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# THE UNIVERSITY OF THE WITWATERSRAND

# The influence of a short intervention programme on Professional Development of in-service teachers in Education for Sustainable Development in secondary schools

**CONCEPTA MUOFHE THENGA**

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**A thesis submitted to the Wits School of Education, Faculty of Humanities, University of the Witwatersrand in fulfilment of the requirements for the degree of Doctor of Philosophy.**

**Johannesburg, 26th August 2020**

## Declaration

I declare that this thesis is my own, unaided work. It is being submitted for the degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



Concepta Muofhe Thenga

12th day of February 2020

I dedicate this work to my late parents, Takalani Selina Sibiya and Tshidaho Phillip Thenga, and my sons, Madali and Ntsieni

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**List of Abbreviations**

| | |
|---|---|
| AMCEN | African Ministerial Conference on Environment |
| AEETAP | Africa Environment Education and Training Action Plan |
| CAPS | Curriculum and Assessment Policy Statement |
| DBE | Department of Basic Education |
| DEC | Delta Environment Centre |
| DESD | Decade of Education for Sustainable Development |
| EE | Environmental Education |
| EEASA | Environmental Education Association of Southern Africa |
| ESD | Education for Sustainable Development |
| EfS | Education for sustainability |
| ESE | Environment and Sustainability Education |
| FET | Further Education and Training |
| GAP | Global Action Programme |
| GDE | Gauteng Department of Education |
| SBA | School Based Assessment |
| SDG | Sustainable Development Goals |
| TPD | Teacher Professional Development |
| UN | United Nations |
| UNDESD | United Nations Decade of Education for Sustainable Development |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| WSSD | World Summit for Sustainable Development |

# Chapter 1:

# Introduction and background

## 1.1 Introduction

Humanity is currently facing a number of environmental and societal challenges. These environmental and sustainability challenges are embedded in the South African Geography curriculum and require people to know and understand them in order to function in this changing world (Bonnett, 2012). The topics raised in the curriculum are relevant for addressing the training and preparation of both pre-service and in-service teachers for the development of a sustainable society. The overarching issue is:

> *Are teachers trained to provide relevant education, and if so, relevant as defined by what – the economy; the need for developing learners' subject knowledge, citizenship and life skills; the need for developing a sustainable society; or all of the preceding?* (Lotz-Sisitka, 2013, p.26).

Lotz-Sisitka (2013) argues that education quality should not only focus on efficiency and mastery of the subject content but must also include learners' views and must be situated in the local culture and community interests. Wals (2012b) stipulates that Education for Sustainable Development (ESD) contributes to quality education; education that is locally relevant and culturally appropriate. Quality education delivers content that is relevant to the learners' communities. On that account, it is important to capacitate teachers so that they can teach for and about ESD and enable learners to access quality education. This study investigates the effectiveness of teacher professional development (TPD) on ESD in Grade 10 to 12 Geography classes in South African secondary schools. The aim is to explore the effectiveness of a short course intervention programme in developing and transforming teachers' subject knowledge and pedagogical practices and integrating values in teaching and learning.

This chapter is arranged as follows:

- The context and the background to the study;
- The problem statement;

- The aims and research questions;
- Overview of the research approach and the research process; and
- Overview of the research chapters.

### 1.2 Context and background to the study

The role of education is seen as a catalyst for building a better and more sustainable future for all (UNESCO, 2014). This is the view of UNESCO, which has gained increasing recognition internationally during the United Nations Decade of Education for Sustainable Development (UNESCO, 2014). The United Nations General Assembly adopted the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for sustainable development (United Nations, 2015). SDG 4 states that "*governments must ensure inclusive and quality education for all and promote lifelong learning opportunities for all*". Target 4.7 of this goal states that governments must ensure that "*all learners acquire knowledge and skills needed to promote sustainable development… through education for sustainable development and sustainable lifestyles…*" (United Nations, 2015). To attain this noteworthy goal, teachers should be able to implement ESD in teaching their respective subjects to ensure that learners acquire the knowledge, skills and values that promote sustainable development.

At the end of the UNDESD, UNESCO (2014) designed the Global Action Programme (GAP) on ESD. The GAP identified five Priority Action Areas, namely advancing policy, transforming learning and training environments, building capacities of educators and trainers, empowering and mobilizing youth, and accelerating sustainable solutions at local levels. Priority Action Area 3 of the GAP stipulates that there is an urgent need to build the capacity of educators so that they can deliver ESD effectively (UNESCO, 2014), based on the assumption that learning can be transformed if teachers become learning facilitators for ESD. For that reason, teachers' knowledge and skills in ESD need to be developed to enable them to teach for sustainability. The developments that have occurred in ESD over the years will be explained further in the literature review.

The principles that underlie the South African Department of Basic Education's Curriculum and Assessment Policy Statement (CAPS) for all subjects are social

transformation; active and critical learning; high knowledge and high skills; progression; human rights, inclusivity, environmental and social justice; valuing indigenous knowledge systems; and credibility, quality and efficiency (Department of Basic Education, 2011). These principles support ESD-orientated learning because they are related to the characteristics of ESD as indicated in the UNESCO ESD sourcebook (UNESCO, 2012). ESD includes the environment, society and economic dimensions; it is culturally relevant, promotes higher order thinking skills, and is based on principles of sustainability (UNESCO, 2012). Education can address issues of social transformation within an ESD framework.

A number of researchers have noted that ESD contributes to quality education in different ways. It is argued that ESD interventions lead to positive changes in students' knowledge, awareness, skills, attitudes and behaviour (Stern, Powel & Hill, 2014; O'Flaherty & Liddy, 2018). O'Flaherty and Liddy (2018) further argue that the pedagogies that are proposed in teaching and learning in ESD promote changes in the knowledge, awareness and skills that learners develop. Laurie *et al* (2016) argue that ESD pedagogies facilitate and promote the learning of knowledge, skills, perspectives and values necessary to advance sustainable lifestyles. According to O'Flaherty and Liddy (2018), these pedagogies include issues-based, project-based, investigative and cooperative group work. One could argue that evidence of positive change in learners' knowledge, awareness and skills is a result of the pedagogy that is associated with ESD. The change in behavior that is necessary for the maintenance of sustainable societies cannot only be attributed to knowledge gain, but also relies on social, cultural and physical environmental factors (Pe'er, Goldman & Yavetz, 2007; Stern, Powell & Hill, 2014).

According to Dube (2017), there are major challenges in the implementation of ESD in the South African school context. Dube (2017) contends that this is due to teachers' lack of ESD knowledge and poor teaching practices; and also, the contextual issues and structural constraints within schools. Therefore, Dube (2017, p.93) recommended that these challenges can be addressed through in-service teacher training "*to ensure mastery of appropriate competencies for implementation of Environmental Education (EE) and ESD*".

Even though components of ESD content can be found in most subjects in the South African education curriculum, Geography has perhaps the closest relationship with ESD. This aligns with the Lucerne Declaration on Geographical Education for Sustainable Development (Haubrich, Reinfried & Schleicher, 2007), which suggests that all action themes in the United Nations Decade of Education for Sustainable Development, including the environment, water, rural development, sustainable consumption, cultural diversity, climate change and disaster reduction, have a geographical dimension. The 2016 International Charter on Geographical Education asserts that geography helps people to think critically about sustainable living locally and globally and how to act accordingly. Therefore, geography is seen as an essential part of education for addressing sustainable development issues. Smith (2013) argues that there is an overlap in content and pedagogy between Geography and ESD, therefore it is an important discipline to engage in when teaching for, about and through sustainable development.

*Fundisa* for Change is a collaborative programme formed to enhance transformative environmental learning through teacher education (*Fundisa* for Change, 2013). *Fundisa for Change* aims to develop teachers' knowledge and skills, strengthen the teaching of environmental concepts in schools, and encourage teachers to develop the values and ethics needed for a more just and sustainable society (*Fundisa* for Change, 2013). This study will focus on the *Fundisa* for Change programme, where in-service teachers were trained on environment and sustainability content as well as teaching and assessment practices using the *Teaching Climate Change* manual.

An intervention course, which was run at Delta Environment Centre (DEC) in March 2016 by *Fundisa for Change*, was developed with the intention of supporting Geography teachers in the Further Education and Training Phase (FET) to meet the requirements of the Curriculum and Assessment Policy Statement (CAPS). All the topics in the Geography curriculum are explored by applying the conceptual framework that embraces the "four big ideas" advocated by Bonnett (2008) and adopted by the Department of Basic Education (DBE), namely understanding place, spatial distribution patterns, spatial processes, and human and environment interaction. This means that all concepts studied in the Geography curriculum should be taught with an understanding of what they are,

where they occur, how they occur, and their impact on humans and the environment. Attitudes and values that the Geography curriculum aims to foster are:

> *a concern for the sustainable and fair use of resources for the benefit of all; recognizing the significance of informed decision making; the application of geographical knowledge and skills in learners personal lives; respect for the rights of the people; and a sense of fairness, sustainability and equality* (Department of Basic Education, 2011, p.9).

These attitudes and values fostered in the Geography curriculum require teachers to understand environmental issues better so that they can help learners makes sense of such issues.

Fourteen teachers attended the *Fundisa for Change* teacher professional development (TPD) course held at the DEC. Twelve were from township schools, one from a suburban school and one from a rural area. The teachers who participated in the intervention course completed a course evaluation at the end of the training. The course evaluation required the participants to report on the following aspects:

- Did the teachers have some experience on environmental learning before the course?
- The relevance of the course content;
- The effectiveness of the course material;
- Is environmental learning part of the curriculum? and
- The likelihood of participating teachers applying what they have learned in the course to their classroom practice.

I analysed participating teachers' responses from the course evaluations. Most of the participants indicated that they were familiar with environmental learning before the course, the course content was relevant, the materials used for training were very effective, and they are highly likely to use the knowledge obtained in their classroom practice.

The views expressed by teachers after the course prompted me to investigate the effectiveness of the *Fundisa for Change* short course intervention programme on teachers' subject content knowledge and the transformation of their teaching and assessment practices in teaching environment and sustainability. This study will therefore determine how in-service teachers from the schools that participated in the short course intervention programme have transformed their practice in teaching environment and sustainability content reflecting key aspects of ESD. The study also established whether transformation that might have resulted from this course was sustained or not.

### 1.3 Problem statement

Raselimo (2017) argues that teaching Geography as part of ESD challenges teachers to consider their content knowledge and pedagogical practices in the process of teaching and learning. This might suggest that most teachers are underprepared to teach for and about ESD. Several interventions have been conducted in South Africa and the rest of the world to develop teachers' knowledge and skills in teaching environment and sustainability such as Kids in Parks (Ferreira, 2014), Eco-schools (Rosenburg, 2009), the South African Green Schools programme (Bizcommunity, 2017), Gould League of Bird Lovers in Australia (Gough, 2006) and Green Schools in Taiwan (Gough, 2006). The *Fundisa for Change* was one such programme, which, as explained above, used the Teaching Climate Change manual to train teachers and introduces teachers to relevant content knowledge, teaching and assessment practices that enable them to teach environment and sustainability content in CAPS successfully. This study investigated the effectiveness of the *Fundisa* for Change intervention programme and how such courses can be structured and implemented effectively.

O'Donoghue (2013) argues that teachers need to know the subject and improve teaching methods and assessment practices for active classroom teaching and learning for environment and sustainability to take place. Mandikonza and Lotz-Sisitka (2016) contend that teachers should have the capacity to implement change in their teaching practices in order to engage learners and be able to respond to issues in their communities. "*If one wants to change society and education, one of the cornerstones to start with is education of already qualified teachers and teacher education*" (Hofman,

2015, p.213). This study seeks to determine if teachers did transform their practices after attending the *Fundisa for Change* intervention course.

The purpose and aims of the study are outlined next.

### 1.4 Aims of the study

The purpose of this study is to determine what influence the *Fundisa for Change* short course intervention program had in improving teacher capacity for effective implementation of ESD in the curriculum. The *Fundisa for Change* intervention programme held at DEC was designed to improve teachers' content and pedagogical knowledge of Geography using the *Teaching Climate Change* manual. Climate change units in the *Teaching Climate Change* manual were related to topics in the Geography Curriculum and Assessment Policy Statement (CAPS). Since the intention of the *Fundisa for Change* programme is to improve and strengthen environmental learning in schools through teacher education (Fundisa for Change, 2013), the aim of this study is to determine if the *Fundisa for Change* programme managed to transform teachers' content knowledge and pedagogical practices.

The following are the objectives of this study:

- To establish the extent of transformation of teachers' environment and sustainability content knowledge after attending the short course intervention program.
- To determine whether teaching methods transformed positively after the course.
- To determine how assessment practices used by teachers to assess environment and sustainability themes were modified after the course.
- To determine how resources used in teaching and learning changed after the course.
- To determine the extent to which teaching and learning is linked to local community, societal, and environmental and sustainability values.
- To establish constraints on and enablers for implementing ESD in schools

The research questions which guided this study are listed in the next section.

## 1.5 Research questions

The **main research question** for this study is:

> In what ways have the short teacher professional development course transformed teachers' content knowledge, teaching and assessment practice in teaching for and about ESD in Geography?

The **sub-questions** are:

- What are teachers' conceptions of environment and sustainability knowledge and how do they identify such knowledge in the Grade 10 to 12 Curriculum and Assessment Policy Statement (CAPS) document for geography?
- What teaching and assessment practices do teachers use when teaching environment and sustainability content knowledge after intervention?
- Which resources do teachers use to teach environment and sustainability knowledge?
- In what ways do teachers integrate environment and sustainability values in their teaching and assessment practices?
- What are the constraints and enablers in implementing ESD in teaching practices?

## 1.6 Definition of concepts

This section briefly defines key concepts used in this thesis. These concepts will be discussed in detail in the literature review in Chapter 2.

### 1.6.1 Environmental Education

The Tbilisi declaration marks the starting point for formal international EE initiatives (UNEP, 2009). Tbilisi declaration stipulated that EE should be provided for people of all ages and at all educational levels, in both formal and non-formal settings. Reddy (2011) argues that EE is a form of education that is primarily concerned with addressing environmental issues and problems in order to reduce their impact. Reddy (2011) further argues that EE should be viewed as a process that is aimed at developing a society that is aware of and concerned about the environment and its associated problems. This requires people to develop knowledge, motivation, skills and attitudes to work individually

and collectively towards solutions to current environmental problems and finding solutions of future problems. Ferreira (2013) contends that EE aims to prepare current and future generations to think environmentally, ecologically and act accordingly.

According to Pavlova (2013), Environmental Education (EE) and ESD share a vision of quality education and a society that lives in balance with the Earth's carrying capacity. Pavlova (2013) further argues that the difference between EE and ESD is in terms of the expectations and how that vision is realized and what need to be balanced. ESD will be described in the next section.

### 1.6.2 Education for Sustainable Development

UNESCO (2005) describes ESD as a process that prepares people to plan for and cope with issues concerning sustainability and the planet, and to find solutions to problems and lifestyles that threaten them. This means that ESD empowers people to propose solutions to environmental and sustainability issues that are endangering people's livelihood.

> *ESD empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity* (UNESCO, 2014, p.11).

Wals (2012a) argues that ESD emphasize the involvement of citizens in decision making. The aim of ESD is to empower citizens to act for positive environmental and social change. ESD requires educators and learners to reflect critically on their own communities, and to work collectively in reducing environmental challenges (UNEP, 2009). ESD requires teachers to consider local and community values so that learners can reflect on what affects them in their communities.

The effective implementation of ESD requires teachers who know and understand the concept of sustainable development and ESD. Therefore, the importance of TPD will be discussed in the next section.

### 1.6.3 Teacher professional development (TPD)

According to Avalos (2011), TPD is a complex process that requires teachers to improve their capacity either individually or collectively in terms of subject content knowledge and teaching practices. Avalos (2011) further contends that teacher development is about teacher learning and transforming their knowledge for the benefit of their learners. TPD refers to ongoing personal, social and intellectual growth of teachers' knowledge, skills and practices in teaching (Ferguson, 2011). This means that TPD transforms teachers' knowledge and skills to improve learners' performance. The development of in-service teachers on ESD is the main concern in this study, and the terms teacher development and teacher professional development will be used interchangeably.

Transformative learning will be discussed in the following section.

### 1.6.4 Transformative learning

Taylor (2008) describes transformative learning as adult learning that is grounded in human communication, where learning is understood as a process of interpreting prior knowledge in order to construct new experiences. Lange (2009, p.195) contends that "*transformative learning is about challenging worldviews, with implications that individuals and society are improvable and constructible"*. Transformative learning is a process that occurs when individuals make meaning through interactions with the social environment (UNEP, 2009). This means that learning is transformative if individuals go beyond acquiring knowledge and reflect on worldviews in order to consciously construct new experiences. Transformative learning has been introduced here as a concept that refers to adult learning which allows teachers to transform their content knowledge and pedagogical practices so that they can improve learners' outcomes.

Critical reflection, which may contribute to transformative learning, will be defined in the next section.

### 1.6.5 Critical reflection

Mezirow (2000) argues that critical reflection involves reasoning or intuition. People reflect on the content or the description of the problem and the strategies for solving problems,

and then question the relevance of the problem (Mezirow, 1991). This means that critical reflection occurs when individuals think through and reflect on their experiences. Cranton (1996) argues that critical reflection can lead to changes in one's perspective on practice or serve to confirm the current practices. It must be noted that not all adult learning which involves critical reflection leads to transformative learning. In other words, critical reflection does not necessarily lead to transformation of perspectives on practice.

Critical reflection as an essential element of Mezirow's transformative learning theory is important to this study because the research participants were required to critically reflect on the content they teach, the process of teaching and their premises. Mezirow (1991) argues that critical reflection is made up of content reflection, process reflection and premise reflection. Critical reflection has been assessed through the way participants relate the content in the CAPS and climate change units (content reflection) during interviews, and the pedagogical practices (process reflection) reflected during lesson observations.

Reflective discourse (or dialogue), which is defined in the next section, can also contribute to critical reflection.

### 1.6.6 Reflective discourse/dialogue

According to Mezirow (2000), dialogue or reflective discourse is a process in which people discuss viewpoints with others to better understand the meaning of an experience. Mezirow (2000) further argues that discourse is required to assess and fully understand the way others interpret experience. In this study, the term dialogue will be used to refer to arguments that take place in class on issues of environment and sustainability. In this study, dialogue is a medium through which transformation is promoted and developed Taylor (2009). Taylor (2009) further maintains that social interaction and dialogue lead to consensual validation among learners. Dialogue plays a role in developing environment and sustainability concepts in classroom practice. Through it, one understands that there is a need for people to express their own thoughts, comments and questions rather than just absorb information as is.

These concepts are necessary for approaching the research questions.

### 1.7 Research design and methodology

This section will introduce the research design and methodology and my reasons for choosing these. Chapter 4 will elaborate on these.

The study was situated in an interpretivist qualitative paradigm and used a case study method. Interpretive research assumes that meaning is socially established by individuals in interaction with their world (Merriam, 2002). Merriam (2002) further a that interpretive research allows researchers to learn how individuals experience and interact with the social world and the meaning they derive from it. Punch (2009) concurs with Merriam (2002) further argues that interpretive research concentrates on the meanings that people bring to the situation and behavior, which they use to understand the world. Henning, van Rensburg and Smit (2004) state that phenomena and events in interpretive research are understood through mental processes of interpretation which are influenced by interacting with research participants in the social context. In this study, the researcher will make interpretation of reality through interaction with the teacher participants in terms of their knowledge of ESD and teaching practice in Geography after attending the *Fundisa for Change* teacher development intervention course. The meaning they make are reflected in their views and action in teaching practices

According to Bassit (2010) interpretivist qualitative research describes and explain human behavior in the way that individuals involved in the research perceives it. Henning *et al* (2004) maintain that interpretive research is concerned with the way in which people make meaning in their lives and the kind of meaning they make. This means that social reality is interpreted based on the views of the research participants.

Interpretive research paradigm focusses on small numbers and indepth analysis of human behavior and perceptions by acknowledging differences as well as similarities (Bassit, 2010). In this case, five teachers participated in the study. Henning *et al* (2004) argue that knowledge is constructed through observations and description of people's intentions, belief, values and reasoning. This study will rely on observations, interviews and document analysis.

I have used the case study method with multiple cases embedded therein, in order to strengthen the results and increase the robustness of the findings (Vohra, 2014). The case study method "*explores [a] real-life, contemporary bounded system (a case) or multiple systems (cases) over time through detailed, in-depth data collection involving multiple sources of information*…" (Creswell, 2013, p.97). The influence of the *Fundisa for Change* teacher development course on teacher practice is the main case under study, whilst the five participating teachers are cases embedded within the main case.

The validity and reliability, meaningfulness and insights of the qualitative inquiry depend less on the sample size than on detailed information generated from the cases selected and the researcher's observation and analytical capabilities (Patton, 2002). The study established the extent and depth of the transformation of the participating teachers' practices as they implement the knowledge and skills gained from the teacher professional development short course programme in teaching ESD in Geography in the FET phase. The structural and cultural influences of the Department of Basic Education in determining what actions enable or constrain the transformation of content knowledge and teaching practices are also considered.

### 1.7.1 Data generation methods

Data was collected using multiple sources (Fouche & Delpoort, 2014). Fouche and Delpoort (2014) argue that using multiple sources of data enables the researcher to draw valid and reliable conclusions about the investigation. Data generation started with the analysis of the *Teaching Climate Change* manual (Vogel, Misser & Vallabh, 2013) to determine the content taught to teachers in the intervention course. The content in the *Teaching Climate Change* manual was related to the content in the CAPS document. Secondly, one-on-one semi-structured interviews were conducted with participating teachers to establish their views on ESD before and after the course. Thirdly, lesson observations were conducted with the five participating teachers. Three of each teacher's lessons were observed in order to develop in-depth interpretations of teaching practices. According to Creswell (2013) multiple observations are conducted because repeated observations provide insight in different settings and among different research participants. Fourthly, lesson plans and assessment documents were analysed in order

to understand their content in relation to teaching practices. Lastly, one-on-one semi-structured interviews were also conducted with officials from DBE to strengthen the findings.

The next section will describe the procedure followed in analysing the data.

### 1.7.2 Data analysis

Data analysis followed the thematic content analysis approach. Thematic content analysis is a method of identifying themes and patterns of meaning across the dataset in relation to the research questions (Ngulube, 2015). In this study, important patterns and themes were drawn inductively and deductively (Boyatzis, 1998; Elos & Kyngas, 2007). Inductive analysis is derived from the raw data, whilst deductive analysis takes place when patterns and themes are generated from the research questions and a theoretical framework (Elos & Kyngas, 2007). The essential elements of transformative learning theory (Mezirow, 1991; 1997; 2000) and Archer's (1995) realist theory of morphogenesis were used to analyze changes in teachers' practices (see section 4.7, Chapter 4).

Themes can be distinguished into two levels: semantic and latent levels (Javadi & Zarea, 2016; Maguire & Delahunt, 2017). Maguire & Delahunt (2017) argue that semantic themes are those that give surface meaning without looking at anything beyond what the participant has said or written, whilst latent themes involve identifying and examining the underlying ideas and assumptions that shape the semantic content of the data. The goal in this study is to identify latent themes in order to understand the meaning made by the participants based on the implications of the theoretical framework.

The next section will outline ethical issues that were taken into consideration in this study.

## 1.8 Ethical considerations

An ethics clearance was obtained from the university's Human Research Ethics Committee to ensure that the study was conducted in an ethical manner. Delta Environmental Centre granted me permission that enabled me to access the *Fundisa for Change* intervention course training material, teachers' portfolios and the list of teachers who attended the course. Gauteng Department of Education (GDE) granted me

permission to conduct research in schools, which enabled me to gain access to school sites and teachers who attended the *Fundisa for Change* intervention course.

