Mrs Baijnath

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"EXPLORING TEACHER IDENTITIES AND EMOTIONS IN THE TEACHING OF EVOLUTION IN GRADE 12 LIFE SCIENCES"**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 15 November 2019 to 10 January 2022.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers below.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

UMGUNGUNDLOVU DISTRICT

[redacted]

Dr. EV Nzama
Head of Department: Education

Championing Quality Education - Creating and Securing a Brighter Future

KWAZULU-NATAL DEPARTMENT OF EDUCATION
Postal Address: Private Bag X9137 • Pietermaritzburg • 3200 • Republic of South Africa
Physical Address: 247 Burger Street • Anton Lembede Building • Pietermaritzburg • 3201
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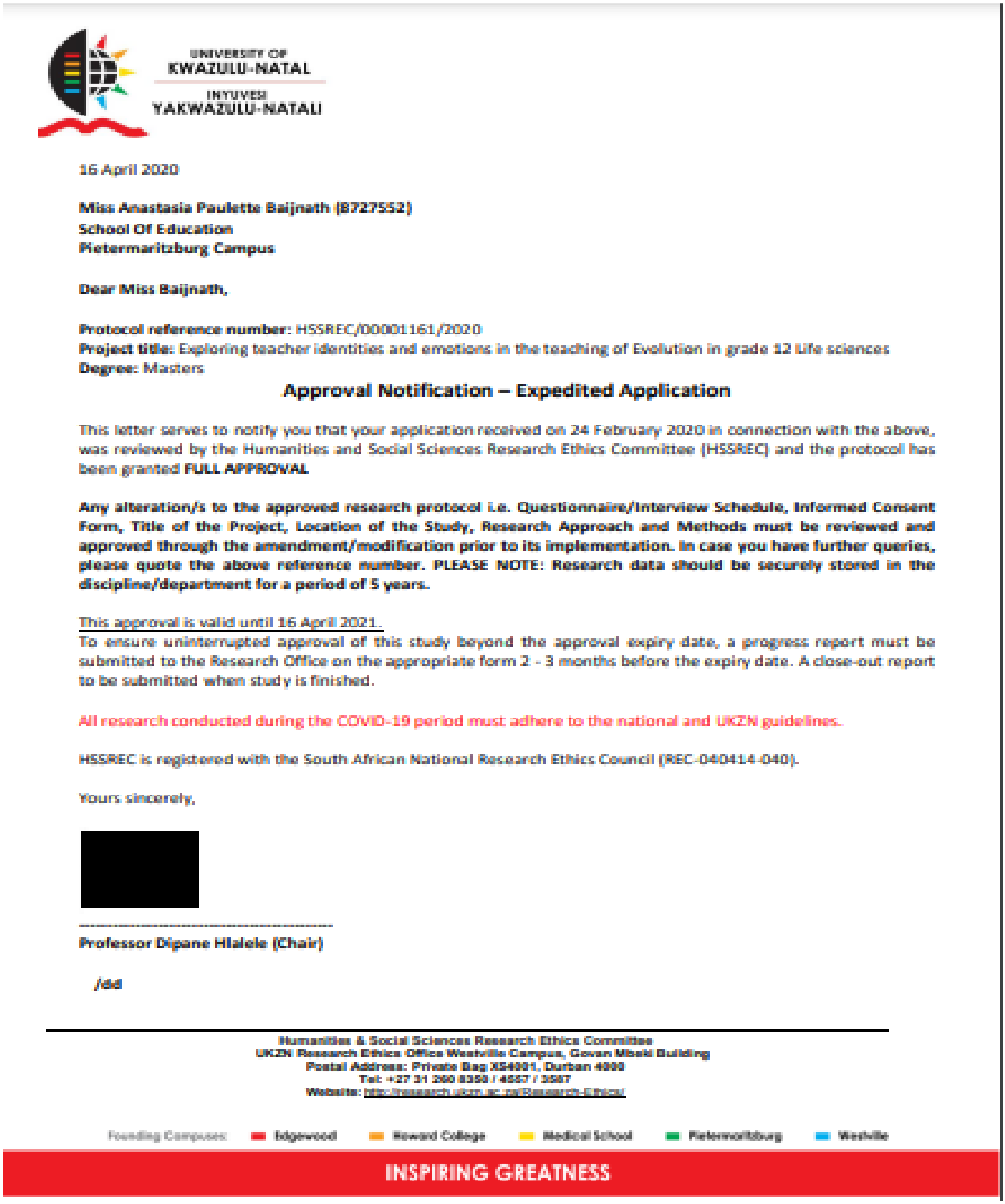
Facebook: KZNDOE ... Twitter: @DBE_KZN ... Instagram: kzn_education ... Youtube:kzndoe