Attention given to ethical issues includes informed consent and voluntary participation, confidentiality, anonymity and privacy (Creswell, 2013). Care was taken so that the dignity of the participants was respected during the research process (Bassit, 2010). Participants were informed of the aims of the study and were asked to complete consent forms. Participants' were made aware that they would remain anonymous: that is, their names, personal information and work sites are not revealed in the thesis. The confidentiality of the participants has been protected by not linking what they said to their names.

The next section will discuss limitations and delimitations of the study.

### 1.9 Limitations and delimitations of the study

The study is limited to the teacher professional development on ESD which was conducted at Delta Environment Centre (Johannesburg, South Africa) using the *Fundisa for Change* programme. Fourteen teachers were trained at DEC, of whom five agreed to participate in the study. The participants came from five secondary schools in the FET phase (Grade 10-12) in the Gauteng province of South Africa.

The research study followed the case study approach, which has its limitations. It must be noted that case study results are limited to phenomenon description rather than predicting future behavior (Merriam, 2002). Gall, Gall and Borg (2010) argue that it is difficult to generalize the results of case studies to other situations. However, case study research might suggest what can be looked at in similar organisations, even though additional research might be needed to verify the findings (Simon & Goes, 2013).

### 1.10 The researcher's positionality

"*Research represents a shared space, shaped by both researcher and participants*" (Bourke, 2014, p.1). The identities of the researcher and the participants have an influence on the research process. Bassit (2010) argues that the researcher's epistemology, ontology and axiology determine the researcher's positionality and reflexivity. Bassit (2010) further argues that no research is totally value free as it is carried

out by humans. I believe that reality is the product of the participants' own perception and cognition, which means that individuals construct their own reality. The values that the researcher holds can influence the researcher's position in conducting the research. To reduce the researcher's bias, data were collected using multiple sources.

My personal characteristics played a major role in the process of conducting the research. I am a black South African female Geography teacher, who taught the subject in a secondary school in the General Education and Training and FET phases for 15 years. I later became a Geography subject advisor, where I interacted with different teachers who were teaching the subject in different schools around Johannesburg. This made me conscious of different levels at which teachers find themselves in terms of knowledge and practice in the subject. My interpretation of teacher professional development and ESD is based on the knowledge gained as a subject advisor as well as geography and environmental studies completed during my postgraduate years.

Positionality is determined by where one stands in relation to participants in the process of conducting the research (Bourke, 2014). I saw myself as an outsider during the research process, but an experienced Geography teacher who taught in a township school. I interacted with participants as a participant observer to establish their perception and knowledge about their professional development on ESD.

Bourke (2014) argues that positionality can be described as reflexivity, which involves self-scrutiny. Bourke (2014) further argues that a researcher must recognise his/her bias so that he or she can gain insight into how to approach the research setting and engage with participants. I have questioned how I make meaning and the biases that might have emanated from my background, perceptions and interests in the process of conducting the research. I reflected on my position coming from outside, but still created personal relations with the participants. I kept a reflexive journal and conducted critical self-reflection to enhance reflexivity. Wallendorf and Belk (1989) as quoted by Anney (2014, p.218) described a reflexive journal as "*reflexive documents kept by the researcher in order to reflect on, tentatively interpret, and plan data collection*".

## 1.11 Overview of chapters

**Chapter 1** has introduced the study by providing the context and the background, the problem statement, research questions, definition of concepts, the conceptual framework, theoretical framework, delimitations and limitations to the study, as well as the researcher's positionality.

**Chapter 2** provides a review of the literature on ESD, teacher professional development for ESD, the implementation of ESD and ESD pedagogies. The chapter ends with a discussion of the notion of practice and its implications for transformative learning.

**Chapter 3** provides the theoretical framework that underlies the study. Mezirow's (1991; 1997; 2000) transformative learning theory and Archer's (1995; 1998) realist social theory of morphogenesis are outlined. The critiques of these theoretical frameworks are discussed in relation to teacher professional development programmes.

**Chapter 4** describes the research design and methodological approaches used in the study. It describes the research approach, data generation techniques and the procedure used to analyse the data.

**Chapter 5** presents and analyses the data, providing a description of the steps followed in generating data from the documentary analysis, one-on-one semi-structured interviews and lesson observations.

**Chapter 6** provides interpretation and discussion of findings.

**Chapter 7** concludes the thesis by presenting an overview of the study and its limitations and suggests recommendations for future research on teacher professional development on ESD.

## 1.12 Summary of this chapter

This chapter has provided the synopsis of the study by highlighting the context and background of the study in terms of the importance of ESD and the challenges in the South African school context. The *Fundisa* for Change teacher professional development programme, which is the main case of the study, was introduced as the focus of the study.

The aim of this study is to determine the influence of the *Fundisa for Change* intervention course in improving content knowledge and pedagogical practice. EE, ESD, teacher professional development, transformative learning, critical reflection and reflective discourse/dialogue were defined as concepts that are relevant to this study. A brief overview of the case study research design was discussed to show how the study was conducted. The chapter also defined the parameters and reflected on the delimitations of the study in terms of the area in which the research was conducted and the choice of research participants.

The background and problem statement above shows the need for building teacher capacity on ESD knowledge, teaching practices and values necessary to teach for and about ESD in Geography classes. Therefore, the next chapter will provide literature review to explain and clarify the concept of ESD, teacher professional development, ESD transformative practices, the implementation of ESD in different areas, and the implications of the notion of practice to transformative learning and ESD.

# Chapter 2

# Education for Sustainable Development and teacher professional development

## 2.1 Introduction

The previous chapter provided an introduction and background to the study, including definitions of key concepts. This chapter reviews literature that will give further insight into several concepts which will help build an understanding of the role of an ESD teacher professional development course.

Teacher education is considered a way of developing teachers' knowledge, skills, dispositions and values, which is expected to result in quality education and transformative thinking towards ESD. Laurie, Nonoyama-Tarumi, McKeown and Hopkins (2016) argue that quality education can be attained if ESD is integrated into the school curriculum and teachers are capacitated to implement it. According to Harvey and Green (1993), quality is a relative to the user of the term and the circumstances in which it is elicited. It means different things to different people. This chapter seeks to build an understanding of teacher professional development (TPD) as a precondition for the development of ESD content knowledge and teaching practices that lead to quality education.

This chapter is structured as follows:

- The concept of Education for Sustainable Development.
- Review on teacher professional development.
- Transformative teaching practices.
- Classroom discourse.
- Teacher competencies.
- The implementation of ESD.
- The implications of the notion of practice for ESD and transformative learning.
- Summary of the chapter.

## 2.2 The concept of Education for Sustainable Development (ESD)

### 2.2.1 Origin and development of ESD

ESD is linked to the United Nations Conference on human environment that was held in 1972 in Stockholm, Sweden (UNEP, 2009). It was the first major international conference that focused on environmental issues. The Brundtland (1987) Commission Report discussed environment and development as a single issue and proposed sustainable development as a means of rectifying environmental problems. This report defined the concept of sustainable development at the World Commission on Environment and Development as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*". The Stockholm United Nations Conference promoted environmental protection, whilst the Brundtland Commission Report developed guiding principles for sustainable development to address global environmental problems. The Brundtland Commission Report laid the basis for the United Nations Conference on Environment and Development (also known as the Earth Summit) held in Rio de Janeiro, Brazil, in 1992 (UNEP, 2009). The Earth Summit placed the concept of sustainable development on the global agenda, and it produced a global plan of action for sustainable development known as Agenda 21 (UNEP, 2009). Agenda 21 suggested that economic, social and environmental considerations were linked to issues of poverty, equity, quality of life and global environmental protection (UNEP, 2009). This suggests that there is a need for humans to transform their attitudes towards harmful economic development which lead to actions that damage the environment, social and cultural sustainability.

One of the program areas of Chapter 36 of Agenda 21 - the promotion of education, public awareness and training - is concerned with capacity building (United Nations, 1992). Agenda 21 noted that education is critical in promoting sustainable development and improving people's capacity to address environmental and development issues (United Nations, 1992). The report of the World Summit for Sustainable Development (WSSD) held in Johannesburg, South Africa, in 2002, reaffirmed education as the foundation for implementing sustainable development (United Nations, 2002). In December 2002, the years 2005 to 2014 were proclaimed the Decade of Education for Sustainable

Development (DESD) by the United Nations General Assembly to enhance the role of education and learning in pursuit of sustainable development (UNESCO, 2006). One of the objectives of the UNDESD was to promote and improve the quality of education (UNESCO, 2005).

In 2014, UNESCO endorsed the Global Action Programme (GAP) on ESD as a follow-up on DESD (UNESCO, 2014). Priority Action Area 3 of the GAP focused on building the capacity of educators and trainers for more effective delivery of ESD (UNESCO, 2014). Building the capacity of teachers includes learning about ESD concepts from local, national and international perspectives (UNESCO, 2017). *Fundisa for Change* was conceptualized to explore environment and sustainability content in the CAPS and to prepare teachers to engage with environment and sustainability knowledge and skills in the curriculum (*Fundisa* for Change, 2013). The formulation of the *Fundisa for Change* programme is in line with the global agenda on ESD. The *Fundisa for Change* teacher professional development short intervention course that took place at Delta Environmental Centre focused on climate change as an ESD concept that teachers must incorporate into teaching Geography. Education is closely tied to international debates on sustainable development since the concept first appeared in the Brundtland Commission Report in 1987. The most recent international development on ESD, the Incheon Declaration, sets out a new vision for education for 2015 to 2030, namely, to transform lives through education (UNESCO, 2015). This vision is captured by SDG 4 which is to "*ensure inclusive and equitable quality education and promote lifelong learning opportunities for all'*, as mentioned in the introduction. It is for this reason that the need for teachers to be capacitated to deliver quality education and promote lifelong learning is considered to be important in transforming our lives. The *Fundisa for Change* programme seeks to capacitate teachers on environment and sustainability knowledge in their subjects and the skills to deliver such knowledge.

The next section will outline ESD's transformative learning intentions.

### 2.2.2 ESD transformative learning intentions

Taylor (2009) describes transformative learning as learning that is grounded in human communication, where learning is understood as a process of interpreting prior knowledge in order to construct new experiences. Therefore, learning is understood as a process of constructing knowledge through dialogue and communication and is grounded in real-life experiences. Lotz-Sisitka (2013) argues that learners' culture is important in making meaning and enables the application of concepts to real life situations in teaching. Thus, learners' culture should be considered in teaching because references to their culture help them in understanding concepts. ESD is rooted in culture, dialogue and communication since it enables learners to link the knowledge taught to real-life experiences. Linking education to learners' culture strengthens the way they think and act for sustainable development.

According to Wals and Benavot (2017), transformative learning occurs when learning is rooted in places and communities. Integrating community life in learning engages learners' interest on environmental issues. Mandikonza and Lotz-Sisitka (2016) acknowledge that ESD prepares people to learn to live justly, equitably and sustainably in the world. ESD has a role to play in preparing people to live sustainably by transforming the practices of those who are positive about the environment. Venkataraman (2009) acknowledges that ESD enables individuals to develop knowledge and skills that allow them to improve the quality of their lives. Mandikonza and Lotz-Sisitka (2016) agree that ESD has the potential to facilitate the transformation of society through development of understanding and action that contribute to more sustainable practices. In other words, education must improve the action of the individuals for the environment and the quality of life.

Taylor, Nathan and Coll (2010) contend that ESD should be embedded in learners' day to day learning experiences. Entrenching learning in day to day experiences depends on the context in which learning takes place. Learning from day to day experiences enhances learners' understanding, encourages participation, creativity and critical thinking. These result from learners being able to relate abstract concepts to real life situations.

The literature reviewed in this section indicates ESD's transformative intentions. ESD is intended to empower people through communication. Learning that is rooted in culture and communication encourages participation and engagement in discussion in the learning process. Learners are inspired to think critically and be creative when learning is related to their experiences. Along these lines, Wals' (2015) argument that ESD is capable of promoting transformative learning is found to be relevant.

The discussion of the origin and development of ESD, and its link to transformative learning intentions, lays the foundation for this study. The integration of ESD into teaching and learning depends on teacher capacity, therefore teacher professional development is discussed in the next section.

### 2.3 Teacher professional development (TPD)

Teacher professional development refers to teacher education that can improve teachers' subject content knowledge and teaching practices. According to Darling-Hammond (2010) and Patton, Parker and Tannehill (2015), teacher professional development refers to a variety of educational experiences related to an individual's work that are designed to improve teaching practices and outcomes. Avalos (2011, p.10) argues that TPD "*is about teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students' growth*". Teachers learn the content knowledge and the pedagogical practices for the benefit of learners' performance and understanding. The ensuing sections will outline types of TPD programmes and their significance, assess what makes a TPD successful, and finally discuss TPD for ESD.

#### 2.3.1 Types of in-service TPD programmes

In-service TPD programmes are organised for practicing teachers with a view to improve their knowledge and teaching practices. These may either be formal or informal programmes. Villegas-Reimers (2003) argues that formal TPD programmes include workshops, professional meetings and mentoring, whilst Evans (2019) argues that informal TPD programmes occur as part of everyday working life, in normal learning environments and contexts. In informal programmes, teachers share information and skills that improve their classroom practices. According to Villegas-Reimers (2003),

informal TPD programmes might involve reading publications and watching documentaries related to particular subject areas. This means that the teacher willingly read publications or watch documentaries for the purpose of improving their knowledge and practice.

There are different approaches to TPD programmes, which encompass what Patton, Parker and Tannehill (2015) classify as individual or collaborative and voluntary or mandatory. Individual teacher development focuses on personal and professional growth of individual teachers (Patton *et al*, 2015), whilst collaborative teacher development focuses on the development of teachers as a community or in partnership with one another (Avalos, 2011; Patton *et al*, 2015). In collaborative teacher development, teachers work together and share practices (Avalos, 2011; Darling-Hammond and McLaughlin, 2011) in the learning process. Both individual and collaborative TPD can be either voluntary or mandatory, as mentioned above. Voluntary TPD takes place when teachers choose to attend a development course, whilst teachers are coerced into mandatory TPD. In voluntary TPD, teachers will show commitment to development (Steyn, 2010), which is not always the case with mandatory TPD programmes.

Some TPD programmes can be occasional and are referred to as short intervention programmes in this study. Such programmes rely on external experts. The Council on Higher Education (2014) in South Africa defines the short intervention programme as occasional courses that improve or refresh participants' knowledge and skills in a particular field. However, Steyn (2008) argues that short courses have a simplistic and technical view of teaching and make people assume that teachers' knowledge and skills could be improved by using external experts.

TPD programmes can take place at or away from the school site. Ferreira (2014) contends that development actions that are implemented away from school settings might help teachers experience things in new ways and can contribute to incidental learning. This implies that the location that may be chosen to host the TPD might have an influence on teachers' learning.

The *Fundisa for Change* course is an example of a formal short intervention TPD programme that specialized in environmental learning and was conducted over a period of five days at the Delta Environment Centre, away from school sites.

This section highlighted different types of in-service TPD programmes in relation to the development of their knowledge and skills for ESD classroom practices. The next section considers the significance and success of TPD programmes.

### 2.3.2 The significance of teacher professional development programmes

The success of TPD is determined by factors such as the ability of the course to cover the criteria, the time spent, teacher commitment, implementation in the workplace and external factors such as policies and structure of the workplace. According to Ferreira (2014), teaching and learning cannot improve if teachers are poorly qualified or lack the skills necessary to facilitate learning. TPD is even more important where knowledge and skills are inadequate (Ferreira, 2014; Steyn, 2008). Knowledge and skills to facilitate learning are therefore considered as a key factor in the ability of teachers to demonstrate their potential and competencies.

Studies conducted by Steyn (2010), Patton *et al* (2015), Derri, Vasiliadou & Kiomourtzoglou (2015) and Nawab (2017) are useful because they show that TPD is important in improving teachers' knowledge and skills to promote student learning. Derri *et al* (2015) further argue that TPD programmes also help teachers to acquire attitudes and competency necessary for student performance. Subject to the studies reviewed in this paragraph, one could argue that the ultimate beneficiaries of TPD programmes are learners, because their learning and performance are assessed through these processes. Students will benefit if teachers implement what they have learned in the course. Nawab (2017, p.146) contends that:

> …*improvement in knowledge and skills during the course does not guarantee implementation in the real situation. When the teachers return to their context, their implementation of ideas and strategies acquired during the course and the conditions that influence this implementation are areas yet to be explored*.

In other words, acquiring knowledge and skills in a course does not necessarily mean that teachers will implement what they have learned. Individuals generally scrutinize the applicability and practicality of what they have learned when courses have ended and implement as they see fit. This could mean that TPDs might not benefit learners as expected.

TPD is effective if it improves learners' outcomes and addresses the needs of the teachers. Singh (2011) argues that teachers must see themselves as owners of the programme. Patton *et al* (2015) support Singh's argument by stating that teachers must be free to express their professional development goals and be allowed the space to work towards that development. Strictly speaking, TPD is effective when teachers are willing to be trained as opposed to being coerced into attending a course.

The needs of the teachers should be addressed in relation to the culture of the school's community and be supported by higher authorities. Thus, there should be a relationship between the individual needs and the needs of the school. Nawab (2017) argues that contextual factors such as the institutional setting have an influence on the implementation of learned practices from a TPD programme. Furthermore, Singh (2011) argues that TPD must be rooted in organizational culture and obtain support from higher authorities.

In summary, these authors suggest that voluntary involvement in a professional development program, supplemented by the culture of the school's community and support from higher authorities, might result in an effective professional development programme.

Section 2.3.1 above, which dealt with different types of in-service training and outlined short course intervention programmes. These should be looked at in relation to continuous TPD. A number of studies show that TPD programmes are effective if they are continuous and ongoing learning processes (Putnam & Borko, 2000; Steyn, 2010; Singh, 2011; Nawab, 2017). Singh (2011, p.1629) argues that teacher professional development "*can no longer be viewed as an event that occurs on a particular day of the school year, rather, it must become part of the daily work in the life of the educator*". Steyn

(2010) concurs with Singh and argues that timing and the duration of a TPD play a role in the effectiveness of the implementation of teachers' knowledge and pedagogical practices. Avalos (2011) argues that prolonged teacher professional development is more effective than shorter programmes because professional development is a lifelong learning process. In this study, I argue that teacher learning is more effective and meaningful if it is prolonged or continuous and intertwined with ongoing practice (Putnam & Borko, 2000).

A problem with short TPD courses might be that they are isolated from real classroom situations which might result in them being ineffective. Ono and Ferreira (2010) and Steyn (2008) claim that short intervention programmes are less likely to result in improvement in teaching than continuous programmes. Ono and Ferreira (2010) further argue that short courses are brief, fragmented, incoherent encounters that are decontextualized and isolated from real classroom situations. Several studies show that continuous and voluntary TPD progrmmes are effective in improving knowledge and skills in teaching practices (Putnam & Borko, 2000; Avalos, 2011; Patton et al, 2015). Although I find these authors convincing regarding continuous TPD programmes, this study sought to verify the influence of the *Fundisa for Change* short intervention programme on teachers who were learning ESD.

It is evident from the discussion above that various studies in the field of TPD show the following as the basis for effective TPD:

- TPD must develop teachers' knowledge, skills and attitudes for the benefit of students' learning and performance;
- TPD must be informed by the needs of the teachers;
- There should be a relationship between teachers' needs and organisational culture, supported by higher authorities;
- TPD is a lifelong learning process.

It is worth noting that the *Fundisa for Change* programme was not conducted as part of the teachers' daily work. It took place over five days, away from the teachers' work sites.

In the next section, TPD is discussed in the context of ESD.

### 2.3.3 Teacher professional development for ESD

The integration of ESD into teaching and learning depends on teachers' capacity. This study is concerned with the integration of ESD into Geography education for secondary school geography teachers. The Lucerne Declaration on Geographical Education for Sustainable Development proposed the integration of sustainable development into the teaching and learning of Geography at all levels and in all regions of the world (Haubrich *et al*, 2007). However, effective teaching and learning ESD will only be attained when Geography teachers' develop sustainability competencies which include knowledge, skills, attitudes, values and commitment (UNESCO, 2017) to incorporate ESD into their classroom practice. This means that teachers must be capacitated in environment and sustainability content knowledge, skills and attitudes necessary to teach for and about sustainable development.

I would argue that teacher capacity in ESD can help towards changing society for sustainable futures and contribute to quality education. Hofmann (2015) argues that to change society and education, one must start with training qualified teachers or in-service teachers. This means that the change of society towards sustainability must be driven by integrating sustainable development into education. The integration of sustainable development requires teachers to be trained to embed sustainable development into their practices (Ferreira, 2011). Ferreira (2011) further argues that teachers hold the key to change as they are expected to implement ESD in schools. However, they cannot be expected to implement this without being capacitated to do so.

ESD practices must be transformative as opposed to mechanistic learning. Chater (2009) describe mechanistic learning as that which depends on conditioning and reinforcement. Mechanistic learning is based on rote learning.

## 2.4 ESD transformative practices

Teachers should possess skills that enable them to teach for transformative learning and sustainable development. For ESD to be effective, transformative pedagogical practices

such as transformative teaching strategies, assessment practices for transformative learning, resources used for transformative learning and the integration of values in teaching and learning must be clarified.

### 2.4.1 Transformative teaching strategies

Teaching and learning for ESD requires teachers to adopt a more transformative stance (Smith, 2013), where learners are encouraged to think critically and reflect on issues around them. Smith (2013, p.261) further argues that teachers need to develop appropriate pedagogies that enable them to "*understand the need for learners to develop skills to question the embedded cultural values, actively identify and assess, communicate and resolve real environmental problems*". This is not easy for most teachers and will require them to be equipped so that they are enabled to teach for and about ESD effectively. The constructivist pedagogies can enable learners to construct knowledge based on real-life experiences.

Corney and Reid's (2007) view is that a constructivist approach to teaching is interactive and learner-centred and therefore important for ESD. Zappala (2007) argues that learning from experience and social interaction is constructivist in nature and might transform belief systems. Reflection and active learning enable individuals to develop an understanding of the world and themselves, which have the potential to change individuals' perspectives, but may not lead to action (Strange & Gibson, 2017). The main emphasis here is that learners will construct their own knowledge from their experiences in relation to the experiences drawn from their cultures and social practices, which may not lead to action. UNESCO (2012) argues that learners' prior knowledge as well as their experiences in the social context is the starting point for stimulating the learning processes in which the learners construct their own knowledge base. This prior knowledge need to be deepened through subject content knowledge and practices for transformative learning to occur. This study will examine whether participating teachers create a space for learners to become active participants in the learning process in relation to the teaching methods taught in the course.

During the Decade of Education for Sustainable Development (DESD), UNESCO proposed that transformative teaching strategies should include the following:

- Teaching and learning methods should be participatory to motivate and empower learners to change their behaviour and take action for sustainable development (UNESCO, 2005).
- Learner-centred approaches must emphasise active development of knowledge rather than merely transfer knowledge (UNESCO, 2012). These include simulations, class discussions, issue analysis, and storytelling (UNESCO, 2012).
- Interactive, learner-centred approaches must enable exploratory and transformative learning (UNESCO, 2014).

Several researchers emphasize the need for learner-centred approaches in teaching ESD (Ferreira, 2011; Laurie *et al*, 2016; Kalumba, 2017; Mokuku and Jobo, 2017). Both Ferreira (2011) and Kalumba (2017) stress interdisciplinary, holistic, enquiry-based, experiential and action-oriented methods in teaching ESD. Mokuku and Jobo (2017) emphasise the importance of outdoor learning, experiments and peer tutoring in environmental learning. Research shows that teaching practices that are associated with ESD stimulate students to ask questions, think critically and make good decisions about the environment (Laurie *et al*, 2016). I would argue that in all the teaching approaches referred to, learners should be seen as active participants in the learning process in order for learners to create knowledge on their own.

The teachers are expected to align teaching approaches to assessment practices. The next section discusses assessment strategies for transformative learning in ESD.

### 2.4.2 Assessment methods for transformative learning in ESD

CAPS "*aims to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives*" (Department of Basic Education, 2011, p.4). As cited in section 2.4.1 above, the approaches that are followed in teaching and learning ESD and assessment determine the knowledge, skills and values that learners will gain from the learning process. The Department of Basic Education (2011) contends that learners who

are educated within the Curriculum and Assessment Policy Statement (CAPS) programme should be able to:

- identify and solve problems and make decisions using critical and creative thinking;
- work as individuals and as teams;
- show responsibility towards the environment and the health of others; and also
- demonstrate an understanding of the world as a set of related systems.

Therefore, the skills stipulated in the CAPS document are aligned to ESD learning intentions as mentioned in section 2.2.2 above, and these skills are critical thinking, problem solving, individual and collective work among others. These are the skills that must be assessed.

Ferreira and Molala (2017) argue that assessment of environment and sustainability concepts can be efficient and effective if teachers know the subject content knowledge and different ways of assessing learners. Environmental problems are complex; therefore, they require teachers who are trained to design and develop assessment tasks that encourage critical thinking (Ferreira & Molala, 2017). This means that assessment of knowledge, skills and the application of knowledge and reasoning should be undertaken in ways that are different from those that simply measure knowledge and concepts mechanistically, to include those that show application, understanding, analysis, evaluation and innovation (O'Donoghue, 2013). The CAPS stipulate that formal assessments must cover a range of cognitive levels and abilities of learners (Department of Basic Education, 2011). Questions that require learners to apply, analyse, evaluate and create knowledge might lead to behavior changes. These cognitive levels must include low, middle and high order questions (Department of Basic Education, 2011). Low order questions require learners to remember the content knowledge, middle order questions demand learners to understand and apply the content knowledge, whilst high order questions involve analysis, synthesis and evaluation skills. This will encourage high order and critical thinking by building from lower-level cognitive skills.

Since assessment is an integral part of teaching and learning, it must include assessment ‘as’, ‘for’ and ‘of’ learning (UNESCO, 2017). Assessment ‘as’ learning allows learners to monitor their own learning (Department of Basic Education, 2011). Learners can monitor themselves from the feedback given by the teachers after a task. According to Carless (2017), assessment ‘for’ learning enhances students learning because it has appropriate balance of summative and formative learning, rich in formal and informal feedback and offer confidence-building opportunities and practice. Carless (2017) further argues that the concerns with assessment ‘of’ learning are compounded by low staff assessment literacy. Assessment ‘of’ learning is more summative and focuses on the results of learning (Department of Basic Education, 2011; UNESCO, 2017). Assessment ‘of’ learning takes place at the end of a topic, term or year, and is therefore linked to promotion at the end of the school year (Department of Basic Education, 2011). All three kinds of assessment are important in assessing environment and sustainability content as they provide learners with the opportunities to demonstrate what they know and can do in different ways and different contexts (Dreyer & Loubser, 2005).

Two strategies of assessing learners are described in the Geography Curriculum and Assessment Policy Statement; namely, informal and formal assessment (Department of Basic Education, 2011). Informal assessment includes observations, demonstrations, learner-teacher conferences and classroom interactions, whilst formal assessments include tests, examinations, practical tasks, mapwork skills tasks, research tasks, fieldwork tasks, projects, oral presentations, demonstrations and performances (Department of Basic Education, 2011). It is further indicated that informal assessment involves both self and peer assessment, where learners learn and reflect from their own performance. CAPS has provided the space for assessment ‘as’ learning, assessment ‘for’ learning and assessment ‘of’ learning through the strategies of assessment mentioned above. CAPS has also provided different ways of evaluating learners’ progress instead of just relying on examinations and tests.

A number of challenges can render assessment ineffective. Firstly, teachers’ inadequate knowledge of the concepts of environment and sustainability and limited awareness of teaching approaches (Ferreira & Molala, 2017) results in poor assessment practices.

Secondly, teachers do not utilize a variety of assessment instruments (Ferreira & Molala, 2017), as pointed out in the Geography CAPS document (Department of Basic Education, 2011). A few of the assessment instruments listed in the Geography CAPS document include report writing, working with data, presentations and recording observations (Department of Basic Education, 2011). Different assessment instruments help in developing different skills and learners critical thinking. Thirdly, Ferreira and Molala (2017) argue that there is also the challenge of inadequate assessment of affective skills and action competence. According to Bholah and Shumba (2018), assessment of affective skills refers to the ability to express own opinions, feelings or critical matters with regards to sustainability concerns and the willingness to change habits and behaviours.

In this case, learners are assessed on how they deal with real life sustainability situations. Teachers must have adequate subject content knowledge and be able to use a variety of assessment types as well as assessing learners' attitudes and values for and about ESD. The study has assessed how participating teachers assess environment and sustainability knowledge.

The next section addresses the issue of using resources to make transformative teaching practices effective.

### 2.4.3 The use of resources as curricular enablers for transformative learning

The availability of teaching resources is important in ensuring transformation in teaching and learning ESD. Laurie *et al* (2016) argue that quality education is not based primarily on fact acquisition because information is easily acquired in today's interconnected world. Laurie *et al* (2016) further contend that education requires people to know how to analyze information, make sense of its abundance and complexity, cooperate with others and communicate results. Teachers need to know how to use the available resources in order to be effective in the learning process.

Learner-centred teaching strategies entail handing over the resources to the learners so that they can make meaning and interpretations in constructing their knowledge (Adler, 2000). This means that the effective use of teaching and learning support material can allow learners to analyse the information rather than just acquire facts. When learners

are encouraged to analyse the information, the development of in-depth knowledge and skills might be achieved. However, it must be noted that having more resources does not necessarily lead to better classroom practice and quality education (Adler, 2000).

Textbooks are generally viewed as reliable sources of credible information that support and enhance students' understanding and learning of concepts (Knight, 2015). Knight (2015, p.4) further argues that "when information is transmitted traditionally to the learner through the textbook, the learner is viewed as a passive recipient". It is important to know how to use the textbook in a way that enhances learner-centred approaches. Lambert (1999) describes common ways that textbooks are used for; i.e. teachers read sections of the text aloud, emphasize key words, select pupils to take turns reading aloud in class, paraphrase the text, use pictures to initiate discussions and also explain, comment or reinforce sections of a particular topic. Lambert (1999) further argues that there is uncertainty over how textbooks can or should be used in relation to planning and organizing effective learning. Reading for the learners or asking them to read aloud in class might not always be an effective way of using the textbook, because it does not allow learners to be active in learning. It is important to encourage learners to use the textbook as a source of information that enables them to take part in dialogue or discussions in class. Textbooks afford learners an opportunity to participate in active learning if they are used as sources of information, which could in turn lead to transformative learning.

While it is commonly accepted that printed textbooks are reliable sources of information that support and enhance students' understanding and teaching, they do not always provide up to date information (Knight, 2015). Information becomes more meaningful to learners if it is up to date, because it will relate to learners' life experiences. It must be noted that the use of different resources in class can help teachers in delivering effective lessons where learners construct knowledge on their own rather than be treated as passive recipients of knowledge. Grajek (2013) as cited by Knight (2015) has pointed out that "*today's student is no different to those of the past, but the technology that they have access to has changed dramatically*". I concur with Grajek that today's students have access to technology, but they still learn in the same style as those who did not have

much technology access. Millar and Schrier (2015) argues that the generation of learners at school now and their teachers are constantly connected through technology, but most teachers did not grow up using it in schools. These teachers are reluctant to accept technology as a resource in class. The use of technology gives learners a chance to engage in activities outside the classroom which enables them to apply knowledge to their realities, and thus make learning transformative.

One can conclude that the use of different resources in classroom practice supports transformative learning. However, learning from the community does not only encourage transformative learning, but also the development of values that inform individuals' behavior.

### 2.4.4 The integration of values in teaching and learning

Values can be defined as "…*the principles and fundamental convictions which act as general guides to behavior, the standard by which particular actions are judged as good or desirable*" (Lewis, Mansfield and Bandains, 2008, p.138). This means that the norms and values of the society determine behaviour. UNESCO (2012) contends that the values that underlie ESD and sustainable development are human dignity, fundamental freedom, human rights, equity and care for the environment. Education supports the values that underlie sustainable development because they promote good and responsible behavior that is necessary for sustaining a community's lifestyle.

Wals and Benavot (2017, p.407) argue that ESD "*promotes the value of diversity and respect of different viewpoints*". UNESCO (2012) specifies that ESD values must be locally relevant and culturally appropriate. This means that ESD values must be rooted in the community's way of life. Wals and Benavot (2017) further maintain that integrating local and indigenous knowledge plays a role in environmental sustainability rather than emphasizing dominant anthropocentric, scientific and Western materialistic ways of viewing the world. Understanding your own values and those of others and the values of the society you live in is integral to ESD (UNESCO, 2012; Preston, 2016).

The Earth Charter is a declaration of fundamental principles to strengthen a just and sustainable global society (UNESCO, 2007). The charter provides a framework that

expresses values and principles which guide societies towards the realization of sustainability. UNESCO (2007) stipulates that the Earth Charter declares our responsibility to one another, community life and future generations, and is based on the following principles:

- *respect and care for community life;*
- *ecological integrity;*
- *social and economic justice; and*
- *democracy, non-violence and peace*.

Values shape individuals' worldviews, expectations, how we treat each other and the use of natural resources (UNESCO, 2012). In other words, values determine our behavior towards the physical, social and cultural environment.

Concerns and values need to be carefully addressed during teaching and learning so as to develop good behavior. Chineka and Mukundu (2017) argue that learners concerns need to be addressed in the classroom. Chineka and Mukundu (2017) further argue that teachers should go beyond learner pass rates to include aspects that make the world a better place to live in. This means that teachers should not just impart subject knowledge, but they also need to instill good citizenship by developing learners who recognise and live by the Earth Charter principles as well as *Ubuntu* principles. In doing so, learners realise that abiding by the Earth Charter and *Ubuntu* principles can make them live harmoniously with other people and their environment.

*"Ubuntu is a Zulu/Xhosa word which is directly translated as 'humanness'*" writes Bolden (2014, p.1) who further maintains that '*Ubuntu* is a philosophy that can be traced to the life experiences and histories of the people in Southern Africa. Shumba (2011, p.84) defined "…*Ubuntu as a moral and ethical framework that stresses collectivity and collective agency that are relevant for behaviour management and character formation that may contribute to sustainable lifestyles*". Shumba (2011) further contends that this framework is in contrast to Western frameworks that emphasize individualism at the expense of collective values. Bolden (2014) argues that *Ubuntu* philosophy is based on principles of caring and community, harmony and hospitality, respect and responsiveness

that expresses people interconnectedness (Bolden, 2014). One can argue that embracing *Ubuntu* principles in education helps learners to acknowledge humanity in themselves and others, which also ties to the norms and values of their communities. *Ubuntu* principles are related to the Earth Charter in the sense that they stress collectivity in behavior management, whilst the Earth Charter declares responsibility to one another, community life and future generations. Therefore, teachers have a role in nurturing values that promote good and responsible behaviour during the teaching and learning process.

Chikunda and Ngcoza (2017) examined *Ubuntu* principles and described their implications for ESD. They argue that *Ubuntu* principles display attitudes and values such as "*respect, empathy, accountability, responsibility, fairness, justice, compassion, unity, selflessness, compromise, love, caring, tolerance, forgiveness and many others"* (Chikunda and Ngcoza (2017, p.84). Dolamo (2013) claims that the community is the core value of African ethics. Therefore, the *Ubuntu* principles stated above can be strengthened in the context of the community that a person belongs to.

Putnam and Borko (2000) contend that learning is about understanding the concepts and developing skills, as well as enculturation of individuals into community's ways of thinking and dispositions. Putnam and Borko (2000) further state that what we learn and how we learn is determined by the interactions amongst people within their environment. Social interaction encourages people to express and share ideas which can socialize communities into particular ways of life. These social interactions encourage learners to work cooperatively through sharing and engaging with each other in the classroom (Lefa, 2015).

This leads us to classroom discourse, or dialogue for transformative learning, which is discussed in the next section.

### 2.5. Classroom dialogue for transformative learning

Classroom discourse or classroom dialogue refers to verbal interactions between teachers and learners or amongst peers, in the construction of knowledge or meaning (Kiemer, Groschner, Pehmer & Siedel, 2014). Sedova, Sedlacek and Svaricek (2016) refer to classroom dialogue as classroom talk and argue that the engagement of learners

in classroom talk stimulates and extends their thinking and advances learning and understanding. Learners are expected to actively participate in class dialogue in order to express their thoughts and understanding of the concepts. Sedova *et al* (2016) further asserts that learning is most effective when learners are actively involved in the construction of knowledge through dialogue. In the context of this study, classroom dialogue allows social interaction between teachers and learners and amongst learners themselves on environmental issues. Productive classroom dialogue involves learners engaging in a conversation that promotes thinking and elaboration of ideas beyond just transferring knowledge (Pehmer *et al*, 2015). To promote thinking and advancement of ideas, Pehmer *et al* (2015) argue that the interaction pattern between teacher and learners must be systematic and start with the teacher asking questions, followed by the learners' answers and then feedback from the teacher. Kiemer *et al* (2014) emphasize teacher questions and teacher feedback in productive dialogue in the classroom. This way, the teacher provides a learning environment where productive dialogue is achievable. In the context of ESD, the teacher is expected to ask questions and learners must answer the questions by referring to the material used for teaching and their own experiences, and then the teacher gives feedback on the responses provided. Kiemer *et al* (2014) attest that classroom dialogue can enrich teaching and learning when learners are actively involved in a way that fosters more meaningful and sustained learning experiences. However, to be transformative, learners must be supported to think critically such that they can come up with suggestions or possible solutions to an issue or must take action

One of the benefits of classroom dialogue is that it motivates and develops learners' interest in the subject and the learning process in general. Kiemer *et al* (2014) argue that classroom dialogue motivates and develops interest in the subject. Larrain, Howe and Freire (2018) refer to argumentation as a form of dialogue in which learners support a position in discussing controversial issues to reach an understanding. This happens when the dialogue is set up in way that the individuals involved in the argument, reason and challenge each other. When argumentation is pursued in a lesson, the understanding of the concepts is deepened because learners not only apply them to lived experiences, but

also analyse them. Therefore, they might get interested and motivated because dialogue and argument allows them to voice their opinions on concepts studied.

The format of classroom dialogue determines the effects it will have on the motivation and interest of students in learning. Kiemer *et al* (2014) contend that classroom interactions are dominated by close-formatted dialogue which negatively affects learners' motivation and interest in learning. This means that there is a need for open-formatted dialogue, where learners are allowed to come up with ideas so that they remain motivated and interested in learning. Sedova *et al* (2016) indicate that research shows prevalence of the transmissive teaching mode where teachers present certain facts and check if learners learned them. In the transmissive mode of teaching, teachers ask closed-ended questions which require short and simple answers with low cognitive demand (Sedova *et al*, 2016). The transmissive mode does not motivate and develop learners' interest in the subject because it is not thought provoking. One could argue that learners are motivated to learn when they gain an opportunity for dialogic discussion so that they can express their views. Yilmaz, Cakiroglu, Ertepinar and Erduran (2017) argue that teachers' lack of pedagogical content knowledge limits classroom dialogue in learning. According to Ritchie (2001) classroom dialogue develops transformative understanding when learners challenge each other from an empirical position. Furthermore, Ritchie (2001) contends that when learners are actively involved in the social practices of their communities, they will come up with alternative perspectives.

Classroom dialogue or arguments during the learning process can be enriched if teachers' knowledge, skills and competencies in teaching of environment and sustainability is strong. The knowledgeable teacher will engage learners in conversation which strengthens their thinking and elaborate ideas rather than transferring knowledge, as well as motivating and developing learners' interest in the subject. In other words, dialogue might strengthen ESD knowledge in the teaching and learning process.

### 2.6 Teachers' competencies for ESD and transformative learning

The knowledge and abilities of teachers to teach environment and sustainability content for transformative learning is important in assessing the effectiveness of teacher

professional development programmes. Weinert, quoted in Adomßent and Hoffmann (2013, p.2), states that "*competencies are the positive combination of knowledge, ability and willingness in the availability of the individual to cope successfully and responsibly with changing situations*". UNESCO (2017) describes competencies as specific attributes individuals need for action and self-organization in various complex contexts and situations. It is argued that these attributes "…*are interplay of knowledge, capacities and skills, motives and affective dispositions*" (UNESCO, 2017, p.10). The ability of teachers to teach environment and sustainability concepts depends not only on the knowledge and skills achieved during training, but also on positive dispositions towards ESD.

Haubrich *et al* (2007) outline geographical competencies to enhance sustainable development as follows:

- geographical knowledge and understanding of major natural systems of the Earth, socio-economic systems and spatial concepts;
- geographical skills; and
- attitudes and values.

The three geographical competencies which can be linked to the specific learning objectives for the SDGs are described as cognitive, socio-emotional and behavioral domains (UNESCO, 2017). The cognitive domain comprises natural, social and spatial knowledge and thinking, socio-emotional refers to the social skills that enable collaboration, negotiation and communication, and the behavioural domain accounts for the attitudes and values which develop critical action (UNESCO, 2017). The development of teachers' cognitive, socio-emotional and behavioural domains can be translated into the development of learners' skills which enable them to cope with changing situations.

Teachers are lifelong learners. Delors (2013) contends that lifelong learning enables individuals to acquire the ability to cope and to control the risks and constraints of lives. In this study, risks and constraints will refer to environmental and sustainability challenges such as climate change and global warming, overconsumption of resources, food security, pollution and globalization. Delors (2013) further argues that education is essential in improving individuals' confidence and ability to take control of their lives. This

means that people should be able to come up with solutions to the environmental sustainability challenges. However, people do not always have the will, knowledge and motivation to change actions that harm environmental sustainability. Portilla (2013) argued that it is impossible to convince industrial nations to act in the interest of environmental sustainability rather than their economic prosperity. This problem requires nations to commit to reducing environmental impacts through education.

Delors (2013) argues that the pillars of education are learning to know, learning to do, learning to live together and learning to be. These pillars serve as prerequisites for the effectiveness of education. ESD should enable learners to know, be able to live and work with others, and be able to transform themselves and their society. The realisation of this transformation lies with teachers who have a responsibility to teach and develop learners' abilities and action that enable them to live sustainably in the environment and with others. A good transformative ESD lesson will enable learners to show what they know, what they can do, how they live with others and encourage a change of behavior towards the environment, social and cultural issues. In the next section, the experiences and challenges in the application of ESD in selected countries in Southern Africa and internationally will be discussed.

### 2.7 The implementation of ESD

The implementation of ESD in different countries will be addressed via studies that have been conducted by different researchers. This will also reflect the challenges that teachers face in executing ESD in their classroom practice. Literature reviewed below indicates that different countries are at different levels of implementing ESD, with others still stuck on the preservation and conservation of the environment (Down, 2010; Strife, 2010; Taylor *et al*, 2010; Bolscho & Hauenschild, 2006). This section will draw on research conducted in Southern Africa and in other regions to explain how ESD is implemented in schools.

#### 2.7.1 The Southern African perspective

This section will review the research conducted in Zambia, Lesotho, South Africa and Namibia. In Zambia, Shumba and Kampamba (2012) argue that much learning lacks

personal and societal relevance. Education should be relevant to the needs of the individuals and their communities. This can happen if change-oriented teaching and learning methods are incorporated into teaching ESD (Shumba and Kampamba, 2012).

Molapo (2014) maintains that the curriculum in Lesotho has the intention of stimulating action for sustainable development in learners, but there are challenges in the implementation phase. Molapo (2014) found that learners in Lesotho have adequate knowledge and awareness of environmental problems but are not able to translate the knowledge into everyday practices. This reveals that there is a need for teachers to nurture the action competence of learners so that they can link formal knowledge with everyday life.

In a study conducted in South Africa, Dube (2014) claims that Geography teachers were found to have conceptual difficulties regarding EE and ESD, which means that they cannot implement ESD effectively. Dube (2014) suggested that the implementation of ESD can be effective if teachers are capacitated to become change agents through professional development programmes. Loubser and Simalumba (2015) pointed out that teachers' knowledge and understanding of environmental concepts and issues is adequate in Namibia. However, Loubser and Simalumba (2015) found that their knowledge of environmental related skills and attitudes is limited and they did not use a variety of teaching skills and alternative assessment in their practice. Loubser and Simalumba (2015) further argue that improved resources, additional training, and departmental and external support through EE centres can play a role in improving educators' abilities to enable EE in Namibia's Geography curriculum.

An organization for environmental educators in the Southern African Development Community known as the Environmental Education Association of Southern Africa (EEASA) provides a forum for practitioners to share experiences and ideas necessary for developing EE and ESD practices in conferences that are held annually (EEASA, 2015). The Matsapha Declaration, signed at the EEASA's 33rd conference in 2015, has noted that countries in Southern Africa are at different levels of understanding and of mainstreaming ESD into existing formal, non-formal and informal education (EEASA,

2015). EEASA (2015) therefore resolved that scaling up ESD will be done differently in different countries, depending on the level of EE or ESD implementation in each country.

I maintain, therefore, that it is imperative for different countries to assess their levels of implementation of ESD so that planned professional development programmes address the limitations revealed in the literature reviewed. The next section addresses the implementation of ESD internationally by referring to four developed countries and the Caribbean as developing region.

### 2.7.2 International perspective

The USA, Germany, Australia, UK and the Caribbean were considered in assessing the implementation of ESD in the international arena. According to Strife (2010), EE in the USA is still framed within the old environmental paradigm of preservation and conservation. Strife (2010) also argued that the US needs to link EE to sustainability so that it can humanize EE's benefits and focus on the social dimensions of environmental problems and solutions. Bolscho and Hauenschild (2006) argue that the main problem in Germany is lack of integration of local environment and global social aspects of sustainable development, especially so because their conception of ESD lacks economic, ecological and cultural aspects of sustainable development. Even though the implementation of ESD is still a challenge in Germany, the concept of ESD is now reflected in their political documents (Singer-Brodowski, Brock, Etzkorn & Otte, 2018).

The Government National Action Plan for Education for Sustainability in Australia has shifted its focus from knowledge of natural ecosystems and threats posed by overuse and depletion of resources to equipping people with knowledge, skills and understanding to make decisions based on environmental, social and economic implications (Commonwealth of Australia, 2009). The study conducted by Taylor *et al* (2010) shows that some teachers in New South Wales, Australia, are incorporating aspects of Education for Sustainability (EfS) into their teaching, though only a few are familiar with the concept. Teachers have intuitive knowledge of ESD and how it differs from EE. They believe that social justice needs to be addressed by teachers when dealing with environmental issues and in their practice across the curriculum (Taylor *et al*, 2010).

Social justice, in this case, refers to quality and equality of the use of resources in society. This means that there is a need for teachers to be trained to teach for sustainability so that they can equip learners with the knowledge and skills necessary to enable them to live sustainably in their environments.

The United Kingdom National Commission, in their policy brief for UNESCO (UNESCO, 2013), indicated that sustainability is often a feature of informal education and extracurricular work in Scottish schools. McNaughton (2012) conducted a study on teachers who were working with ESD for the first time in Scotland. These teachers reflected that they had not used transformative pedagogies in teaching (though they are not new to them), but found that they are an effective, enjoyable and interesting way to teach (McNaughton, 2012).

Down (2010) explored how teachers teach and learn for sustainable development in the Caribbean within the framework of service learning (tourism and consumer studies). Emerging from this study is that economic development in the Caribbean has deepened into a crisis in terms of environmental sustainability (Down, 2010). Down (2010) suggested that the solution to the challenges that are related to economic development in the Caribbean lies in positioning education at the centre of the community. This is to say that the needs of the people should surpass profit making. Education can enable communities to see the need for taking care of the environment rather than stressing the need for economic development in service subjects.