Appendix 2: Letter of permission from the UKZN Research committee



UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

16 April 2020

Miss Anastasia Paulette Baijnath (8727552)
School Of Education
Pietermaritzburg Campus

Dear Miss Baijnath,

Protocol reference number: HSSREC/00001161/2020
Project title: Exploring teacher identities and emotions in the teaching of Evolution in grade 12 Life sciences
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 24 February 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) 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.

This approval is valid until 16 April 2021.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Professor Dipane Hlalele (Chair)

/dd

Humanities & Social Sciences Research Ethics Committee
UKZN Research Ethics Office Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Tel: +27 31 260 8350 / 4557 / 3587
Website: http://research.ukzn.ac.za/Research-Ethics/

Founding Campuses: Edgewood | Howard College | Medical School | Pietermaritzburg | Westville

INSPIRING GREATNESS

Appendix 3: Letter to the School Principals

22 Pearl Crescent
Raisethorpe
Pietermaritzburg
3201

20 April 2020

Dear Sir/ Madam

My name is Paulette Baijnath (Student number: 8727552). I am currently engaged in a Masters' degree in Education (MEd), specialising in Teacher Development Studies, at the University of KwaZulu-Natal (Pietermaritzburg campus).

As part of the requirement for this degree, I am required to conduct a research project. The title of my research study is "Exploring Teacher Identities and Emotions in the Teaching of Evolution in Grade 12 Life Sciences".

The objective of this research study is to explore how a teacher's personal and professional identity influences their teaching of evolution, in Grade 12 life sciences. It also sets out to establish to what extent is teaching evolution an emotional practice? I request your assistance in this research project by being granted permission to conduct my study in your institution.

This study will involve the following procedures:

Purposive sampling of a teacher who meets the criteria of teaching Grade 12 life sciences will be utilised. He or she will be observed during lessons as a data generation method. They may also be required to complete a questionnaire and to participate in a semi-structured interview. The duration of the interview will not exceed 30 minutes at a time, to minimise disruption of teaching and learning. Follow-up interviews may be conducted if necessary. Each interview will be voice-recorded. The duration of the teacher's participation is expected to be 6-8 weeks.

This study will not involve any harm or discomfort to the school and teacher. In the event of any queries, or concern you have, please contact me, my supervisor or the UKZN Humanities & Social Sciences Research Ethics Committee.

Contact details:

Paulette Baijnath:

Cell: 0846126781 Email: pauletteastephens@gmail.com

Dr J. Naidoo (Supervisor)

Work no. 033 260 5867 Email address: naidooj@ukzn.ac.za

UKZN Research Office

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X54001
Durban
4000

SOUTH AFRICA

Tel: 27 31 2604557

Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

Please note: Participation in this research study is voluntary and participants may withdraw at any point with no negative consequences. All names of institutions and participants will be changed, and pseudonyms will be used so that schools and participants remain anonymous.

Information provided by participants will remain confidential and will not be shared with anyone else. Data generated through lesson observations, questionnaires and semi-structured interviews will remain confidential.

Thank you for your cooperation.

Yours sincerely

_____

Paulette Baijnath

DECLARATION OF CONSENT

I_____ (Full names of the School Principal) have been informed about the purpose and procedures of this study and hereby consent to this project being undertaken at your school.