It is clear from the work reviewed above that the five countries referred to are at different levels in the implementation of ESD. The USA and Germany are still emphasizing protection and conservation of the environment, even though ESD is reflected in political documents in Germany. The Caribbean saw the need for positioning education at the centre of the community, making it a public common good as opposed to emphasizing economic development. The UK sees sustainability education as a feature of informal education; a few teachers who are familiar with the concept of ESD have been incorporating it into teaching and learning.

The next section will discuss the implications of practice for ESD and transformative learning and explore what is involved in changing practices.

### 2.8 The implications of practice to ESD and transformative learning

In this study, practice will be described as a concept rooted in practice theory as posited by Bordieu (1990) and Kemmis (2010). Practice is an "*action that is morally committed and informed by traditions in the field*" (Kemmis and Smith, 2008, p.4). Practice is also understood as "*history-making action … for those involved in and affected by it*" (Kemmis, Wilkinson, Edwards-Grove, Hardy, Grootenboer and Bristol, 2014, p.26). Those that are involved in practice are guided by the customs that guide practice, which are passed from generation to generation. According to Kemmis (2010), educational action involves the morally informed action of those who practice education on one hand, and on the other hand, it helps shape social formations and conditions as well as people and ideas, their commitments and their consciousness. Education as a social activity is informed by customs that guide the action of teachers in their practice. Such customs are historical, and they shape teachers' thinking, action and the way they relate with the structure of education and each other in their practice.

Kemmis *et al* (2014) conceptualized practice as the 'sayings', 'doings' and 'relatings' in an educational setting. The 'sayings' refer to a form of understanding, 'doings' refer to the mode of action, whilst 'relatings' refer to solidarity, legitimacy and power relations in a project (Kemmis & Mutton, 2012). In this study, teaching is considered to be a social activity, where teachers 'sayings' and thinking are reflected through their knowledge and understanding of ESD. The 'doings' refer to the teachers' mode of action reflected through the skills and values shown in their activity. The 'relatings' refers to how teachers relate to policies and rules of the Department of Basic Education. I would like to argue that what teachers say, do, or how they relate to the policies and rules of the Department of Basic Education and the culture of their work either enable or constrain the implementation of ESD.

Schatzki (2012) argued that practices are *situated* in the particular circumstances and conditions of particular *sites.* The practitioners of these practices are *co-inhabitants* of

sites along with other people, other species and other objects, and they are in interdependent relationships with these others, not only in terms of maintaining their own being and identities but also *in and through their practices (*Schatzki, 2012). Teachers depend on and relate with each other in their practices, which helps shape their action and identities. Practice always forms and transforms the one who practices and also those who are involved and affected by the practice (Kemmis *et al,* 2014). Teaching as a practice creates and transforms teachers and the other individuals involved in and affected by the practice, such as learners and stakeholders.

According to Kemmis and Mutton (2012), changing practices not only require changing understanding and skills, but also changes in the 'sayings', 'doings' and 'relatings' that hold the existing practices. To ensure change in practices, knowledge and skills of the practitioners must change, but the structure that holds such practices must also change. The Department of Basic Education in the Gauteng province provides generic lesson plans and common assessments, which removes teachers' agency and motivation in using their knowledge, skills and dispositions in teaching for and about ESD.

### 2.9 Summary

The purpose of this chapter was to explore teacher professional development in relation to ESD within teaching practice. The literature review pertaining to ESD and TPD has been presented accordingly by explaining views and limitations that emanated from different research studies. To this end, the chapter reviewed literature on the concept of ESD, teacher professional development for ESD, ESD transformative practices, classroom discourse, teacher competencies in ESD, the implementation of ESD and the implications of the notion of practice for ESD and transformative learning.

The discussions on teacher professional development suggest that its effectiveness can be evaluated through the development of teaching practices. The integration of sustainable development into education requires teachers to be trained in embedding sustainable development into their classroom practices. Teachers need to develop transformative teaching practices, transformative assessment strategies, the know-how to choose and use different resources for transformative learning in ESD, and the ability

to integrate values in their teaching practice. Classroom dialogue was outlined as a means of engagement that deepens insight and motivates learners to learn for and about ESD. It is possible to teach for and about ESD if teachers have the will and the knowledge and are motivated to change for the benefit of the learners. The implementation of ESD in schools both regionally and internationally revealed some of the barriers (including limited action competence, conceptual difficulties, knowledge without skills, and failure to use a variety of skills and assessment methods) and the importance of assessing levels, as different countries considered in this literature review have achieved different levels of implementation. The notion of practice was discussed to show what practice entails and what needs to change for teaching practices in ESD to be transformed: teachers' skills and knowledge must change, but so too must the structures that hold the practices.

Changes in teaching practices reviewed in the literature provide the foundations for the transformative learning theory and realist social theory of morphogenesis discussed in Chapter 3.

# Chapter 3

# Teacher professional development for Education for Sustainable Development: a theoretical framework

## 3.1 Introduction

The previous chapter presented a review of literature on teacher professional development for ESD, ESD transformative practices, teachers' competencies for ESD and transformative learning and the implementation of ESD in different countries. This chapter is an exploration of the theoretical framework that was used to understand the transformation of teachers' views and teaching or pedagogical practices. I drew on two theories, namely, Mezirow's transformative learning theory (1978; 1991; 2000; 2003) and Archer's realist social theory of morphogenesis (1995; 1998). The theoretical framework for this study was formulated to establish teacher development and teacher learning of ESD through the *Fundisa for Change* intervention course for Geography teachers in secondary schools. The study sought to understand teachers' frames of reference, and these are displayed through their knowledge of environment and sustainability and their teaching practices as a result of their interaction with the *Fundisa for Change* intervention course. This theoretical framework was used as the lens in answering the research questions (see section 1.5 and 1.6), in conjunction with concepts outlined in Chapters 1 and 2.

This chapter is arranged as follows:

- Introduction to transformative learning theory.
- Essential elements of transformative learning theory.
- The significance of transformative learning theory for professional development for ESD.
- A critique of transformative learning theory.
- Introduction to realist social theory.
- The morphogenetic approach.
- A critique of the realist social theory.
- Summary of the chapter.

### 3.2 Transformative learning theory

Mezirow (1978; 1991; 2000; 2003) and other transformative learning theorists (Cranton & King, 2003; Crowther & Sutherland, 2008; Taylor, 2009) described transformative learning theory as a field of adult education that can be used to understand how adults learn. Transformative learning theory as proposed by Mezirow (1978) is grounded in cognitive and developmental psychology which he first applied in his study on US women returning to post-secondary study or the workplace after an extended time out. In this study, the theory is used to demonstrate the potential of transformative learning for Geography in-service teachers who attended the ESD course and the implications for classroom practice. At the heart of Mezirow's (1991) transformative learning theory is a rational, critical, cognitive process which requires individuals to think, reflect, question and examine one's assumptions and beliefs. For the purposes of this study, transformative learning theory is used to understand and describe how the participating teachers develop, reflect and transform their knowledge and teaching practices for and about ESD based on Mezirow's framework.

Mezirow (2003, p. 58) defines transformative learning as *"learning that transforms problematic frames of reference to make them more inclusive, discriminating, open, reflective, and emotionally able to change*". It can be inferred that transformation of frames of reference grant us the right to choose, to be open to different points of view, to include other points of view and to reflect on those views for change to occur. Crowther and Sutherland (2008) concur with Mezirow, as they argue that transformed frames of reference are likely to generate open and inclusive beliefs that will guide action. In other words, frames of reference are open to different viewpoints that shape and determine how we make meaning. It must be noted that not all ideas, beliefs and values have to be transformed, but only those that are said to be problematic.

Mezirow (1991, p. 161) contends that

> *… transformative learning involves an enhanced level of awareness of the context of one's beliefs and feelings, a critique of their assumptions and particularly premises, an assessment of alternative perspectives, a decision to negate an old perspective in favour of a new one or to make synthesis of old and new, an ability*

*to take action based upon new perspectives, and a desire to fit new perspectives into the broader context of one's life*.

In the light of the aforementioned statement, adult learners ought to be aware of the context of their beliefs and feelings in relation to new perspectives in order for transformation to occur. Peters and Wals (2016) contend that transformative learning occurs when we recognize and modify the beliefs that frame our perspectives. This means that people's thoughts and points of view should change for transformation to take place.

Transformative learning theory is relevant in the context of teacher professional development and teacher capacity for learning ESD. Mezirow's views on frames of reference, learning meaning, critical reflection and dialogue are essential for teacher development for ESD and transformation of teaching practices.

### 3.2.1 Essential elements of transformative learning theory

#### *3.2.1.1 Meaning structures or frames of reference*

To develop a transformative learning process for enhancing teachers' learning of ESD, teachers' meaning structures or frames of reference ought to transform. According to Mezirow (2000), a frame of reference is the structure of our assumptions or expectations, through which we filter our ideas formed with or without conscious thought. Mezirow (2000) further argues that frames of reference involve cognitive, affective and conative dimensions. This means that frames of reference necessitate thinking and feelings and suggest actions to follow.

Mezirow (1991; 2000) maintains that frames of reference are shaped by people's experiences. Mezirow (1991) further contends that how people are socialised and interpret their experiences act as a consequence of cultural or personal perspectives derived from childhood. In other words, our frames of reference are derived from cultural and personal attributes that developed over time. If transformation is to occur, we should be aware of these frames of reference because they inform people's actions and how they make meaning of their experiences.

Mezirow (1997) contends that a frame of reference is made up of habits of mind, which are broad habitual ways of thinking, feeling and acting. Habits of mind are a set of dispositions that guide decision in daily life. Mezirow (1997) further contends that habits of mind are articulated as specific points of view showing a person's beliefs, value judgements and attitudes that shape the interpretation of those views. Our points of view are determined by the inherent qualities of our minds that control our thoughts, feelings and actions. According to Jefferson and Anderson (2017), frames of reference are preconceptions that define our life views and have become our habitual actions. In other words frames of reference are made up of habits of mind that define our lived experiences and actions (the way we live and do things).

Mezirow (1994) asserts that another category of frames of reference is meaning schemes or points of view, which involve beliefs, value judgements and feelings which shape our interpretations. Mezirow (2000, p.18) contends that "*a point of view comprises clusters of meaning schemes that tacitly direct and shape specific interpretations and determine how we judge, typify objects, and attribute causality*". This means that we judge and characterize experiences based on the values that we live by that fit into our frames of reference.

This section shows that frames of reference are assumptions through which we filter ideas. They are shaped by people's experiences and how they are socialised. These frames of reference determine the way we live and do things. The next section outlines how we learn meaning.

#### *3.2.1.2 Learning meaning*

Mezirow (2000) contends that development in adulthood can be understood as a learning process where meaning is clarified through awareness. Learning may transform who we are and what we value if we become aware of problematic experiences. Mezirow (2003) argues that learning is understood as the process of using prior interpretations to construct new interpretations of the meaning of one's experiences as a guide to future action. Jarvis (1997) argues that learning is a psychological process that happens from the world in which the learner lives, related to that world and affected by that world. With this in mind, I maintain that learning is influenced by the interpretation of learners' lived

experience. This means that learning is influenced by the culture and customs of the world in which learners' live.

Mezirow (2000) distinguished between two domains of learning, namely, instrumental and communicative learning. These two types of learning lead us to question or evaluate what is accepted as true. Instrumental learning involves determining cause-effect relationships to solve problems (Mezirow, 1991). Mezirow (2000; 2003) contends that instrumental learning is about controlling and manipulating the environment, with emphasis on improving prediction and performance. Instrumental learning is task-oriented and geared towards problem solving (Mezirow, 2000; Quinn and Sinclair, 2016). This means that this kind of learning is technical and involves predictions based on what is observable or empirical truth. However, the limitation of instrumental learning is that it cannot account for differences in opinions, belief, values and decision making (Mezirow, 2000). For that reason, communicative learning is important because it involves understanding the meaning that is derived from communicating with other people.

Mezirow (1991) asserts that communicative learning helps us to understand knowledge about ourselves, others and the social norms of the community or society in which we live. Mezirow (1991) further maintains that communicative learning is relevant when we consider what is communicated, and the context in which that which is communicated makes sense. Communicative learning is rooted in the social norms and values underlying our society. This understanding includes becoming aware of the assumptions, intentions and qualifications of the person communicating (Mezirow, 2003). Mezirow (1991) asserts that the meaning of social norms is objectified in the ordinary language of communication. Thus, communication is important in understanding the behavior of a community and their values. Further to Mezirow's (1991) views, Quinn and Sinclair (2016) argue that communicative learning involves individuals interpreting the values, intentions, feelings, moral decisions and normative concepts of themselves and others. Quinn and Sinclair (2016) further argue that individual learners try to decipher and discern meaning from their social experiences to create new meaning schemes. This means that communicative learning enables us to share and justify our understanding and beliefs.

In summary, this section refers to learning meaning as a psychological process which is influenced by learners' experiences and their situation. Mezirow (1991; 2003) and Quinn and Sinclair (2016) show that communicative learning involves understanding knowledge about ourselves in relation to the social norms of the society and from social experiences respectively. Both indicate that communicative learning is about understanding ourselves and others within our society. Communicative learning in this study was assessed through teachers reflecting critically on knowledge and skills during interviews and lesson observations. It is worth mentioning that learning is an individual experience that promotes meaning making by provoking critical reflection which facilitates transformative learning.

#### *3.2.1.3 Critical reflection*

Critical reflection is a process whereby individuals question the integrity of deeply held assumptions and beliefs based on prior experience (Mezirow, 1991; Taylor, 2009). This means that the participating teachers will be able to reflect critically on their environmental and sustainability knowledge, teaching practices, and the experiences that come with knowledge. According to Jefferson and Anderson (2017) critical reflection requires students to consider the meaning of their experiences in the context of their assumptions in order to formulate actions that result from their understanding. For the purposes of this study, this means that the participating teachers critically reflect on the content knowledge, related skills in teaching and learning, and experiences in the context of ESD. Mezirow (2000) argues that we transform frames of reference by becoming critically reflective on those assumptions or beliefs that arise from frames of reference as well as the context that has sharpened them and becoming aware of their context. This means that beliefs that shape our frames of reference are dependent on our surroundings. I maintain that critical reflection, in the context of this study, is a thoughtful and conscious process which involves being able to assess one's understanding of and belief about ESD and related environmental issues, such as climate change.

Mezirow (1991) argues that not all reflection leads to transformation, although it may lead to confirmation or even elaboration of existing meaning schemes or the creation of new meaning schemes. Cranton (1996) supports Mezirow's argument but points out in

addition that critical reflection can either lead to perspective transformation on practice or serve to confirm existing practices. In certain instances, existing perspectives on practices might be developed further or confirmed through thoughtful action. As Cranton (1996) argues, we cannot teach transformation, we cannot identify how and why it happens. However, we can teach for transformation and establish its evidence in practices. Teacher educators taught environment and sustainability in the *Fundisa for Change* TPD, and individual teachers had the opportunity to personally and consciously transform their viewpoints on ESD. Hence this study's interest to establish if the course stimulated transformative learning processes among individual teachers.

Mezirow (1994) argues that three forms of critical reflection are required for the transformation of meaning schemes and perspectives: namely content reflection, process reflection and premise reflection.

### *Content reflection*

Mezirow (1991) contends that reflection on what we perceive, think, feel or act upon is content reflection. Cranton and King (2003) argue that content reflection refers to the examination of the content or description of problematic meaning schemes. This kind of reflection allows us to reflect on the content of the problem or think back on problematic meaning schemes or frames of reference. This means that content reflection enables us to describe the problem. In this context, participating teachers reflect on the content knowledge base, skills and values that seek to transform teaching practice for ESD.

The intention of the *Fundisa for Change* course was to teach in-service Geography teachers subject content knowledge, teaching methods and assessment methods for Grades 10 to 12 in relation to ESD. *Fundisa for Change* used climate change units to teach the geography content knowledge in relation to the content in the CAPS document. Teachers who attended the course learned the content and had to question their prior understanding and challenge themselves on ESD content knowledge and related teaching practice. In so doing they reflected on their content knowledge so that they could see its relevance to the curriculum. The content learned might be new knowledge, or the problem might be how to infuse such knowledge (environment and sustainability

knowledge) into the curriculum. How the research participants reflected on the content is further discussed in the data presentation and analysis in Chapter 5.

### *Process reflection*

According to Mezirow (1991) process reflection is concerned with finding ways of solving problems now and in the future. Furthermore, Mezirow (1991) points out that process reflection is an examination of how we perform the functions of perceiving, thinking, feeling and acting. It involves thinking about the strategies used to solve the problem rather than the content of the problem itself. Cranton and King (2003) claim that process reflection involves how problem-solving strategies are handled. Therefore, process reflection requires us to consider the actions required and related factors in changing experiences. The intentions of the *Fundisa for Change* intervention course were to transform teachers' knowledge, skills and values in teaching ESD. The participating teachers reflected on how to include ESD in classroom practice in terms of knowledge, skills and values.

### *Premise reflection*

Mezirow (1991) argues that premise reflection involves awareness and critique of the reasons that we do things in a particular way. Kitchenham (2008) attests that premise reflection allows us to see what is happening in our world, which might include our value system. Furthermore, Mezirow (1991) argues that premise reflection refers to why we perceive, think, feel or act as we do. Premise reflection has the potential to transform meaning perspectives (Cranton and King, 2003; Kitchenham, 2008; Merriam & Bierema, 2014). I maintain that premise reflection leads to change in thinking and action.

According to Mezirow (1991), content and process reflection can lead to elaboration, confirmation or creation of meaning schemes, whilst premise reflection should lead to the transformation of meaning schemes. This means that content and process reflection could lead to transformation in some way or might just result in confirmation or elaboration of the existing meaning schemes. The challenge we have is that confirming or elaborating meaning schemes is not transformation. Premise reflection is essential because it allows us to question our value systems. Transformation can therefore only occur if learners are willing to change their value systems, which influence their thinking and actions.

According to Jefferson and Anderson (2017) the contribution of critical reflection to teachers as learners is empowerment, increased competence, building confidence and the capacity to deal with uncertainties in their classroom practice.

In summary, critical reflection requires the participating teachers to think and reflect on the interpretation of knowledge, skills and values for ESD. Critical reflection can either lead to perspective transformation on practice or serve to confirm current practices. In this study, the transformation of participating teachers' knowledge and skills would mean that their capacities to teach ESD have been strengthened. Discourse or dialogue is discussed in the next section to show its importance as a medium of critical reflection.

#### *3.2.1.4 Dialogue*

Mezirow (2000) uses the term reflective discourse to refer to dialogue devoted to searching for a common understanding and assessment of the justification of interpretation. For the purpose of this study, I will use the term dialogue to refer to reflective discourse. Taylor (2009) describes dialogue as a medium of critical reflection that is put into action and where experience is reflected on, assumptions and beliefs are questioned, and habits of mind are transformed. According to Mezirow (2000) dialogue is based on finding agreement, welcoming difference, trying other viewpoints and identifying common contradictions. Bohm (2009) defines dialogue as a process of gathering and unfolding meaning that comes from many parts. It must be noted that dialogue relates to communicative learning, where people come up with different viewpoints in order to make meaning.

It is important to distinguish between dialogue and discussion. Bohm (2009) argues that dialogue allows people to see the parts from a large perspective, whilst discussion is about finding a solution or the best alternative among many. Bohm (2009) further argues that a conversation is said to be dialogic if the intention of those taking part is to learn from each other and build shared meaning that includes all perspectives. Discussions end with a solution, whilst dialogue allows people to explain and justify their viewpoints. Bolton (1998) asserts that dialogue helps us in finding ways to work with others. The critical factor is about sharing meaning between those that are involved in dialogue. Bohm

(2009) argues that dialogue helps us to move beyond cultural stereotypes and develop a sense of shared meaning, because we get to understand our cultural differences.

Mezirow (2000) argues that feelings of trust, solidarity, security, and empathy are preconditions for full participation in dialogue. Mezirow (2000) further argues that the participants can freely and fully participate in the dialogue if they have more accurate and complete information, are open to alternative points of view and accept the resulting best judgment until new perspectives are created. Being open to alternative points of view is important in understanding and making judgment of interpretations. Taylor (2009) claims that dialogue emphasises relational and trustful communication. Teachers and learners participate fully in discussion and dialogue when they are free and have a trusting relationship.

Learning requires the educator and the teachers as learners or the teacher and children as learners to be in a social relationship that allows them to participate in dialogue. Cranton and King (2003) are of the opinion that adults in professional development should be engaged in dialogue so that they can challenge and construct new understanding. I did not observe dialogue between the *Fundisa for Change* educators and participating teachers, nor amongst participating teachers as learners during the *Fundisa for Change* course, because I started this study when the course has been completed. Therefore, I had to assess how the participating teachers provoked dialogue among learners in classroom practice. The participating teachers were expected to enact what they learned through practicing communicative learning with their learners in class. Classroom dialogue is discussed in Chapter 5 to reflect how participating teachers used it to integrate environmental sustainability values in relation to dialogue as a medium of transformative learning (see section 5.4.4).

With reference to the essential elements of transformative learning theory, I maintain that theory can provide a platform to understand how teacher professional development can lead to authentic and critically reflective practitioners. In the context of this study, teachers critically reflected on content knowledge, teaching and assessment practices through interviews.

### 3.2.2 The significance of transformative learning theory for teacher professional development for ESD

The goal of professional development is to lead teachers to critically examine their current practices through acquiring alternative ways of understanding what they know, what they do and how they do it (Cranton and King, 2003; Cranton, 2002). Cranton and King (2003) are of the opinion that teacher professional development that is transformative opens up alternatives and introduces new ways of thinking about teaching and learning. This means that teacher professional development courses should ideally lead to transformative learning if teachers are exposed to alternatives and new ways of doing things and thinking. The intention of the *Fundisa for Change* programme is to strengthen transformative environmental learning based on knowing the content knowledge and improving teaching practices and assessment practices *(*Fundisa for Change, 2013). Thus, *Fundisa for Change* TPD exposed teachers to new knowledge, alternative teaching and assessment practices for teaching environment and sustainability knowledge.

According to Grabove (1997), acquiring knowledge and skills does not necessarily give rise to transformation in teaching practice. Steyn (2017) argues that transformative learning requires teachers as adult learners to understand how they know. It is almost certain that acquiring knowledge and skills is important in TPD processes, even though being conscious and critical of experience in the teaching practice might engender transformation. Cranton and King (2003) argue that professional development must make teachers aware of their habits of mind about teaching and allow them to critically examine their beliefs and values. This study examines teachers' understanding of environment and sustainability content and of transformative pedagogies. Teachers change of value systems will be seen through the way they encourage learners behavior towards environmental sustainability.

Even though Mezirow (1991) maintains that the goal of adult education is reflective and transformative, Taylor (2015) argues that transforming teaching beliefs is often challenging and difficult. It is challenging to change teaching beliefs because teaching practice is shaped by what teachers experienced as learners in that they tend to teach as they were taught. Cranton and King (2003) argue that those teachers' personal

experiences on education and basic teaching and learning have shaped their habits of mind about teaching in many ways. Teachers might teach in the way they were taught or in line with their school culture, which might hinder transformation.

The implication of transformative learning theory for teacher professional development for ESD is a change in perspectives. Taylor (2015) points out that transformation occurs when the teachers find that their frames of reference are incompatible with or inadequate to provide the understanding of experience, such that they are provoked to question their deeply held assumptions about teaching. Transformative learning theory in this study is particularly relevant in understanding and describing how teachers learn and make meaning of their perspectives, critically reflect on their knowledge, skills and experiences, and use dialogue to foster transformation. Cranton (2002) argues that critical reflection can be a starting point for continuing, self-directed professional development. This implies that teachers will start thinking differently about their practice and eventually change their assumptions on teaching practice. Cranton (1996) claims that transformative TPD brings perspectives about teaching into consciousness and allows teachers to critically examine their values and beliefs in their practice.