_____ _____

SIGNATURE OF SCHOOL PRINCIPAL DATE

Appendix 4: Letter to Teacher Participant

22 Pearl Crescent
Raisethorpe
Pietermaritzburg
3201

20 April 2020

Dear Sir/ Madam

My name is Paulette Baijnath (Student number: 8727552). I am currently engaged in a Masters' degree in Education (MEd), specialising in Teacher Development Studies, at the University of KwaZulu-Natal (Pietermaritzburg campus).

As part of the requirement for this degree, I am required to conduct a research project. The title of my research study is "Exploring Teacher Identities and Emotions in the teaching of evolution in Grade 12 life sciences".

The objective of this research study is to explore how a teacher's personal and professional identity influences their teaching of evolution, in Grade 12 life sciences. It also sets out to establish the extent to which teaching evolution is an emotional practice. I request your assistance in this research project by being granted permission to conduct my study in your institution.

This study will involve the following procedures:

Purposive sampling of a teacher who meets the criteria of teaching Grade 12 life sciences will be utilised. He or she will be observed during lessons as a data generation method. They may also be required to complete a questionnaire and to participate in a semi-structured interview. The duration of the interview will not exceed 30 minutes at a time, to minimise disruption of teaching and learning. Follow-up interviews may be conducted if necessary. Each interview will be voice-recorded and the duration of the teacher's participation is expected to be 6-8 weeks.

This study will not involve any harm or discomfort to the school and educator. In the event of any queries, or concern you have, please contact me, my supervisor or the UKZN Humanities & Social Sciences Research Ethics Committee.

Contact details

Paulette Baijnath: Cell: 0846126781 Email: pauletteastephens@gmail.com

Supervisor: Dr J. Naidoo Email address: naidooj@ukzn.ac.za

Work no. 033260 5867

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Durban
4000
SOUTH AFRICA
Tel: 27 31 2604557- Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Please note: Participation in this research study is voluntary and participants may withdraw at any point without any negative consequences.

All names of institutions and participants will be given pseudonyms will be used so that schools and participants remain anonymous. Information provided by participants will remain confidential and will not be shared with anyone else. Data generated through lesson observations, questionnaires and semi-structured interviews will remain confidential.

Thank you for your cooperation.

Yours sincerely

_____

Paulette Baijnath

DECLARATION OF CONSENT

I_____ (Full names of the School Teacher) have been informed about the purpose and procedures of this study and hereby consent to this project being undertaken at your school.

_____ _____

SIGNATURE OF TEACHER DATE

I hereby provide consent to: (Please circle response)

Audio-record semi-structured interviews YES / NO

Observe lessons and classroom activities YES / NO

Use Collage designed YES / NO

_____ _____

Signature of Participant Date

Appendix 5: Interview Schedule

Dear Participant,

To assist in the collection of data, and to improve my understanding of how the identities of teachers and the extent to which their emotions influences the teaching of evolution in Grade 12 life sciences, relevant questions have been formulated for the interview. Please try to answer each question honestly and without prejudice. Kindly note that all the information that you provide to the interviewer, will be handled in a professional and confidential manner. I thank you for your valued time and responses.

1. Briefly describe yourself as a life sciences teacher in the classroom?

2. What are some challenges that you face in the classroom as a life sciences teacher?

3. What is your understanding of the theory of evolution?

4. Is evolution a challenging topic to teach? If yes, please describe some challenges and how you are able to overcome them.

5. To what extent do your emotions affect your teaching of evolution?

6. Briefly describe the teacher support that you receive from the school management team.

7. Do you receive sufficient support and training from the Department of Education to teach life sciences, in particular, evolution?

8. Please state whether you follow a religion or not and if so, which religion you follow. Please note that this is confidential and only for the purpose of this research project. Do your religious beliefs pose a challenge in teaching evolution? Briefly explain.

9. If you were approached by the life sciences subject advisor to implement changes to the current life sciences curriculum, what changes would you recommend? Why?

10. What recommendations would you offer to the Department of Education with regards to teaching life sciences, especially teaching evolution?

Appendix 6: Lesson Observation Schedule

To assist in the collection of data, and to improve my understanding of the extent to which the identities and emotions of life sciences teachers influence their teaching of evolution in Grade 12, the following observation schedule has been compiled below. Kindly note that all observations will be handled in a professional and confidential manner. I thank you for your valued time and willingness to be a part of this research study.