Transformative TPD enables teachers to critically examine current practices as they acquire alternative ways of doing things. It is important for teachers to acquire knowledge and skills in a TPD. However, teachers must be aware and critically reflect on their experience from TPD for transformation to occur. It must be noted that transformative learning theory is also not without weaknesses; therefore, the limitations of this theory for this study are discussed in the next section.

### 3.2.3 Critique of transformative learning theory

Mezirow's transformative learning theory has been used in this study as an underlying theoretical framework to understand the intentions of the *Fundisa for Change* TPD and whether it transformed teaching practices for ESD. Transformative learning theory is useful for understanding individual change in professional development. However, transformative learning in the context of this study needs to occur on both individual and social levels to be meaningful. Three areas of shortcoming have been identified

concerning transformative learning theory and teachers learning ESD: the first relates to the context in which experiences occur; the second has to do with the desire to change; and the last with showing evidence of perspective transformation.

#### *3.2.3.1 Experiences are context dependent*

At the core of Mezirow's (1991) transformative learning theory (as mentioned in section 3.2.1 above) is the rational, critical and cognitive process of meaning making that requires thinking, reflection, questioning and examination of one's assumptions. Mezirow's explanation of the construction of meaning from experience is illustrated at an individual level, without considering the social context. I affirm that experience cannot just be described as personal and historical because the context in which experience occurs is also of significance in determining transformation.

Clark and Wilson (1991) contend that, to construe meaning from experiences through critical reflection and dialogue, Mezirow did not consider the social context which gives meaning to experience. Clark and Wilson (1991, p.76) further argue that Mezirow does not deny the existence of the social context in meaning making, but fails to "*maintain the essential link between the meaning of experience and the context in which it arises and by which it is interpreted*". The construction of meaning is context dependent.

Learning occurs within the context of our communities. In the context of this study, the meaning that teachers as learners attach to environment and sustainability issues are made within a particular social context. Clark and Wilson (1991) argue that Mezirow generally disregarded the sociocultural and the historical context in an attempt to generalize a process of perspective transformation. But our socialisation determines how we deal with environment and sustainability issues and this happens within the social context.

#### *3.2.3.2 The desire to change*

Cranton (2002) points out that Mezirow failed to realize that motivation plays a role in fostering reflection and transformative learning. Taylor and Cranton (2013) argue that motivation encourages individuals to realise the need to change. Taylor and Cranton (2013) further argue that motivation can either be extrinsic or intrinsic. Individuals are

either externally motivated to engage in learning for an external reward or internally when the change satisfies them. When teachers are motivated to learn they are more likely to transform their perspective, which will have implications for their classroom practices. Intrinsic motivation to learn can result in long lasting learning outcomes.

However, Taylor and Cranton (2013) argue that Mezirow did not address the fact that transformative learning should be a voluntary process, where individuals need to be open and willing to engage in the activities that have the potential for transformation. Tennant (1993) argues that transformative learning is self-directed learning where individuals are not coerced to learn. The Department of Basic Education (at district level) chose teachers to participate in the ESD course because environment and sustainability content has been introduced as a new topic in the CAPS curriculum. Most teachers were trained before it was incorporated into the curriculum. Teachers can change their teaching practices easily if they had the desire to transform their practices.

#### *3.2.3.3 Evidence of perspective transformation*

As already pointed out, reflection and dialogue are key elements of transformative adult learning. According to Mezirow (1991), reflection and dialogue ought to produce new meaning perspectives that ground decision making and action. Since transformation is inherent, it is not possible, as argued by Ferguson (2011), to determine that perspective transformation has occurred. I agree with Ferguson (2011), who pointed out that the problem is made worse by the reality that certain cultural groups discourage openness, dialogue and argument. However, in terms of ESD, perspective transformation would be evident in teachers' behavior and attitudes towards the environment and sustainability issues.

According to Newman (2012) transformative learning can only be verified by the learners themselves. It is not possible to assume that people have undergone transformation because they say they have or because they participated in the intervention course. However, adult educators should have a deeper awareness of their learners' frames of reference and how they shape practice to be able to foster change in others. Cranton (2002) contends that adult educators can neither teach transformation nor identify how and why it happens. There is no special method, as argued by Cranton (2002), which

guarantees transformation. It is complex to describe whether transformation has occurred or not. In this study, evidence of transformation was sought in what teachers said about their practices before and after the course and lesson observations. What teachers said, document analysis and lesson observations will be analysed in Chapter 5 to reveal evidence of transformative learning among the participants.

It must be noted that transformative learning theory is psychological, and it emphasizes that substantive change is reflected in an individual's thinking and behaviour. Tennant (1993) argued that Mezirow's position on perspective transformation underestimates the power of social forces that shape individuals' lives. For this reason, elements of Archer's (1995; 1998) realist social theory of morphogenesis have been included in order to explain change of teaching practice in relation to social influences. Archer (1995) argues that social reality is made up of individuals/groups that choose to perform through cultural practices that are exercised within and in relation to structural conditions. Drawing on Archer's theory, I argue that individuals do not learn and operate in a vacuum, but they learn within the society.

### 3.3 Realist social theory

Realist social theory, as propounded by Archer (1995), is a field of philosophy that grew out of Critical Realism. Critical Realism, further developed by the work of Bhaskar (1979), is a philosophy that propounds that reality exists independently of our knowledge of it. Sayer (2000) also argues that reality exists, be it natural or social, and whether we have adequate understanding of its nature or not. However, our knowledge about this reality is socially constructed and it does not exist independently of the social world (Sayer, 2000). The existence of reality does not necessarily depend on our awareness.

Critical realism grew from the notion that reality is differentiated, structured and changing (Bhaskar, 1979; Archer, 1995). Reality is therefore not viewed as amorphous. Sayer (2000) contends that critical realists distinguish between the real, the actual and the empirical. 'Real' refers to the structure and powers of the object, the 'actual' refers to what happens if and when the powers are activated, whilst the 'empirical' indicates experiences and events (Sayer, 2000). Consequently, whatever happens in the world is influenced by

the way that world is structured. According to Modell (2009), critical realism rejects the possibility of the existence of a singular, objective world, which is readily observable and made knowable without being filtered. This suggests the existence of multiple realities. The social world is subjective and is made known through observing people's relations with each other. In the social world, people's roles and identities are internally related but depend on their relations to others (Sayer, 2000). I argue that teachers' agencies are relational as they depend on how the teachers relate with others and with their organisational structures.

Archer (1995) posits that social reality is stratified into the natural, practical and social orders as shown in Table 3.1 below. Archer (1995) further postulates that the natural order is made up of natural objects, the practical order constitutes human interactions with natural objects, whilst the social order consists of human interactions. Knowledge in the natural order is embodied with minimal reflexivity. Chernilo (2017) argues that reflexivity refers to the way humans exercise their autonomous power in society. The teachers engage with the curriculum and rules in the practical order. In the social order, teachers interact with each other to produce knowledge that is discursive because they articulate their concerns and conditions that have the potential to change. The social order has maximal reflexivity because teachers, as agents with causal powers, decide on their future actions.

**Table 3.1 Three orders of natural reality and associated knowledge**

| | **Natural order** | **Practical order** | **Social order** |
|---|---|---|---|
| *Relationship* | Object/object | Object/subject | Subject/subject |
| *Knowledge type* | Embodied | Practical | Discursive |
| *Emergent from* | Coordination | Compliance | Commitment |
| *Reflexivity* | Minimal | Moderate | Maximal |

(Adapted from Archer, 2010)

As a development from critical realism, realist social theory is built on the premise that any observable event in social life is determined by interactions amongst structure, social

conditions prevalent at that time and individual interest, as well as motivation of persons or groups involved in the action. Further to this, Archer's (1995) view is that individuals are capable of free choice, which is in part influenced (enabled or constrained) by conditions that influence and shape an individual's or group's interactions in a social context. Archer (2000) distinguishes between two types of agency; i.e. primary agency and corporate agency. Karlsson (2020) contends that primary agency refers to individual agency that develops based on what an individual is interested in while corporate agency refers to collective or collaborative action of a group organized to attain its goals. Karlsson (2020) further argues that while an individual teacher is a primary agent who works within the structure and may lack the role and agency to shift things on her/his own, corporate agents work as a collective to change the structure. Social change is therefore an outcome of social interactions by individuals or groups in context. Archer (1995) proposed the morphogenetic framework in order to explain how the interactions of structure-agency and agency-culture influence the social change context. In this study, teaching is a social practice. Therefore, by using Archer's framework, I argue that what teachers choose to do or not to do in their practice is likely to be partly influenced by the structures that govern their teaching practice, namely, teaching strategies, assessment practices and the integration of values.

The following section discusses the morphogenetic approach as a tool that was used to trace changes in the social practices of teaching as a result of teachers being engaged in an ESD training course.

### 3.3.1 The morphogenetic approach

The term morphogenesis means change in form or shape (Porpora, 2013). Archer (1995) used the term morphogenesis in realist social theory to conceptualize a realist approach to the structure-agency concern. The morphogenetic approach identifies structure, culture and agency as components in explaining social change (Porpora, 2013). Any particular social change will need to be explained in terms of particular structure, culture and agents involved (Porpora, 2013). Social change cannot just be explained intrinsically in terms of the individuals involved, but the extrinsic factors such as structure (which refers to material resources, roles and positions of individuals) and the culture (which refers to

the social interactions of the individuals and groups in an institution) should be considered. Transformation of the content knowledge and teaching practices in classrooms can be understood by referring to organizational structural conditions, inherent cultural interactions and the individual motives.

Archer (1995) argues that society is stratified and that it consists of individuals and social institutions. This society must be understood and analysed as the interaction of structure and culture that is exercised by individuals over time. The temporal pre-existence of structure is seen as a condition for individual action, which either leads to reproduction or transformation of the society and its practices (Archer, 1995). Archer uses analytical dualism as a methodological approach, which emphasises recognizing the interplay between structure and agency as well as culture and agency without conflating them (Zeuner, 1999). Analytical dualism is used to distinguish between the structural system and sociocultural interaction which is maintained throughout the phases of the morphogenetic cycle (Archer, 1998). Archer (1995) further argues that structure is shaped by the processes and powers whose interplay elaborates it. Structure, culture and individual choice (agency) have powers that influence social interactions; and these are structural emergent powers, cultural emergent powers and people emergent powers.

Porpora (2013) describes structure as the "*rules that control human interaction*", whilst agency is described as "*people in any structural arrangement*". Porpora (2013) further argues that structure is understood as social relations among social positions, and the agency of people within such structural arrangements. Archer (2010) contends that agents have powers that guide their actions, and these powers are influenced by structure and culture. Agents' functions are either enabled or constrained by structures and cultures in which they find themselves (Mandikonza and Lotz-Sisitka, 2016). In this study, teacher agency refers to teachers' personal powers, action, and their capacity to engage within the social and cultural context of their practice. Structure refers to roles and positions of teachers in relation to curricula and policies (material resources); whilst culture refers to the institutional relationships (Department of Basic Education expectations, teaching responsibilities and their interaction). Teachers have agency, but they operate within a structure that can influence their cultural practices, which is significant in transforming

teaching practices for the implementation of ESD in the school where the teachers work. However, structure is more dominant in the system of education and therefore hinders the transformation of teaching practices.

The morphogenetic approach indicates that people always act out of structural circumstances, which either modify or sustain their actions (Porpora, 2013). Structural or cultural morphogenesis will take place at a given time, due to what the agency does at different circumstances (Porpora, 2013). Archer (1995) argues that the temporal pre-existence of structure is seen as a condition for individual action, which either leads to reproduction or transformation. Social structures are therefore situated in both time and space ($T^1$-$T^4$). This is presented in Figure 3.1 below, adapted from Archer.

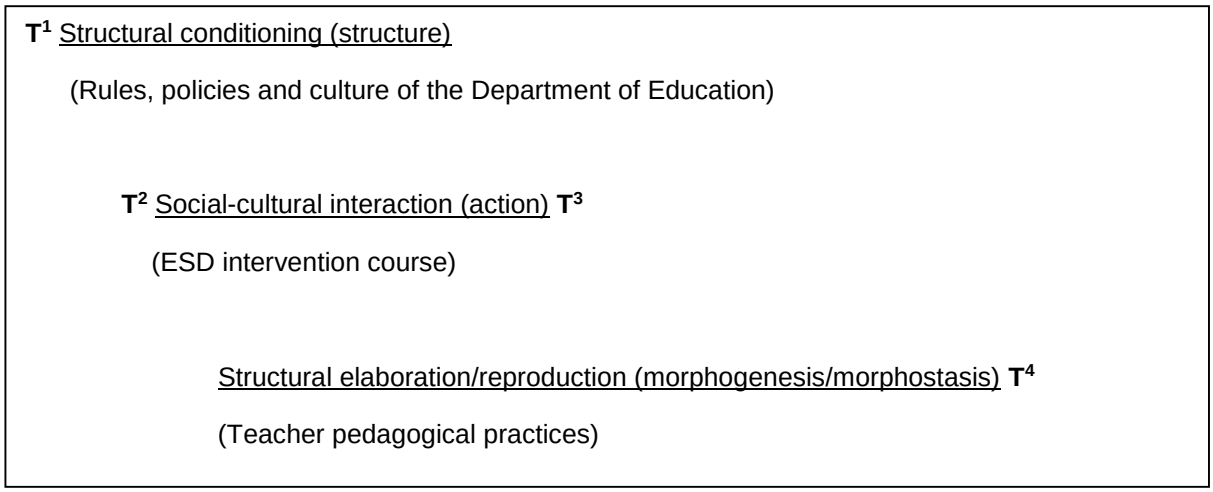


**Figure 3.1: The Morphogenetic cycle** (Adapted from Archer, 1995)[1]

The period **$T^1$** indicates structural conditioning. Structural conditioning refers to circumstances, either structural or cultural, that cause change. **$T^1$** in this case refers to the rules and policies of the Department of Education. The period **$T^2$** - **$T^3$** indicates socio-cultural interaction. Socio-cultural interaction refers to circumstances that alter or sustain

[1] Temporality is a necessity because social structures are earthed in space and situated in time. The morphogenetic cycle uses elements of time referred to as $T^1$-$T^4$. T1 specifies the start of a new cycle, $T^2$ designates interaction whilst $T^3$ shows structural elaboration or reproduction (Archer, 1995).

human actions. In the context of this study, socio-cultural interaction would be the *Fundisa for Change* intervention course. The period **$T^4$** will show morphogenesis or morphostasis which indicates results that are either altered or sustained circumstances as a result of the interaction at **$T^2$ - $T^3$**. In the context of the study, this would indicate whether teachers have implemented what was learned in the *Fundisa for Change* course in their teaching practices or not. This will signify that content knowledge and teaching practices are either transformed or sustained. If the participating teachers implement and change their practices, morphogenesis will have taken place, but if they do not change their practices, then morphostasis will be the result.

The interaction of structure and agency produce an outcome. Sayer (2000) asserts that the outcome of any event emerges from the interaction of factors, and its characteristics may not be reducible to any one of the causal factors. According to Archer (1995), the notion of emergence is defined as a situation in which two or more features give rise to a new phenomenon. This new phenomenon has properties that are irreducible to those of its constituents. The notion of emergence therefore influences how we understand the interaction of structure and agency to produce an outcome. Archer (2010) argues that emergence signifies stratification of social reality where strata possesses different emergent properties or powers.

Elder-Vass (2007) argues that social structures have emergent properties or powers of their own which cannot be reduced to emergent properties of the individuals. Elder-Vass (2007) furthermore argues that emergent properties are relational, which means that they are not contained in the elements themselves but could not exist apart from them. For the purposes of this study, the Department of Basic Education structure constitutes curriculum, policies and rules which has emergent powers which cannot be reduced to the emergent properties of teachers as agents. Teachers as agents interact with the structure of the Department of Basic Education to produce pedagogical practices without reducing any of their factors.

The application of the morphogenetic approach in this study will be explained in the next section.

### 3.3.2 The application of the morphogenetic approach to this study

The morphogenetic approach in this research is used in conjunction with transformative learning theory to explain changes in content knowledge and teaching practices for ESD after teachers attended an intervention course. The morphogenetic approach is guided by Archer's work (1995), where she indicated that individual actions and decisions are enabled or constrained by the conditions that shape the social context of their structure. Realist social theory of morphogenesis points out that change depends on the interaction between individuals and the structural conditions of their social context which influence practice.

The morphogenetic approach in this study has been utilised to understand the influence of the *Fundisa for Change* course in transforming the content knowledge and teaching practices for Geography teachers learning ESD. The intention of *Fundisa for Change* is to improve and strengthen environmental learning in schools (Fundisa for Change, 2013) (see Chapter 1). I have tried to understand teachers' implementation of ESD in teaching Geography in relation to the Department of Basic Education's rules and policies and the culture of their working institutions. In addition to establishing the effect of the course on teacher practice, this theory was also used to determine if the Department of Basic Education's rules, policies and expectations enable or constrain the implementation of ESD in classroom practice.

However, Archer's theory of morphogenesis is not without challenges. It's methodological individualism will be critiqued in the following section.

### 3.3.4 Critique of the realist social theory

Archer (2010) contends that emergence indicates a social condition where social reality emerges or is an outcome of the interaction between structure and agency. Elder-Vass (2007) maintains that any organisation is an emergent entity made up of a group of individuals, structured by relations between them. Elder-Vass (2007) further argues that Archer's theory is challenged by methodological individualism, where the behavior of the organisation or society is reduced to that of individuals. It is for this reason that King (1999) argues that Archer's notion of emergence cannot be used to understand society

because it is individualistic. Elder-Vass (2007) further argues that emergence is mistaken, because the emergent properties do not depend on relations between the parts but the interactions between the parts and the whole at a specific moment in time. It has to be noted that certain aspects of society are not reducible to individuals, even though aspects of society are rooted in individual practices. This challenge has been addressed in this study by using transformative learning theory, which is more concerned with the intrinsic transformation of individuals.

Despite this critique, the morphogenetic cycle is important in this study because it has allowed me to understand change in content knowledge and teaching practices based on the ESD intervention course attended by the participants in relation to their institutional structural conditions. I therefore contend that the interaction between structure and agency should be analysed in order to understand the transformation of content knowledge and pedagogical practices of secondary school Geography teachers.

### 3.4 Summary

This chapter discussed the theoretical framework used to understand teachers' views and actions in relation to learning ESD through an intervention course. A synthesis of Mezirow's transformative learning theory and Archer's realist social theory of morphogenesis has been examined to understand teachers' thinking and actions associated with ESD in terms of the content knowledge, teaching practices and value systems.

The goal of transformative learning is to transform frames of reference that have become habitual so that the individuals concerned can change their thinking and action (Mezirow, 1991; 1997). In this study, transformative learning constitutes a paradigm shift in the way that teachers think and act for ESD. The teacher learning process is a social action; therefore, Archer's realist social theory of morphogenesis was used to understand change of the content knowledge and teaching practices as a social practice. According to Archer (1995), any social change can be explained in terms of structure, culture and agency. Morphogenesis shows that people act out of structural and cultural circumstances which

either modify or sustain their actions. The realist social theory of morphogenesis has been utilised to show that teachers' agency is influenced by institutional structural conditions.

This theoretical framework guided the choice of research methodology discussed in the ensuing chapter.

# Chapter 4

# Research design and methodology

## 4.1 Introduction

In Chapter 3, the theoretical framework devised to understand the extent of transformative learning of teachers who attended the *Fundisa for Change* short intervention TPD course, was discussed. This chapter presents the implications of transformative learning theory and the realist social theory of morphogenesis for the qualitative interpretive research paradigm. Further, the research approach and method used to answer the research questions are discussed. The research method is explained in relation to the research participants. The chapter explains the sampling techniques used in selecting the participants and describes how the researcher gained access to the research sites. Data generation procedures are then explained sequentially, followed by a description of the data analysis process.

This chapter is arranged as follows:

- The implications of transformative learning and realist social theory for a qualitative interpretive research paradigm.
- The case study research method.
- Sample size and sampling techniques.
- Gaining access to the research sites and participants.
- Data generation methods.
- Data analysis.

## 4.2 The implications of transformative learning theory and realist social theory for the qualitative interpretive research paradigm

The study sought to understand and describe the influence of a short intervention programme on teacher professional development (TPD) in ESD. To investigate this influence, an interpretive qualitative research paradigm was used to guide the study. Merriam (2009) contends that interpretive qualitative research lies with the idea that meaning is socially constructed by individuals who are in interaction with their world.

Punch (2009) states that interpretivists concentrate on the meanings people bring to situations and behaviour, which they use to understand the world. Interpretivist knowledge "*is constructed not only by observable phenomena, but also by descriptions of people's intentions, beliefs, values, reasons, meaning making and self-understanding*" (Henning, van Rensburg & Smith, 2004, p.20). In other words, meanings are not simply imprinted on individuals but are formed through interaction with others and through historical and cultural norms that operate in individuals (Merriam, 2009). The choice of an interpretivist research paradigm for this study was motivated by the need to determine if and how teachers' frames of reference are expanded and transformed, which would hopefully transform their habits of mind (Mezirow, 1991) as individuals and in their relation to the structural conditions (Archer, 1995) of their work place.

An interpretivist research paradigm focusses on smaller numbers and in-depth analyses of human behavior and perceptions, acknowledging differences as well as similarities (Bassist, 2010) between participants in terms of their content knowledge and pedagogical practice. The interpretivist research paradigm interprets reality the way it is viewed by the participants (Scott and Morrison, 2006; Bassit, 2010). The study was conducted through document analysis, interviews and lesson observations at five different school sites with five participating teachers. The results of data that emerged were corroborated by interviewing three Department of Basic Education officials. According to Taylor and Cranton (2013) transformative learning typically falls into the interpretive research methodology. Transformative learning seeks to understand how people make meaning from their experiences (Taylor and Cranton, 2012). According to Maxwell (2012) realists maintain that the real world exists independently of our perceptions and constructions, but our knowledge of the real world is interpretive. Therefore, the interpretive paradigm serves to determine how teachers as adults learn and gradually change their perspectives on ESD. Evidence of change in perspectives was expected to be seen in a change in content knowledge, teaching and assessment practices, and the integration of values in lessons.

Qualitative research studies behavior as it occurs naturally (McMillan & Schumacher, 2010). This study examined participant teachers' knowledge and the implementation of

ESD in their classroom practices. This means that the situational context, which is important in understanding human behavior (McMillan & Schumacher, 2010), was considered. In this study, the interpretivist research paradigm contributed to depth in explaining participants' views of ESD and their classroom practices. The case study research method was applied in this study.

### 4.3 The case study research method

Gall, Gall and Borg (2007, p.447) define "*case study research as the in-depth study of one or more instances of a phenomenon in its real-life context that reflects the perspectives of the participants involved in the phenomenon*". Case studies provide answers to 'why' and 'how' questions (Rowley, 2002; Kyburz-Graber, 2004). This study sought to investigate teachers understanding of the subject knowledge and why and how participating teachers choose particular pedagogies in their classroom practices after attending the *Fundisa for Change* intervention course. Lotz-Sisitka and Raven (2004) argue that case study research is useful in ESD research because it has informed theory and practice in EE professional development. The reason the case study research method was chosen is because environmental issues vary from place to place and they are localised. However, the results of the study in terms of teacher professional developments in ESD are transferable to other related studies. What will differ is the context at which these environmental issues occur. Rosenberg and Yates (2007) are of the opinion that a case study is most usefully applied where the phenomenon of interest is complex and highly contextualized. Case study research is appropriate for this study because ESD practices tend to be complex and localized.

Case studies are rich in description, interpretation and narrative, which allow understanding of the phenomenon in question rather than measuring it (Lotz-Sisitka & Raven, 2004). Case studies allow in-depth description and interpretation of the phenomenon being studied. Whatever the research participants say or do has to be related to the contexts. Various authors argue that case study research lacks rigour (Yin, 2009; Barth & Thomas, 2012); therefore, in this research, multiple cases are embedded within the main case study. Figure 4.1 below shows the structure of the case, with the *Fundisa for Change* teacher development ESD programme as a vehicle for teacher

practice being the case study, and the teacher ESD practices from various school sites being cases embedded within the main case. Embedding five participating teachers within the main case study was seen to be adequate for the generation of robust data.

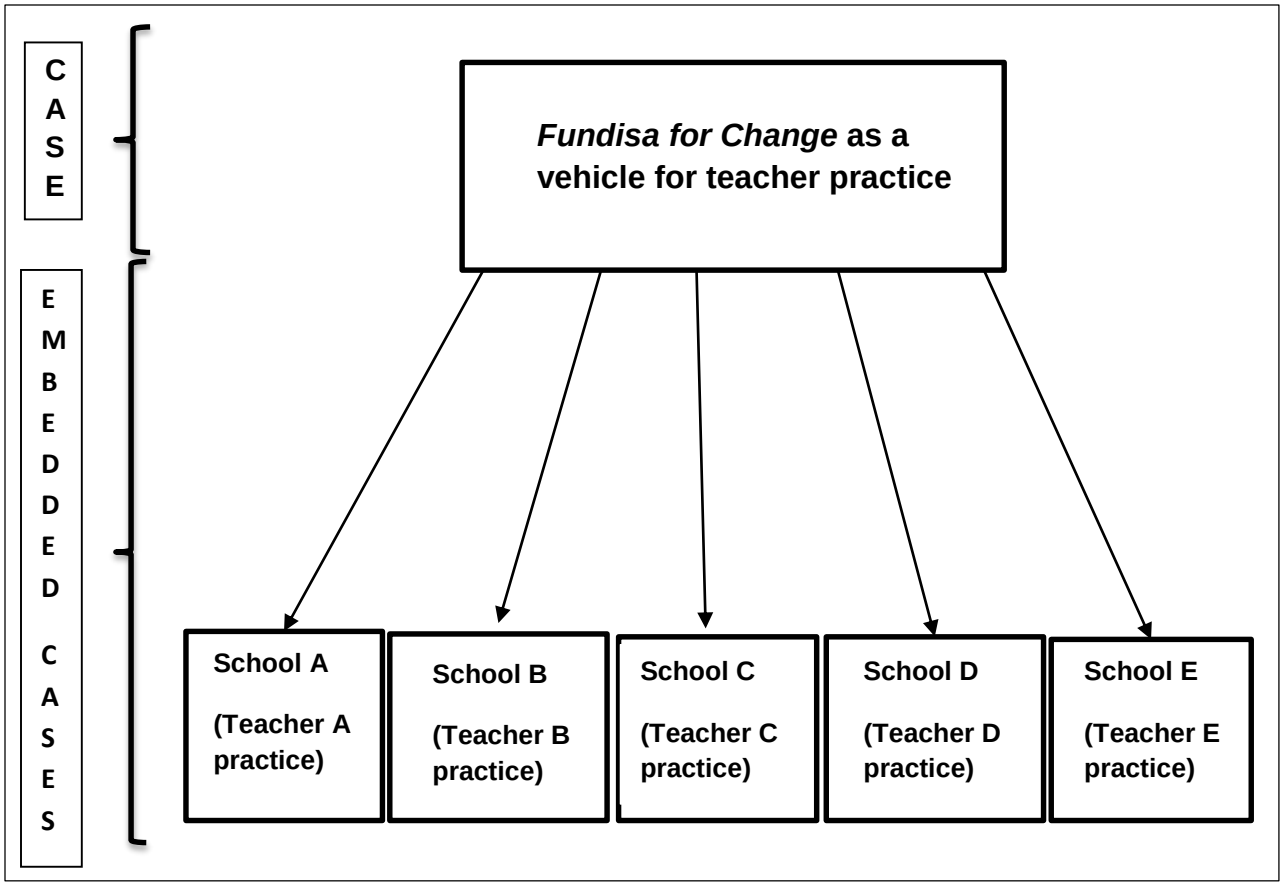


**Figure 4.1: Fundisa for Change as a vehicle for teacher practice case study and embedded cases**

According to Yin (2012), conducting a study in more than one site will qualify it as being a multiple-case study. For the purpose of this study, five sub-cases - namely, five teachers' ESD practices - are embedded within the main case to gain more insight on how teachers implement the knowledge and skills acquired through participation in the *Fundisa for Change* intervention course. According to Denscombe (2007), the findings from case studies can be applied to other comparable instances. The findings of this study might help in structuring and implementing *Fundisa for Change* TPD courses in the future so that they can yield better results on teacher ESD practice. The results of case studies

are transferable to other TPD programmes even though the context of the courses might differ.

To determine the influence of the *Fundisa for Change* TPD intervention course, purposive sampling was conducted in order to select participants.

### 4.4 Sample size and sampling techniques

Creswell (2013) argues that purposive sampling is used to intentionally select individuals and sites to learn or understand a particular phenomenon being studied. Bassit (2010) argues that purposive sampling is selective and does not seek to represent the wider population. Five teacher participants were purposively selected from the *Fundisa for Change* intervention course held at the Delta Environmental Centre (DEC) in Johannesburg, South Africa. The rationale for conducting purposive sampling was to work with teachers who took part in the *Fundisa for Change* intervention course.

Patton (2002) asserts that the sample size of case studies is determined by what the researcher wants to know, the purpose of the research, and what will be credible. The sample size in this study was influenced by the purpose of the research and the number of teachers who participated in the course. Patton (2002, p.245) further contends that

> … *the validity, meaningfulness, and insights generated from qualitative inquiry have more to do with the information richness of the cases selected and the observation/analytical capabilities of the researcher than the sample size*.

Five cases were studied in detail to determine how teacher participants are implementing the ESD knowledge and skills gained from the *Fundisa for Change* TPD short course programme in classroom practices.

A list of names of teachers who attended the *Fundisa for Change* short intervention course was accessed from the DEC in Johannesburg, South Africa and participants were selected from that list. The intention was to work with teachers who had been trained in the above-mentioned programme. Five of the teachers who were approached to participate in the study were from the same school, but only one was willing to participate. Working with teachers from different school sites has allowed me to gain a better understanding not only of how the participants are implementing what they have learned

from the course but also the factors specific to particular school contexts that either enable or constrain the implementation of ESD.

Permission was sought to interview several Department of Basic Education[2] officials, namely the district official and officials from the provincial and the national offices. The three officials from the Department of Basic Education were not part of the case study. However, they were included in order to triangulate perspectives emerging from the data. According to Bertram and Christiansen (2014), triangulation refers to collecting data from several different sources in order to increase the trustworthiness of the descriptions.

The next section discusses how access to the research sites and the participants was obtained.

### 4.5 Gaining access to the research sites and participants

To gain access to the research sites and participants, I sought permission from the DEC, Johannesburg, South Africa to conduct research on the intervention course held there. Once permission was granted, DEC gave access to the list of teachers who attended the course and the names of their schools. DEC also provided access to the material used for training teachers, moderated teachers' portfolios of evidence, and the moderator's report on portfolios of evidence compiled about teachers who participated in the course. The intention was to ascertain what was taught in the course based on the portfolios of evidence and the course evaluation forms.

An ethics clearance was obtained from the university's Human Research Ethics Committee to ensure that the study would be conducted in an ethical manner. I also applied for permission to conduct the study from the Gauteng Department of Education

[2] The Department of Basic Education in South Africa develops, maintains and support the education system. It is comprised of the district and the provincial offices. The district is responsible for quality of teaching and learning and it supports teachers through workshops, monitoring and evaluation. The district support schools and play a mediation role between schools and the provincial Department of Education (Nkambule & Amsterdam, 2018).

(GDE). The research proposal, which detailed the purpose of the study, was submitted, together with research instruments and letters to the school governing bodies and to the teachers (research participants). The GDE granted permission and provided an approval letter granting access to the research sites and the participants concerned.

I wrote a letter to the principals of schools requesting them to grant me permission to work with teachers in their school sites. The principals of schools approached accepted. A letter was also written to the teachers (research participants) inviting them to participate in the study. The letters were written in order to involve participants voluntarily in the research process. Participants were asked to sign the consent form attached to the letter as proof of voluntarily agreeing to take part in the study. All five teacher participants signed the consent forms as proof of consent.

Research participants were made aware that they would remain anonymous - that is, their names, personal information and the schools where they work would not be revealed in the research report or any other publication emanating from the study. Pseudonyms are used here to protect the identity of the participants in this study (Bassit, 2010). The participants are referred to as Teacher A, B, C, D and E respectively, in relation to the school sites A, B, C, D and E respectively. Schools A, B, C and D are public township schools, whilst school E is a public Afrikaans-medium school in a suburban area. Care was taken to respect the dignity of the participants during the research process (Bassit, 2010). I maintained a respectful relationship with the participants throughout the data collection period, which allowed ease of access to their knowledge, lessons and teaching documents.

The next section will outline how the data were generated.

### 4.6 Data generation methods

For the purposes of this study, multiple forms of data (Fouche and Delport, 2014) were generated. Data were generated through analysing the *Teaching Climate Change* manual used in the *Fundisa for Change* teacher professional development course; conducting one-on-one semi-structured interviews with participating teachers; analyzing transcripts of lesson observations, lesson plans and assessment documents; and by conducting one-

on-one semi-structured interviews with Department of Basic Education officials. This was done to ensure triangulation (Creswell, 2012), which is a way of assuring the trustworthiness of research.

The steps followed in generating data are briefly described in the sections that follow.

### 4.6.1 Document analysis – *Teaching Climate Change* manual

The *Teaching Climate Change* manual was analysed in conjunction with the CAPS in order to understand the intentions of the *Fundisa for Change* intervention course. This helped in formulating interview questions and designing the lesson observation schedule.

The next step was conducting one-on-one semi-structured interviews with teachers who participated in the study.

### 4.6.2 One-on-one semi-structured interviews with teachers

One-on-one semi-structured interviews were conducted at five different school sites. Semi-structured interviews were selected because they are relatively informal, having the appearance of discussion or conversation, and based on the assumption that data is generated through interaction with the interviewees (Mason, 1996). Semi-structured interviews allow for probing and follow up questions (Kvale & Brinkmann, 2009). The interview questions were formulated to determine the knowledge gained by the participants during the *Fundisa for Change* intervention course, their perceptions of the intervention course, the implementation of the teaching methods and assessment practices taught in the course (See Appendix 2: Interview guide). The interviews with the participants were conducted to establish their classroom practices before the course, what they had gained from the intervention course and what they were implementing in their classroom practice after the course.

The step that followed one-on-one semi-structured interviews with participating teachers was non-participant lesson observations.

### 4.6.3 Non-participant lesson observation

Observation is a process of gathering open-ended, first-hand information by observing people and places at a research site, rather than depending on what participants' say they do (Creswell, 2012; Scott & Morrison, 2006). Non-participant observation entails the researcher recording what was taking place in the lesson, in this case by taking notes (Creswell, 2012). Lesson observations were conducted with participating teachers during the school day to establish if they implemented what they had learned in the course in their classroom practices. Menter, Elliot, Hulme, Levin and Lowden (2012) argue that observations can be useful in discovering whether people do what they say they do or behave in the way they claim to behave. Key aspects observed are the subject content knowledge, presentation of the lesson and teaching approaches, assessment, the integration of values and the context of the examples used during the lessons (see Appendix 3, Lesson Observation Schedule) in relation to the *Fundisa for Change* course.

Three lessons were observed per teacher participant in order to gain in-depth information of their classroom practices. According to Creswell (2012) multiple observations are conducted in order to obtain the best understanding of the practices in the site and about individuals. Lesson observations were not audio-recorded to avoid recording learners during discussions in class, because learners were not part of the unit of analysis in this study. I sat at the back of each class and compiled sets of notes as the lessons progressed at different sites. The participants asked me to make comments at the end of each lesson, which I did by discussing strengths and weaknesses with them.

Lesson observations were followed by analysis of the lesson plans and assessment documents.

### 4.6.4 Document analysis – lesson plans and assessment documents

Document analysis refers to studying existing documents in order to understand their content or establish deeper meaning by looking at their coverage (Strydom & Delport, 2014). According to Bowen (2009), document analysis requires data to be scrutinised and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge. In this case, lesson plans and assessment documents were analysed and

interpreted to make meaning. Bowen (2009) further argues that documents contain words and images that have been recorded without a researcher's intervention. Documents analysis is often used in combination with other qualitative research methods as a means of triangulation (Bassit, 2010; Bowen, 2009).

With regards to this study, documents that were scrutinized are lesson plans, tests and assessment tasks. Document analysis was compared with the participating teachers' interviews and notes gathered from lesson observations. I analyzed the documents with the intention of drawing out interpretations of content knowledge, teaching and assessment practices in relation to the *Fundisa for Change* teacher professional development intervention course (see Appendix 5, Lesson plan example; Appendix 6, Assessment plans; and Appendix 7, Summative assessment example). The document analysis generated rich descriptions of how teachers teach and whether there was any evidence of transformative thinking for environmental and sustainability knowledge. Findings of the analysis of the data sets are discussed in more detail in Chapter 6.

In the next section, the one-on-one interviews conducted with Department of Education officials are explained.

### 4.6.5 Interviews with the Department of Basic Education officials

The one-on-one interviews with the Department of Basic Education officials were seen to be necessary to deepen insight and to help in explaining the constraints and enablers for the implementation of ESD. Three officials at the Department of Basic Education were interviewed: namely, the official from the district and higher education officials from the provincial office and the national office (see Appendix 4, Interview guide for the district official and the interview guide for the provincial and national officials).

The official from the district was asked how teachers were chosen to attend the course, the intended benefits of the *Fundisa for Change* course, the importance of generic lesson plans and common assessment tasks in ESD, her opinion on the choice of resources and if she thought meaningful teaching and learning is taking place in schools. The officials from the provincial and national Department of Basic Education were also asked questions on the position of the Department of Basic Education on generic lesson plans

for ESD, common assessment tasks for ESD, the use and availability of resources for ESD to teach the subject effectively, and whether meaningful learning was taking place or not.

Data generation methods described show the sequence followed in collecting data for this study. The processes followed in analysing data will be outlined in the next section.

### 4.7 Data analysis

Data were analysed using inductive and deductive reasoning, utilising thematic content analysis as the key approach. Inductive analysis means the themes for the analytical process were generated from the data in order to make generalisations or hypothesis, whilst deductive analysis means drawing conclusions from previously known facts (Javadi & Zarea, 2016). In other words, with inductive analysis one works from the general to the particular, whilst one works from the particular to general in deductive analysis. Thematic content analysis is a method of identifying patterns or themes of meaning across the datasets in relation to the research questions (Ngulube, 2015). Codes are generated from data and later categorised into themes. In this study, codes and themes were identified both inductively and deductively (Boyatzis, 1998; Elos & Kyngas, 2007).

Data analysis in this study was based on the following analytical framework which emerged out of the data and the research questions, as reflected in Figure 4.2. The framework shows inductive and deductive analysis. The inductive analysis has themes that are generated from the raw data. The following themes were generated from the raw data:

- The intentions of the course.
- Teachers claims about the ESD course.
- Teachers' practices in relation to what they learned in the course.
- The claims by the officials of the Department of Basic Education about teachers' practices in relation to the curriculum.
- The constraints and enablers in implementing ESD in the classroom.

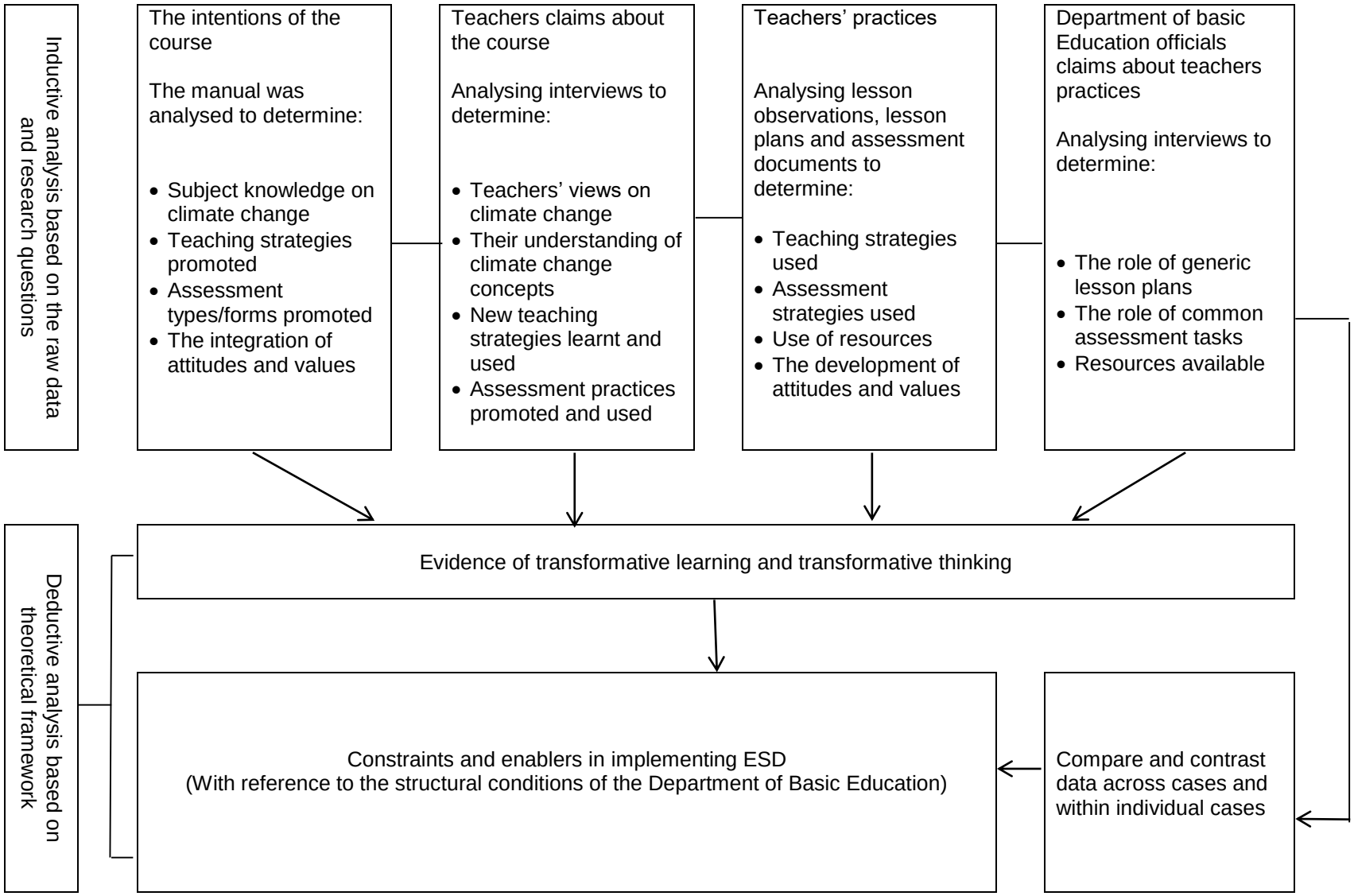


**Figure 4.2 Data analytical framework**

Figure 4.2 illustrates that data was analysed inductively and how conclusions were arrived at deductively. Inductive analysis involved analysing the *Teaching Climate Change* manual for the intentions of the course, interviews with the participating teachers and Department of Basic Education officials, and lesson observations to see how the participating teachers taught and assessed learners. Analysis of the *Teaching Climate Change* manual determined the subject content knowledge on climate change, teaching methods, assessment practices and values taught in the course. One-on-one semi-structured interviews with the participating teachers were analysed to see participating teachers' views on climate change, their conception of ESD, and teaching and assessment strategies they employ in their classes. Evidence of what the teachers did was revealed through lesson observations, lesson plans and assessment documents in relation to the intervention course. Analysis of the one-on-one interviews with the Department of Basic Education officials were used to establish the role of generic lesson plans and common assessments in teaching for and about ESD.

**Table 4.1: Themes elicited inductively from the research questions and evidence of transformation**

| **Themes** | **Evidence of transformative learning and thinking** |
|---|---|
| Teachers' conceptions of environment and sustainability | • Improved/ increased knowledge<br>• The ability to recognize and identify environment and sustainability knowledge from the curriculum |
| Teaching practices | • Implementing learner-centred teaching methods during the course in classroom practices |
| Assessment practices | • Using various assessment methods as seen in assessment plans<br>• Asking questions at different levels (low, middle and higher order questions)<br>• Applying environmental concepts in assessment tasks |
| The use of resources | • Using various resources that have ESD content and also the resources suggested in the course. |
| The integration of local and community values | • Integrating local and community values in teaching and learning pertaining to sustainability |
| Constraints and enablers in implementing ESD | • Applying ESD concepts in classroom discourse<br>• Implementation of learned practices from the intervention course |

Gale, Heath, Cameron, Rashid and Redwood (2013) argue that comparing and contrasting data is important in qualitative analysis. Figure 4.2 exhibits how data analysed in terms of the themes were compared and contrasted across the cases and within individual cases. Table 4.1 above shows the themes elicited inductively from the research questions, and the anticipated results which would show evidence of transformative thinking and action. The data analytical framework in Figure 4.2 and Table 4.1 were designed to determine whether the course has achieved its objective of transforming participating teachers' content knowledge and pedagogical practices. The application of Archer's morphogenesis, as part of realist social theory, was used to infer the constraints and enablers in implementing ESD. This was done by referring to the role of structural conditions of the Department of Basic Education in teachers' classroom practices.

Themes can be distinguished into two levels; that is, semantic and latent levels (Javadi & Zarea, 2016; Maguire & Delahunt, 2017). Maguire & Delahunt (2017) state that semantic themes are those that give surface meaning without looking at anything beyond what the participant has said or written. Furthermore, Maguire & Delahunt (2017) argue that latent themes go beyond what has been said as they involve identifying and examining the underlying ideas and assumptions that shape the semantic content of the data. The goal in this study is to identify latent themes, to understand the meaning made by the participants based on connotations from the theoretical framework.

The next section outlines how credibility and confirmability of the findings were achieved.

### 4.8 Credibility and confirmability

This section discusses how the credibility and confirmability of the research findings were established in this study.

#### 4.8.1 Credibility

Credibility refers to the confidence placed in the accurate description or interpretation of the research findings (Anney, 2014). Multiple data sources were used, namely document analysis, one-on-one semi-structured interviews and lesson observations, in order to confirm the emerging findings to ensure credibility (Merriam, 2009). Using multiple data

sources helped to reduce bias and provided a tool to cross examine the integrity of participants' responses through comparison (Anney, 2014). These helped in tracing whether findings from one data source concurred with findings from another data source.

To ensure that participants' ideas were represented accurately, member checking was conducted. Member checking involves taking data and tentative interpretations back to the participants from whom they were derived and asking if the interpretations made are reasonable (Merriam, 2009). Member checking was conducted after transcribing interviews, where participants were asked to check the interpretations made from the data gathered (Shenton, 2004). Anney (2014) argues that member checking eliminates researcher bias when analyzing and interpreting the results. After conducting interviews, transcription of those interviews followed immediately, to ensure that teacher participants could check the interpretations made.