Lesson Observation Schedule

Date :	Grade: 12
Learning Area: Life Sciences	Lesson Topic: Natural Selection & Darwinism

Prompts and Comments

Planning

Lesson outcomes / resources / organization / use of time / flexibility to adapt

_____

_____

_____

_____

Knowledge and Understanding

Theory and practical skills in life sciences curriculum / development of key concepts and skills / demonstrate understanding of natural selection in evolution

_____

_____

_____

_____

Teaching

Activities designed / responsive to learners needs / questioning / use of language / pace / handling sensitive issues

_____

_____

_____

_____

Managing learners

Sets ground rules / atmosphere of classroom / dealing with inappropriate behaviour and responses / respect and tolerance of learners views.

_____

_____

_____

Appendix 7: Reflective journal schedule

Data collection method 3 : Reflective Journal
Lesson : Darwinism and Natural Selection
Grade : 12

The following are guiding questions to assist you in reflecting on your lesson:

1.How many learners were present in class today?

2.1.Were the learners interested /not interested during the lesson? How were you able to gage this?

2.2. If learners were not interested or showed resistance, how could you overcome this negative attitude in the future?

3.What were some of the challenge you experienced when teaching Darwin's theory of Natural Selection today?

4.Briefly explain how you were able to overcome these challenges.

5.What emotions did you experience teaching this lesson? Why did you feel that way?

6.Was your personal identity compromised during the teaching of this lesson? Briefly elaborate.

7.If you could change any aspect of a lesson, what would that be? Why?

8. Please add on any reflective thoughts or suggestions that you have on teaching Darwinism under General Evolution.

Thank you kindly for your response.

Example of Reflective Journal

Reflective Journal: Teaching Evolution in Grade 12 Life Sciences

1.How was your identity as a person/ Life Sciences teacher affected when teaching Natural Selection and Human Evolution on a:

1.1. personal level

It was not affected on a personal level.

1.2 professional level

It has challenged me as I have had to research current data relating to the topics and make it more relable. It has made me a better teacher in that I was able to disconnect my emotions from the topic as I do not believe in human evolution.

2.What emotions did you experience when teaching Evolution topics such as Darwin's Theory of Natural Selection and Human Evolution? Why was this so?

I felt like I could understand why the theory of natural selection was accepted and from a scientific perspective I found common ground. However, when it came to human evolution I felt very uncomfortable and disconnected. The reason for these emotions is that I am a very spiritual person and my beliefs are contrasting to both topics. Being a christian, my relationship with the creator has made me reject every idea that takes away from his masterpiece of creation.

3.Were the learners interested /not interested during the lesson? How were you able to gage this?

Some learners were interested and some were not. I could gage this from their responses to questions or interactions or lack thereof. However, it is important to note that some learners may only show interest because of their passion to progress/ succeed and get good marks for Life Sciences or to not fail the section that is tested.

4. What would you change about your Natural Selection and Human Evolution lesson? Why?

For natural selection I prefer to use more practical examples ie. simulation of natural selection involving learners doing a practical and having discussions on it. For Human evolution I prefer learners watching a video of the timeline and the various fossils and have it all visual and I could pause the video and point out important points.

5. Please add on any reflective thoughts or suggestions that you have on teaching Darwinism and Human Evolution.

I would suggest that Darwinism be taught as used to relate to evolution in present times as well as to broaden learners perspectives. I would also suggest that Human Evolution be reduced to the main events and ideas and evidence without the detail required to be learnt.

Thank you kindly for your taking the time to assist me in gaining a better understanding of how Life Sciences' teachers are affected by the teaching of Evolution in Grade 12.

Appendix 8: Guidelines for collage compilation

This data generation instrument is the compilation of a collage. Butler-Kisber and Poldma (2008) and Pillay, Ramkelewan and Hiralaal (2017) describe a collage as the process of using pieces of images, photographs or materials that are glued on a flat surface to highlight certain relevant events in one's life.