### 4.8.2 Confirmability

Confirmability refers to the degree to which the results of an inquiry could be confirmed or corroborated by other researchers and is concerned with establishing that data and interpretations of the findings are real and not in the researchers' imagination (Anney, 2014). According to Anney (2014), confirmability can be achieved through an audit trail, keeping a reflexive journal, and triangulating research methods. I have kept a journal where I record my encounters with the participants as I collect the data. The journal shows the date and time of interviews and lesson observations. Data were gathered using different methods in order to strengthen the findings. Data sets were also compared and contrasted to arrive at findings.

## 4.9 Summary

This chapter has presented the research design and methodology deployed in the study. An interpretive research paradigm was discussed, linked to the case study research method used. *Fundisa for Change* as a vehicle of teacher practice was discussed as the main case of the study with five cases embedded in it. Sampling techniques and how the researcher gained access to the research sites were explained. Data generation methods were discussed sequentially and in detail. The data generation methods that were

implemented are analysis of the *Teaching Climate Change* manual, one-on-one interviews with the participating teachers, lesson observations, analysis of lesson plans and assessment documents, and one-on-one interviews with Department of Basic Education officials. Thematic content analysis was used to analyse the data, where themes were developed inductively and deductively. Themes were drawn inductively from the raw data and deductively from the research questions and the theoretical framework used as a lens in the study. Finally, the chapter discussed how credibility and confirmability of the results were ensured.

The ensuing chapter presents the data and analysis with a view to identifying transformative learning and transformative thinking that might have resulted from the *Fundisa for Change* TPD intervention course.

# Chapter 5

# Data presentation, analysis and interpretation

## 5.1 Introduction

The previous chapter discussed the research design and methodology used to establish the extent to which the practice of Geography teachers indicated the implementation of ESD after they had attended *Fundisa for Change* professional development course. This chapter will present and analyse data in pursuit of finding answers to the research questions. Data were analysed to determine the extent to which participating teachers have transformed their content knowledge and practices in relation to structure and agency. The teachers' conception of environment and sustainability content knowledge, teaching practices, assessment practices, the use of resources and the integration of values in teaching are themes that were elicited inductively from the raw data and the research questions. These themes were further examined deductively using elements of transformative learning theory (Mezirow, 1991; 2000; 2003) and Archer's (1995; 1998) realist social theory of morphogenesis to draw conclusions.

This chapter is organised according to the themes drawn inductively from the data analytical framework derived from the raw data, as follows:

- What were the intentions of the ESD course?
- What did the teachers say about the ESD course?
- What did the teachers do about what they have learnt in the course?
- What did the officials of the Department of Basic Education say about teachers' practices in the curriculum?
- What were the constraints and enablers in implementing ESD in the classroom?

## 5.2 What were the intentions of the ESD course?

This section discusses the intention of the *Fundisa* for *Change* teacher development course as presented in the *Teaching Climate Change* manual (Vogel *et al*, 2013) that was used in training teachers on ESD. The *Fundisa for Change* climate change units integrated four forms of knowledge, which are presented in the manual (Vogel *et al*, 2013).

The four forms of knowledge referred to are meta-cognition (thinking about thinking), meta-knowledge (knowledge about nature and limitations of knowledge), meta-learning (learning how to learn), and meta-dialogue (dialogue about how we engage in dialogue). Vogel *et al* (2013) maintain that teachers need to develop the four forms of knowledge to be able to develop citizens who can address complex problems facing modern society. The four forms are important for both teachers and learners in understanding climate change and transformation of thinking and behavior.

The next section will discuss the relationship between climate change units and CAPS, teaching strategies, assessment strategies and values taught in the *Fundisa for Change* teacher development course.

### 5.2.1 The relationship between climate change units and CAPS

The course covered the Geography curricula for Grade 10 to 12 as reflected in the CAPS document with reference to climate change units, and these are presented in Table 5.1 below. The three climate change units developed to broaden teachers' knowledge and expertise on the environment and sustainability are as follows:

*(i) Energy exchange;*

*(ii) Resource use and change; and*

*(iii) Responses to energy exchanges and climate change.*

Table 5.1 below shows that climate change units can be used to teach all topics in the Grade 10 to 12 curricula except mapwork skills. The energy exchange unit and the energy resource use and change unit can be used to teach Climatology and Geomorphology in Grade 10, whilst the responses to energy exchanges and climate change units can be used to teach Population Geography and Water Resources. Climate change units in the Grade 11 curriculum cover all the topics: Climatology is covered in the energy exchange unit, as well as the energy resource use and change unit, Development Geography and Resource Use and Sustainability are covered in the energy resource use and change unit. Even though the manual did not specify Geomorphology in Grade 11, it can be covered with the energy resource use and change unit. The climate change units show

that Grade 12 Climatology and Geomorphology can be taught using the energy exchange units. Settlement Geography can be taught by referring to responses to energy exchanges and climate change. Economic geography was not matched to any climate change unit. However, economic activities can be related to the responses to energy exchanges and climate change.

**Table 5.1: Climate change units and their relationship to CAPS topics**

| **Climate change units** | **Topics in the CAPS document** |
|---|---|
| Energy exchange | **Grade 10** – How is energy supplied and added to the system, how energy is transformed through various processes (e.g. moisture in the atmosphere)<br><br>**Grade 11 & 12** – How energy is transferred across the system (e.g. Earth's energy and the global air circulation )<br><br>**Grade 12** – energy transfer (e.g. pressure belts, cold and warm fronts, high and low pressures). |
| Energy resource use and change | **Grade 10** – The role of people in climate systems (Term 2)<br><br>**Grade 11** – Drought and floods - how people respond to changes in energy flows (Term 1), Resources and sustainability (Term 4), why some people use more of the global energy bundle and the impacts (Term 3) |
| Responses to energy exchanges and climate change | **Grade 10** – Geomorphology: change through time (Term 3),<br><br>**Grade 10 & 11** – How do people respond to climate change (Grade 10 Term 4 & Grade 11 Term 1)<br><br>**Grade 10** – how humans interact with climate change. Responses and interventions; population and movements; settlements; governance; and climate policy |

The *Teaching Climate Change* manual also provided references to additional information that influences teachers' and learners' knowledge. Table 5.2 below lists some of the references provided in the *Teaching Climate Change* manual.

**Table 5.2: References that enhance teachers' knowledge on climate change**

- Definition of climate change and water quantity and quality (International Panel on Climate Change)
- Teaching climate change: Energy exchange
- Vulnerability
- Resilience
- Natural resource management
- Resource use and sustainability linked to development
- Food security
- The tragedy of the commons
- International response to climate – struggles between North and South (Oxfam & Greenpeace)
- Debates on climate change and collective solutions (focus on Durban)
- The role of civil society on climate change debates
- Regional and national response to climate change – Kyoto protocol
- Local and personal response to climate: Climate change heroes and heroines stories

Teachers who participated in the course were also exposed to different materials, as shown in Table 5.2 above. The resources included in the *Teaching Climate Change* manual were suggested to enhance participating teachers' understanding of the relationship between climate change and topics in the Geography CAPS curricula for Grade 10 to 12. The resources suggested can be utilized together with the resources in the CAPS to enhance teachers' and learners' knowledge. The references or resources suggested in the *Teaching Climate Change* manual have the potential to transform teachers' frames of reference in terms of enhancing their ESD knowledge.

Teaching the participating teachers about climate change and how to relate it to the CAPS could sharpen teachers' knowledge and skills. The *Teaching Climate Change* manual suggested additional resources to use in teaching environment and sustainability content knowledge. Mezirow (1991) refers to learning that enhances and develops knowledge as instrumental learning.

The next section will discuss teaching strategies that were taught in the course.

### 5.2.2. Teaching strategies

The *Fundisa* for Change intervention course presented different teaching strategies that could be utilized to teach climate change in Geography. Teachers were referred to the *Methods and Processes* (Rosenberg, O'Dohoghue & Olvitt, 2008) resource material that was included in the *Fundisa for Change* intervention course package. Teachers were shown how to integrate different teaching strategies in relation to the knowledge and skills they aimed to develop in a particular lesson. Table 5.3 below shows a list of teaching strategies and related skills.

**Table 5.3: Teaching strategies related skills**

| **Approaches to teaching** | **Teaching strategies** | **Skills development** |
|---|---|---|
| Experiential learning | Experiential learning | Learners experience the world through senses or emotions |
| | Investigative methods | Help learners to collect information from different sources |
| | Information transfer | Can take a form of class notes, lecture, brochure, poster, field trip or experiment. Mostly combined with other methods |
| | Deliberative methods | Provide different viewpoints, scenarios or possible futures for learners to think, predict or debate about. |
| Active meaning making | Scenario (using case studies) | Involves making predictions |
| | Learning by doing | Project work on vulnerabilities and practical activities that can make communities resilient |
| | Fieldwork and collaborative research | For research purposes |
| | Role play and debate | Helps learners explore and put themselves in the shoes of other people and then report findings |
| Integration of methods | Combining investigative, deliberative and learning by doing | Learners collect information from different sources, provide different viewpoints, scenarios or possible futures for learners to think, predict or debate about and do practical activities or projects |
| | Critical deliberation | Helps in negotiations |
| | Values clarification | Involves dialogue where learners are encouraged to challenge their views and values |

Table 5.3 reveals experiential learning, active meaning making and integration teaching strategies as approaches that may be used in teaching environment and sustainability. Teachers should know how to apply such strategies, where learners are expected to learn from experience, to collect information, predict and debate, do practical work, explore, negotiate and challenge viewpoints. The teacher should be able to facilitate and encourage learners to interact with each other and their environment. This kind of learning is what Mezirow (1991) referred to as communicative learning.

The *Teaching Climate Change* manual classified learning into surface and deep learning. Surface or shallow learning is associated with factual recall, whilst deep learning is associated with the development of higher order thinking skills (Entwistle, 2001; Vogel *et al*, 2013). Table 5.3 also shows that experiential learning, active learning and the integration of teaching methods are approaches that encourages learners to participate in the learning process. Learners do not just listen to the teacher teaching, but they are afforded a chance to come up with their viewpoints. These teaching approaches engage learners in meaning making which may deepen learners understanding and help in developing higher order learning skills.

The next section will outline the assessment practices that were taught in the *Fundisa* for Change intervention course.

### 5.2.3 Assessment practices

The teachers who participated in the *Fundisa for Change* intervention course were taught assessment practices that could influence assessment in their classroom practices. The participants were introduced to central knowledge questions in Geography. The questions taught ranged from understanding the concept, causes, changes, effects, benefits and costs, and actions to solve environmental and sustainability problems. Table 5.4 below show the central geographic questions that are presented in the *Teaching Climate Change* manual and examples.

An analysis of the *Teaching Climate Change* manual reveals that the intention of the course was to shift teachers from factual recall thinking to deeper levels of thinking about climate change (Vogel *et al*, 2013; Houghton, 2004). A shift in teachers' thinking could

result in a shift in their classroom practices. Mezirow (1991) argued for a paradigm shift of learning that allows individuals to shift their thinking. The central questions presented in table 5.4 below, as presented in the *Teaching Climate Change* manual, are evidence of this attempt to shift teachers' thinking through learning.

**Table 5.4: Central questions for Geography and examples**

| **Central questions** | **Examples** |
|---|---|
| What is happening? | What is climate change? |
| Why is it happening? | Why is climate change happening? |
| How is it changing? | How is climate changing? |
| What are the effects of change? | What are the effects of such climate change? |
| What are the benefits and costs of change? | What are some of the benefits and costs of climate change (not all of climate change is and will be bad!) |
| What decisions must be made? | What decisions must be made nationally, regionally, locally and personally? |
| What is my position? | What is your perspective or viewpoint? |
| What actions can I take? | What can be done to solve problems or what actions can be taken to solve the problems? |

The integration of attitudes and values presented in the *Teaching Climate Change* manual is discussed in the next section.

### 5.2.4 The integration of attitudes and values

The *Teaching Climate Change* manual supports the development of attitudes and values in learners as described in the CAPS. The Geography curriculum aims to foster the following attitudes and values in learners:

- *A concern for the sustainable and fair use of resources for the benefit of all;*
- *Recognising the significance of informed decision making;*
- *The application of geographical knowledge and skills in learners' personal lives;*
- *Respect for the rights of all people; and*

- *A sense of fairness, sustainability and equality* (Department of Basic Education, 2011, p.9).

Learners are encouraged to engage and share ideas with the local community in order to develop a sense of stewardship, citizenship and agency. The teachers and learners are empowered to become active agents of change in the climate change discourse. The *Teaching Climate Change* manual (Vogel *et al,* 2013) shows that teaching methods such as critical deliberation and values clarification may be used to foster attitudes and values. Rosenberg *et al* (2008) argue that critical deliberation is a teaching method that enables learners to express their views and values so that they can come to a newly improved understanding, whilst values clarification enables learners to challenge the values they hold in relation to their actions. Rosenberg *et al* (2008) further argue that critical deliberation includes story methods, case studies, media analysis, scenario planning, problem solving and presentations. The values-clarification approach to teaching can occur through dialogic methods, guided questioning, scenario planning, case studies and role play (Rosenberg *et al*, 2008; Vogel *et al*, 2013). Vogel *et al* (2013) agree with Rosenberg *et al* (2008) on values clarification as a teaching strategy that creates a situation in which learners are challenged about the values they hold, and how such values are related to their actions and choices. Vogel *et al* (2013) further argue that values clarification as a teaching strategy intends to develop environmental values that learners can carry into their lives and futures in order to make pro-environmental choices.

Vogel *et al* (2013) argue that giving learners a chance to explore values held by other communities can create chances for transformative learning. The exploration of values can be referred to as content reflection. According to Mezirow (1991), content reflection allows us to look at what happened or what leads to a particular interaction or outcome of practice. When individuals question their prior understanding and challenge themselves, they might make new meaning of their experiences. Vogel *et al* (2013, p.64) further argue that transformative learning includes:

- *Experiencing an enhanced level of awareness of the context of one's beliefs and feelings;*

- *Critiquing one's own assumptions and particular premises;*
- *Performing assessment of alternative perspectives;*
- *Taking actions based on a new perspective; and*
- *Cultivating a desire to fit the new perspective into broader context of one's life.*

The *Teaching Climate Change* manual shows that approaches that assess deeper learning support change and transformation of ideas, values, beliefs and lives. The *Teaching Climate Change* manual also shows that learners must be able to respond to climate change at international, regional and national levels, and at personal level. A number of case studies can be used to explore climate change at international, regional and national levels, where learners can be expected to suggest possible solutions and actions that can be taken to adapt and cope with the climate change problems. At a personal level, climate change can give learners a chance to evaluate their own actions and feelings on daily activities and the use of resources and even make recommendations for future actions on environment and sustainability issues. At all these levels, teachers should assist learners in identifying contestations on how to manage and interpret climate change challenges. *Teaching Climate Change* emphasized the integration of values to develop learners' attitudes. The question remains whether the course dealt with the values of the teachers such that their perspectives might be transformed.

In the next section, evidence of the teachers' take-up of ESD regarding what they have learned will be presented through the analysis of the one-on-one interviews.

### 5.3 What did the teachers say about the ESD course?

The data analytical framework represented in Figure 4.2 in Chapter 4 indicates that the analysis of one-on-one semi-structured interviews revealed the following themes that address what teachers said about the *Fundisa* for Change intervention course; namely, teachers' views on climate change, their understanding of ESD content knowledge, and teaching and assessment practices. The participating teachers reflected on the content in order to respond to the interview questions asked. Mezirow (1991) contends that reflection on what we perceive, think, feel or act upon is content reflection. The above-mentioned themes are presented in the ensuing sub-sections.

### 5.3.1 Teachers' views on climate change

The *Teaching Climate Change* manual shows that there is a need for learners to understand geographical knowledge and skills necessary to discern meteorological processes and climate change in order to respond effectively to the changes. This means that, Geography teachers should not only know meteorological processes, but also understand climate change in order to be effective in their practice.

**Table 5.5: Participating teachers' views on climate change**

| **Interview question: "*What were your beliefs/views on climate change before and after the course?"*** | | |
|---|---|---|
| Participants | Before the course | After the course |
| Teacher A | ***"****I believed it was a myth and that it happens after a long time"* | *"I now believe that it is caused by human actions and people should know how to reduce or eliminate its impacts"* |
| Teacher B | ***"****I believe that climate change happens after a long time and it is caused by human actions such as pollution"* | *"It's still the same"* |
| Teacher C | ***"****I always loved the environment".* | *"My belief has been strengthened. The course has opened my eyes"* |
| Teacher D | ***"****I knew about it and believed it especially global warming".* | *"I now know more about its causes and impacts"* |
| Teacher E | ***"****I believed it and I know that some people think it's a myth".* | *"My belief is still the same, but one can always learn more"* |

The participating teachers were asked to explain their views on climate change before and after the course. Table 5.5 above presents the interview question asked and the participating teachers' responses on their climate change views before and after the course. An analysis of participating teachers' responses shows that Teacher A's views on climate change were transformed by the *Fundisa for Change* intervention course. It is evident that the course strengthened Teacher C's and Teacher D's views on climate change. However, Teacher B and Teacher E said they knew about climate change and their beliefs on climate change remained the same. The participating teachers' declarative statements shows that there is some sense that they can relate more to the causes and

impact of climate change after the course. A change in teachers' belief is evident from these declarative statements.

The next section presents participating teachers' conceptions of environment and sustainability content knowledge.

### 5.3.2 The conception of the environment and sustainability knowledge

The intention of the *Fundisa for Change* intervention course was that teacher participants were to reflect on the content to determine the level of their environment and sustainability content knowledge. The participating teachers were asked to identify sections in the curricula that address environment and sustainability content knowledge and whether they saw that as new knowledge or not.

Table 5.6 below presents the interview question asked about the identification of the environment-and-sustainability content knowledge in the curriculum and the participants' responses about the sections where they identified environment and sustainability content knowledge in relation to the Grade 10 to 12 curricula.

**Table 5.6: Participants' responses on the identification of environment and sustainability content knowledge in Grade 10 to 12 Geography curricula**

| **Interview question: "*Can you identify sections in the curriculum with environment and sustainability content knowledge?*"** | |
|---|---|
| Teacher A | *"Environment and sustainability content knowledge is found in all the Geography topics."* |
| Teacher B | *"It is found in all the Geography topics."* |
| Teacher C | *"Environment and sustainability content knowledge is found in all the Geography topics. In Grade 11 it is mainly found in Climatology, development and sustainability, and energy and resources."* |
| Teacher D | *"Environment and sustainability content is clear in topics such as climate, the role of the oceans. There are small aspects that deal with environment and sustainability content in economic geography, where we focus on improving the economy and trade relationships."* |
| Teacher E | *"It is easy to identify environment and sustainability content. Development geography & Energy and resources in Term 3 and 4 of the Grade 11 curricula address environment and sustainability content."* |

All the participants could identify sections in the curricula that address environment and sustainability content knowledge for the grades for which they were responsible. Teachers A and B did not say much about environment and sustainability content knowledge, which makes one assume that they were not very sure of what they were saying. Teachers C, D and E identified the environment and sustainability sections in the curriculum and also gave examples. Teacher C was teaching Grade 11 at the time of data collection and she could link the topics in the curriculum with climate change units easily as presented in Table 5.1 above. Teacher D said there is little opportunity to address environment and sustainability knowledge in the Grade 12 Economic Geography section, because it focuses on improving economy and trade relations. I assume Teacher D responded the way she did because Economic Geography is not linked to climate change units in the *Teaching Climate Change* manual. However, it could be argued that the improvement of economy and trade relies on the availability of resources, which mean that it is linked to environment and sustainability education. Therefore, one cannot avoid environment and sustainability in teaching this section.

Table 5.7 below presents the interview question on whether participating teachers saw environment and sustainability as new knowledge before and after the *Fundisa for Change* intervention course.

**Table 5.7: Participants' responses on environment and sustainability as new knowledge before and after intervention course**

| **Interview Question: "*Did you see environment and sustainability knowledge as 'new knowledge' before and after the course?"*** | |
|---|---|
| Teacher A | *"No, even though environment and sustainability content was covered during my teacher-training years. It is an eye-opener".* |
| Teacher B | *"No".* |
| Teacher C | *"No, my knowledge was just strengthened".* |
| Teacher D | *"The environment was not a big thing before the course. It was not very clear. It is now clear after the course".* |
| Teacher E | *"I didn't see it as new knowledge. I already had knowledge about it, but I believe you can always learn more".* |

An analysis of all the responses captured in Table 5.7 above revealed that the participants were aware of environment and sustainability content knowledge before the course, even though it was not covered during their pre-service teacher education. However, the intervention course strengthened their understanding of environment and sustainability content knowledge. In this case there is no transformation, because the participating teachers had this perception before the course. Participating teachers' responses on the conception of environment and sustainability are later compared to evidence of what they do during lessons.

The next section will present what teachers said about the teaching strategies they use in classroom practice.

### 5.3.3 Teaching strategies

The participating teachers were asked to explain teaching strategies used in their classroom practice. Table 5.8 below presents the interview question asked on teaching strategies and the responses to the question by the participating teachers. The analysis of the responses to the interview question shows that participants have changed their teaching strategies after the intervention course, even though Teacher E said she did not change her teaching methods much after the course. Teacher A said that she uses learner-centred methods but could not elaborate on the learner-centred methods she uses. Teacher B also said she now uses learner-centred methods such as fieldwork and observations. Teacher C said she still uses the textbook and fieldwork within the school. Teacher D said she uses information transfer, research, fieldwork, smartboard and cellphones. Teacher E mentioned storytelling, pictures and videos as teaching approaches, and she said she did not change her teaching methods. It is interesting that Teacher E thought she did not change her methods of teaching; however, she said "…*but I now try to do something practical or actual for the kids - I get them to experience".* Evidence from the responses shows that some of the participating teachers used experiential learning pedagogies such as fieldwork-based learning, technology based learning and manipulative instructions such as flash cards. Therefore, the analysis of the responses to the interviews reveals that the *Fundisa for Change* course might have changed the teaching strategies used by the participating teachers.

**Table 5.8: Teaching strategies used by the participants before and after the course**

| **Interview Question: "*What teaching methods did you use to teach environment and sustainability content before and after the* Fundisa *for Change intervention course?"*** | | |
|---|---|---|
| Participants | Before the course | After the course |
| Teacher A | *"Textbook based teaching, where I read with the learners."* | *"I use learner-centred teaching methods."* |
| Teacher B | *"It was mainly textbook method. The problem is that in some textbooks, certain sections are not correct. In such cases, I correct the information for learners."* | *"Teaching methods used are more learner-centred than teacher-centred approaches e.g. fieldwork, observations and others."* |
| Teacher C | *"I used the textbook and fieldwork within the school".* | *"I am still continuing with the textbook method and fieldwork within the school yard. It is difficult to conduct fieldwork away from the school due to time constraints. I am also incorporating information from websites since we now have smartboards."* |
| Teacher D | *"I used information transfer. We mainly rely on textbooks because we don't have many resources in the school."* | *"Information transfer is still one of the methods. Sometimes we allow learners to research for information and also conduct fieldwork within the school yard. We go out of the school to familiarize learners with certain aspects of the environment, unlike relying on talk and listen in class. We are also using smart boards [more] than talking about things they do not see. We are also using cellphones sparingly as they can be both positive and negative."* |
| Teacher E | *"I like starting my lessons with a video or a story. It's not always possible, just to get them to be interested in what I am going to say. Most of the time I either summarise or show them pictures or something like that."* | *"I don't think I have changed my teaching methods a lot. My teaching methods stayed the same, but I now try to do something practical or actual for the kids - I get them to experience. For example, using a piece of material on the 'stoep' to show desertification and keep on folding it to show them how we reduce the ground - this was to show that they should look after our soil. I started thinking about doing practical work and not just showing pictures, but they have to experience it; they would put up some flash cards around the school in places they think we are not looking after our environment."* |

The discussion indicates that the participating teachers have transformed their teaching strategies after the course even though they did not fully explain the methods they used except Teacher E. In the next section the assessment practices used by the participating teachers is discussed.