It will provide rich data that you the participant can express, without the use of verbal or written methods. It will provide valuable data on the extent to which the identities and emotions of life sciences teachers influence their teaching of evolution in Grade 12. Kindly note that all collages will be handled in a professional and confidential manner. I thank you for your valued time and willingness to be a part of this research study. The guidelines for compiling a collage are provided below:

Guidelines for Collage Making:

Theme for the collage:

My identities and emotions when teaching evolution in Grade 12 life sciences

Design a collage which reflects your identity and emotions as a life sciences teacher and specifically when teaching evolution.

Materials: paper, magazines, photographs, scissors, glue, sketch pens, pen colours

Method:

1. Select and cut out suitable pictures, words, quotes from magazines and newspapers. You may also use photographs or other paraphernalia to express your emotions.

2. Stick your cut-outs and write a short description below each.

3. Your collage is now ready to depict your pictorial story!

Appendix 9: Samples of Participants' Collages


Ardi
CELEBRATING
LIFE !!
"I want women to embrace ageing, be proud of it, and do it well."
Healthy
I've opened the doors wide.
Equipped
Pets
Home
Live life in Full Colour!
DOUBLING YOUR CHANCES
OF GETTING TO THE FINAL
WIN
The XYZ of
Fastest
I think you need to be mentally tough
"It was my dream from a very young age to ... become a teacher!
I like a bit of alone time
but, love to travel...
SPORT
THANK YOU

Want to become a

Naledi

BETTER

teacher!

delivery

of curriculum is important

service

TO LEARNERS + THE SCHOOL...

FOR THE PLANET

Equipped

Appendix 10: Summary of teacher identities and emotions from collages compiled by teachers

Teacher Participant	**Naledi** *The young, anxious, challenged teacher who wants to become better!*	**Karabo** *The life-long learner filled with optimism and hope*	**Lucy** *Epitomises dedication to the teaching profession*	**Ardi** *Life-long dream was to become a teacher!*	**Eve** *The matriarch, what you see is what you get!*
Personal identity	Love for the planet A quiet, shy person Serious Sense of responsibility for others	New fashion, Grooming is important, updated Live a healthy, colourful life Extremely extreme, speed!	Mother Wife	Celebrating life! So thankful! "I want women to embrace ageing, and be proud of it and do it well". Live life in full colour, Healthy, fastest Love my home and pets	Green revolution You make it beautiful! Joy and jewels "I love words"

				I love to travel…but also appreciate a bit of alone time.	
Professional identity	Equipped to teach Delivery of curriculum is important I want to become a better teacher!	Equipped to teach Always give the best of you. That's my dream – to become better and better! My goal was always to win.	Researcher/ life-long learner Never quit!	Equipped It was my dream from a very young age to become a teacher! Doubling your chances of getting to the final	Tried and trusted Happy at this stage of my teaching career Responsibility, be better
Situated identity	Service to learners and the school	Wellness for everybody When you make mistakes, you learn from it.	Be a teacher not a friend Plan how to teach your material Networking Communicate more, ask,	I've opened the doors wide I think you need to be mentally tough to win	Support to other teachers in Life Sciences It's imperative to be different. Rewarded

		Discovery is important. Challenged, Wide awake Is there any truth to Evolution?	learn, refine, improve Passion is infectious. Pass this desire to learn more to my learners.		

Appendix 11: Turn-it-in report

Turnitin Originality Report

Exploring Teacher Identities and Emotions in the teaching of Evolution In Grade 12 Life Sciences by Paulette Baijnath

From Postgrad chapters (Postgrad chapters)

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Appendix 12: Language Editor's report

Proofwrite Solutions

WRITE • EDIT • RESEARCH • DESIGN

28th June 2021

To whom it may concern

EDITING OF DISSERTATION FOR ANASTASIA PAULETTE BAIJNATH

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 Paulette Baijnath's dissertation titled **"EXPLORING TEACHER INDENTIES AND EMOTIONS IN THE TEACHING OF EVOLUTION IN GRADE 12 LIFE SCIENCES"** 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

[redacted]

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.