### 5.3.4 Assessment practices

This section discusses what the participating teachers said about the assessment practices that they used before and after the *Fundisa for Change* intervention course. Table 5.9 below indicates the questions asked and the participating teachers' responses.

**Table 5.9: Ways in which participants assessed learners before and after the intervention course**

| **Interview question: "*How did you assess learners in your subject before the course?"***<br>***"Are there any changes in the way you assess learners after the course?"*** | | |
|---|---|---|
| Participants | Before the intervention course | After the intervention course |
| Teacher A | *"I used questions from the textbook and previous question papers."* | *"I use different kinds of assessment for class activities such as peer, group and teacher – based. The district provides all tests and examinations as common assessments."* |
| Teacher B | *"I used textbook activities and previous question papers."* | *"Yes, there are changes in the way I handle informal assessments. I assess them either as individuals, peers or groups. I set my own questions for such activities. Unfortunately, all School Based Assessments (SBAs) and examinations are provided by the Department of Basic Education (at district level)."* |
| Teacher C | *"I used textbook activities and questions from previous question papers."* | *"Yes, I now incorporate a little information from recent newspapers, handouts provided in the course, and I also download information from the internet for daily or informal assessment. I also use these for class tests. We use Departmental common tests for all SBAs and examinations (at district level). We are not forced to use them, but if we decide to set our own, they have to be sent to the district for moderation. I have not used anything that I have set on my own after this course. Before I had prepared question papers for my cluster for Grade 12 SBAs."* |
| Teacher D | *"I assess through tests. Remember teachers do not do assessment. If we were setting on our own, assessment of* | *"Formal assessment is still being done by the Department of Basic Education. I think it has* |

| | | |
|---|---|---|
| | *environment and sustainability knowledge would be better. We would be able to give learners research tasks where learners would gather information and take pictures which will allow us to see the real impact of the environment."* | *to change from what we have right now to something better and more effective. Informal assessment allows me to give learners different things such as presentations and bring their own pictures to show their understanding. Formal assessment is set by the Department of Basic Education. There is nothing that we can do about it. If you decide to change, it's a process because papers have to undergo moderation by the subject head/ facilitators from the district - which takes a lot of time."* |
| Teacher E | "*Assessments stayed the same. We get the tests and SBAs from the district. These tests also integrate environment and sustainability content knowledge. Informal assessments are mainly done using past question papers where learners mark themselves. I also use the textbook activities."* | |

The analysis of participants responses reveals that participating teachers' do not set their own tests, tasks and examination papers, but rely on common assessments provided by the district. Teachers A, B, C and D said they relied on textbook activities before the *Fundisa for Change* course, but they have changed how they conduct informal assessment after the course. Teacher D said she also gave learners a chance to do presentations for class activities. Teacher E said she used the textbook and previous question papers for class activities before and after the *Fundisa for Change* intervention course. However, the district allows them to set their own formal tests, tasks and examinations if they so wish, but they need to submit them to the district to which they belong for moderation purposes. Teacher D said they do not do that because the process of moderation is time consuming. Hence, there is no evidence of transformation in what teachers said in the one-on-one interviews about assessment practices because participants do not set their own tests, tasks and examinations.

Even though *Fundisa for Change* programme encouraged assessment for learning to enhance students learning, lack of evidences of assessment for learning hinders transformation in teaching and learning. In the next section, evidence from lesson observations and document analysis is presented and analysedd.

## 5.4 What did the teachers do about what they have learnt in the course?

To present teachers' enactment of the curriculum, data obtained through the analysis of documents such as lesson plans, assessment programs and assessment tasks, together with data generated through lesson observations are presented. This section presents the extent to which the participating teachers enacted the intended curriculum in relation to the *Fundisa for Change* intervention course. This section is concerned with the actions of the teacher participants. The analysis in this section addresses the following themes: teaching strategies, assessment practices, resources used in teaching and the integration of values.

### 5.4.1 Teaching strategies

The participating teachers learned different teaching strategies in the *Fundisa for Change* intervention course. The analysis and presentation in this section is drawn from the analysis of teaching strategies in the generic lesson plan documents used by the participating teachers and lesson observations.

#### *5.4.1.1 Teaching strategies used in lesson plans*

The Department of Basic Education in the Gauteng Province provides generic lesson plans to all public schools. The generic lesson plans were analysed in order to examine the teaching strategies suggested. To determine the suggested teaching strategies, four generic lesson plans from Grade 12 and Grade 11 were analysed for the lessons observed (see Lesson plan example, Appendix 5).

The four Grade 12 generic lesson plans analysed are on causes of urban heat islands, valley climates, concepts and characteristics of the informal sector, and challenges facing South Africa's informal sector. The suggested teaching strategies in the lessons plans analysed are class discussion, and question and answer. The lessons observed in the Grade 11 classes are on monsoon winds, fohn winds, drought and desertification, 'development', globalization, resources and sustainability, using resources, and soil and soil profiles. Of the eight lessons observed, four generic lesson plans were made available to the researcher. The four Grade 11 generic lesson plans that were made available are on the causes of drought, the effects of drought, fohn and monsoon winds.

The teaching strategies suggested in the Grade 11 lesson plans are discussion, illustrations, question and answer.

It is important to note that teaching strategies on the lesson plans provided by the Department of Basic Education are not that varied. The lesson plans from the Department of Basic Education focus on illustrations, class discussion, and question and answer for the lesson plans analysed. Moreover, all the participants rely on these lesson plans and use them without making any alterations or amendments. Therefore, one could argue that the use of generic lesson plans from the Department of Basic Education hinders transformative thinking and action for the participating teachers. The participating teachers continued emphasizing summative assessments at the expense of formative assessments due to the provision of common assessments from the Department of Basic Education. This shows the impact that the structure has on teachers' agency, resulting in upholding assessment practices that were used before the course.

The next section presents evidence of the teaching strategies displayed during lesson observations in comparison with teaching strategies learned from the *Fundisa for Change* intervention course.

### *5.4.1.2 Teaching strategies displayed during lesson observations*

Table 5.10 below presents the teaching strategies displayed by the participating teachers during lesson observations. The teaching strategies are linked to lessons observed with each teacher participant.

**Table 5.10: Teaching strategies used during lesson observations**

| Participating teachers | Lesson observations | Topic of the lesson | Teaching strategies |
|---|---|---|---|
| Teacher A | LO1 | Grade 11: Sustainable development | Reading for information and explanations |
| | LO2 | Grade 11: Monsoon winds | Reading for information and questions and answers Grade 11 |
| | LO3 | Grade 11: Fohn winds | Reading for information and explanations |
| Teacher B | LO1 | Grade 12: The informal sector | Reading for information, information transfer, class |

| | | | |
|---|---|---|---|
| | LO2 | Grade 12: Travelling disturbances associated with anticyclones | discussion, dialogue, questions and answers<br><br>Reading for information, information transfer, class discussion, drawing, questions and answers |
| Teacher C | LO1<br><br>LO2<br><br>LO3 | Grade 11: S.A.'s long-term strategy using conventional energy sources.<br><br>Grade 12: Anabatic and katabatic winds<br><br>Grade 11: Drought | Reading for information, information transfer, class discussion, group discussion, questions and answers<br><br>Reading for information, information transfer, class discussion, questions and answers<br><br>Reading for information, information transfer, class discussion, questions and answers |
| Teacher D | LO1<br><br>LO2<br><br>LO3 | Grade 11: Globalization<br><br>Grade 11: Resource use and sustainability<br><br>Grade 12: Urban heat islands | Information transfer, questions and answers<br><br>Information transfer, class discussion, dialogue, questions and answers<br><br>Information transfer, class discussion, questions and answers |
| Teacher E | LO1<br><br>LO2<br><br>LO3 | Grade 11: Trade and development<br><br>Grade 11: Using resources<br><br>Grade 11: Soil and soil profiles | Writing notes, explanation of notes, questions and answers<br><br>Writing notes, explanation of notes, questions and answers<br><br>Fieldwork observation within the school, media and reading for information |

It is evident that Teachers A, B and C relied on reading for information from the textbooks, questions and answers, and class discussion. Teacher D also included information transfer, whilst Teacher E used a variety of teaching strategies such as writing notes, media and fieldwork within the school (which gives learners a chance to learn from experience). There is no evidence of transformative thinking and action in the choice of teaching strategies used by Teachers A and C. Teachers A and C did not try any of the teaching methods taught in the course. Teacher B and D used dialogue to a small extent in teaching the informal sector in Grade 12 and resource use and sustainability in Grade

11 respectively. Teacher B and D integrated dialogue in two lessons mentioned above showing chances of transformative thinking to a small extent. Teacher E's choice of teaching strategies shows transformation because she used media and fieldwork within the school. Teacher E used media which enabled learners to view the soil profile. Teacher E also took the learners to the field around the school so that they could observe the impact of soil erosion. However, one cannot tell whether she learned this from the course or not.

The next section will present the analysis of assessment practices based on documentary evidence and lesson observations.

### 5.4.2 Assessment

All the participating teachers have reported that they rely on common assessments comprising tests, tasks and examination papers set by the Department of Basic Education. Data analyzed in this section include the assessment plans, some tasks completed by the Grade 11 and 12 classes, and the assessment practices exhibited during lesson observations.

#### *5.4.2.1 Types of assessments in the assessment plan*

Schools use the assessment plan provided by the Department of Basic Education to conduct formal assessment (Department of Basic Education, 2011). The assessment plans for Grade 11 and 12 below show that the Department of Basic Education expects learners to do different kinds of tasks in different topics, such as data handling, tests, research writing, practical work and examinations.

**Table 5.11: The programme of assessment for Grade 11 and 12 Geography classes**

| Grade 11 Assessment plan | Grade 12 Assessment plan |
|---|---|
| **Term 1** | **Term 1** |
| Task 1: Data handling | Task 1: Data handling |
| Test 1: Climate and weather; and mapwork | Test 2: Climate and Geomorphology and mapwork |
| **Term 2** | **Term 2** |
| Task 2: Research and essay writing | Task 2: Research writing |
| Mid-year examination (Atmosphere and Geomorphology) | Mid-year examination (Atmosphere and Geomorphology) |
| **Term 3** | **Term 3** |
| Task 3: Practical mapwork | Task 3: Practical mapwork |
| Test 2: Development | Test 2: People and their needs |
| | Preparatory examination (Paper 1 & 2) |
| **Term 4** | **Term 4** |
| End of the year examination | End of the year examination |

The DBE provides all the assessment tasks in the programme of assessments. These tasks assess content and different skills. It was not possible to assess the participating teachers' transformative thinking because all of them rely on the summative assessments provided by the DBE (see section 5.3.4 above). However, the types of assessments provided by DBE are varied in the programme of assessment as it was emphasized at the *Fundisa for Change* TPD short course.

The next section will reflect on and analyse environment and sustainability concepts covered in research tasks set for the Grade 11 and 12 Geography classes.

### *5.4.2.2 Environmental and sustainability concepts displayed in assessments tasks.*

This section presents environment and sustainability concepts displayed in the research task that learners were expected to complete during the period of data collection (July to September 2017 and January 2018) which is one of the assessment tasks provided by

DBE. Table 5.12(a) shows the Grade 11 research task, whilst Table 5.12(b) shows the Grade 12 research task.

**Table 5.12 (a): Grade 11 research task displaying environment and sustainability concepts**

**Grade 11 research task for 2017**

Research: Choose a topic from the two options provided

1. **Globalization**

Globalization has a positive influence on South Africa's economy and population. Investigate this hypothesis from any corporation of your choice.

Learners were expected to provide the following:

- History of the corporation
- Where and why the corporation was established in S.A.
- Impacts on the economy and people
- Challenges
- S.A. companies that have gone global and where they are in the world
- Positive impacts

2. **Non-conventional energy resources**

Hypothesis: S.A. will rely more on non-conventional energy sources for the provision of power in the future.

Learners were expected to address the following

- History and development of the energy source
- Map of distribution of the energy source in S.A.
- Description of the application of the energy source
- The importance of the energy source
- Problems encountered when using the source
- Acceptance or rejection of the hypothesis

Table 5.12(a) above displays the Grade 11 research task that was prepared by the district for the third term in 2017. The task had two research topics that learners had to choose from, namely globalization or non-conventional energy resources. One can argue that the research tasks presents environment and sustainability concepts that encourage teachers to integrate them into their teaching.

The Grade 12 classes were required to conduct a research on a problem that has been reported in the newspaper in 2018. Non-delivery of RDP houses and flooding in the area,

as shown in table 5.12(b) below, are some of the problems highlighted as examples of issues to investigate.

**Table 5.12 (b): Grade 12 research task displaying environment and sustainability concepts**

**Grade 12 research task for 2018**

Task 2: Research task

Investigate a problem or issue that is experienced in learners' communities. The problem/issue must have been reported in a local/provincial/national newspaper.

Learners are required to conduct research and write a report where they discuss their findings. Below is a list of examples that learners can investigate.

- Non-delivery of RDP houses
- Flooding in the area
- Poor service delivery
- Job creation programmes
- Industrial areas issues e.g. pollution
- Transport problems
- Mining issues e.g. pollution/environmental damage
- Damage due to old and outdated infrastructure.

Steps to be followed in completing their investigation and writing the report were as follows:

Step 1: Find your own article

Step 2: Explain the causes of the problem/issue

Step 3: Explain the effects/results

Step 4: How the government/municipality/community respond to the problem/issue

Step 5: Possible solutions or future actions to prevent the problem/issue.

The research tasks for both Grade 11 and 12 were prepared by the district of education. These research tasks afforded learners a chance to investigate different environmental and sustainability issues. In this way, the provision of the research tasks by the Department of Basic Education encouraged participating teachers to integrate environment and sustainability concepts through assessment. As much as the environment and sustainability concepts are reflected in the research tasks, the participating teachers could not implement what they had learned in the course because they did not set the tasks on their own. Thus, the participating teachers were not

implementing the practices that they had learned from the course due to what the DBE prescribes for the schools. It must be noted, however, that providing these tasks helps teachers who do not know how to set such tasks and encourages teachers to integrate environment and sustainability concepts into classroom practices.

The next section presents the assessments practices based on lesson observations.

#### *5.4.2.3 Assessment practices identified during lesson observations*

Lesson observations show the sources of questions that participants rely on for the informal assessments, namely class activities and homework activities. Table 5.13 below shows the assessment activities seen during lesson observations. Teacher A relied on the textbook and previous question papers for class activities whilst Teacher C and E used the textbook for class activities and homework activities respectively. Teacher B and D did not expect learners to write in their workbooks, but asked questions orally. It is evident that the participating teachers relied on textbook and previous questions for class activities that learners had to write in their workbooks. The comparison between one-on-one interviews in section 5.3.4 and lesson observations demonstrate that participants do not do what they said they do.

**Table 5.13: Sources of assessment activities displayed during lesson observations**

| Participants | Lesson observations | Topic of the lesson | Informal assessment |
|---|---|---|---|
| Teacher A | LO1<br>LO2<br>LO3 | Grade 11: Sustainable development<br>Grade 11: Monsoon winds<br>Grade 11: Fohn winds | Class activity from the textbook.<br>Class activity from previous question papers.<br>Class activity from previous question papers. |
| Teacher B | LO1<br>LO2 | Grade 12: The informal sector<br>Grade 12: Travelling disturbances associated with anticyclones | Class activity from the textbook.<br>Oral questions & answers |
| Teacher C | LO1<br>LO2<br>LO3 | Grade 11: S.A.'s long-term strategy using conventional energy sources.<br>Grade 12: Anabatic and katabatic winds<br>Grade 11: Drought | Oral questions & answers.<br>Oral questions & answers, and class activity from the textbook.<br>Oral questions & answers, and class activity from the textbook |
| Teacher D | LO1<br>LO2<br>LO3 | Grade 11: Globalization<br>Grade 11: Resource use and sustainability<br>Grade 12: Urban heat islands | Oral questions & answers.<br>Oral questions & answers.<br>Oral questions & answers. |
| Teacher E | LO1<br>LO2<br>LO3 | Grade 11: Trade and development<br>Grade 11: Using resources<br>Grade 11: Soil and soil profiles | 2 homework activities from the textbook<br>No activity given<br>No activity given as the teacher was explaining examination tips based on handout that she gave to learners |

The next section will present the resources that participants used during lesson observations.

### 5.4.3 Resources

The *Teaching Climate Change* manual included additional sources that influence teachers' knowledge on climate change (see table 5.2 above for a list of the references provided in the *Teaching Climate Change* manual). In this section, the presentation and analysis of resources used is established from the generic lesson plans and lesson observations.

#### *5.4.3.1 Resources reflected in lesson plans*

The Department of Basic Education has suggested different kinds of resources in the Grade 12 generic lesson plans, such as work guides, textbooks, diagrams and the white or chalk board. These resources are the same for all lessons observed in the Grade 12 classes. The Grade 11 generic lesson plans suggested the use of textbooks, work guides, exercise books, white or chalk boards, world maps, cartoons and diagrams.

The generic lesson plans included work guides that provided notes without indicating the sources. Thus, the generic lesson plans do not assist participating teachers in making use of different resources as suggested in the *Teaching Climate Change* manual. Therefore, the use of the generic lesson plans may hinder participating teachers' transformative thinking and action in the way they make use of the resources in their classroom practices.

#### *5.4.3.2 Resources identified during lesson observations*

The participating teachers used different resources for the lessons observed. Teacher A used the textbook and a printed diagram for the first lesson observed, which was on 'sustainable development'. She tried to use the smartboard, but she duplicated what was in the textbook. Teacher A still used the textbook and printed notes for the second lesson observed, on 'monsoon winds'. The third lesson observed was on the 'fohn winds' and she still used the textbook, printed notes and a case study. Teacher A struggled to use the smartboard which she tried during the first lesson observed. This suggests the need for smartboard training for some teachers.

Teacher B used the textbook for lessons on 'the characteristics and challenges on the informal sector' and used the textbook in conjunction with the chalkboard in the second

lesson observed (on the travelling disturbances associated with anticyclones). Teacher C used the textbook in the first lesson observed, when teaching 'South Africa's long-term energy needs using conventional sources'. Teacher C continued to use the textbook in the second and third lessons observed, in conjunction with images shown using the smartboard, teaching on 'anabatic and katabatic winds' and 'drought' respectively. Teacher B relied on the textbook, whilst Teacher C used images to some extent in explaining concepts.

Teacher D used the textbook, printed notes and the chalkboard for the first lesson observed on 'globalisation'. She used the textbook and showed images using the smartboard in the second lesson observed, on 'resources and sustainability', and for the third lesson observed, on 'urban heat islands'.

Teacher E used different resources for the lessons observed. She used a PowerPoint presentation to teach the first lesson observed where she taught 'trade and development'. For the second lesson observation, she used a video, PowerPoint and the whiteboard to teach 'the use of resources'. She also used PowerPoint and field observation within the schoolyard to teach 'soil and soil profile' in the third lesson observed.

Evidence from the lesson observations indicate that the participating teachers continued to rely heavily on textbooks as sources of information, except for Teacher E who used a variety of resources during lesson observations. None of the participating teachers had adopted the additional sources included in the *Teaching Climate Change* manual. Consequently, there is no evidence of transformative thinking and action for Teachers A, B, C and D in the way they made use of resources indicated in the *Teaching Climate Change* manual. However, Teacher E used a variety of resources, which shows that her thinking and actions were transformed.

The next section will present and analyse what teachers did in the quest for integrating values in teaching and learning.

### 5.4.4 The integration of attitudes and values in teaching

Section 5.2.4 above shows attitudes and values fostered through the Geography curriculum as well as transformative learning indicators reflected in the *Teaching Climate Change* manual and the CAPS document. Attitudes and values that are fostered through the Geography curriculum and transformative learning indicators discussed in section 5.2.4 were used to determine the integration of values during lesson observations. Participating teachers taught values by giving examples that related to learners' experiences and allowing discussion or dialogue on concepts discussed. Table 5.14 below shows the values integrated into lessons through examples, discussion and dialogue as reflected in lesson observations.

**Table 5.14: Values integrated in lessons**

| Participants | Lesson observations | Lesson topic | Examples, discussion and/or dialogue | Attitudes and values fostered |
|---|---|---|---|---|
| Teacher A | LO1 | Sustainable development (Grade 11) | Examples | A concern for the sustainable and fair use of resources |
| | LO2 | Monsoon winds (Grade 11) | Discussion of the impacts of floods | The application of geographical knowledge and skills in learners' personal lives |
| | LO3 | Fohn winds (Grade 11) | Discussion of the impacts of fohn winds | The application of geographical knowledge and skills in learners' personal lives |
| Teacher B | LO1 | Informal sector (Grade 12) | Dialogue on social ills such as littering, drugs and selling liquor without licenses in the informal sector.<br><br>Pollution caused by street vendors | Enhance the level of awareness<br><br>A sense of stewardship |
| | LO2 | Anticyclonic travelling disturbances (Grade 12) | Discussion on the effects of line thunderstorms took place. Learners were encouraged to watch the weather focus to see the occurrence of line thunderstorms | Enhance the level of awareness |

| | | | | |
|---|---|---|---|---|
| | | | (*S.A was experiencing line thunderstorms at the time of the lesson*) | |
| Teacher C | LO1 | S.A. long term energy<br><br>(Grade 12) | Nuclear power station deal in SA was referred to, which was on the news that week.<br><br>Example of solar geysers installed at an area nearby – renewable resource | A concern for the sustainable and fair use of resources<br><br>Cultivating the desire to fit new perspectives into the broader context of one's life |
| | LO2 | Valley winds<br>(Grade 12) | Anabatic and katabatic winds | No reference to environment and sustainability |
| | LO3 | Drought and desertification<br>(Grade 11) | Reference made to 'drought experienced in the Western Cape' at that moment – linked to human practices that lead to desertification. | Enhance the level of awareness |
| Teacher D | LO1 | Globalisation<br>(Grade 11) | Linked globalization to the carbon footprint, pollution and impacts caused by industries such as damage to the ozone layer and from acid rain, and effects on agriculture, which can lead to food insecurities.<br><br>Isando was used as an example of an industry that provides employment to people but also has negative impacts to the environment. | Pro-environmental behavior<br><br>A sense of fairness, sustainability and equality |
| | LO2 | Resources and sustainability<br>(Grade 11) | The importance and effects of mining in relation to population numbers. | A concern for the sustainable and fair use of resources |

| | | | | |
|---|---|---|---|---|
| | | | Dialogue on population numbers was encouraged. | |
| | LO3 | Urban heat islands (Grade 12) | The causes and impacts of urban heat islands and ways of reducing impacts | The application of geographical knowledge and skills in learners personal lives |
| Teacher E | LO1 | Trade and development (Grade 11) | Clarified the terms 'trade' and 'development' | Not linked to environment and sustainability |
| | LO2 | Use of resources (Grade 11) | The use of resources and their relationship with population numbers<br><br>The degradation of the environment due to economic development. | Recognizing the significance of informed decision making |
| | LO3 | Soil (Grade 11) | The role of vegetation in reducing soil erosion | Pro-environmental behaviour |

The participating teachers integrated some of the attitudes and values into the lessons observed through examples, discussions and dialogue. Teacher A tried to foster a concern for sustainable and fair use of resources through examples in teaching 'sustainable development'. Teacher A also tried to foster the application of geographical knowledge and skills in learners' personal lives through a discussion of impacts of floods when teaching the 'monsoon winds' and effects of hot, dry winds when teaching the 'fohn winds'.

Teacher B enhanced the level of awareness and a sense of stewardship through dialogue when teaching on 'the informal sector'. She again tried to enhance the level of awareness through class discussion when teaching 'anticyclonic travelling disturbances'. Teacher C aimed to develop a concern for the sustainable and fair use of resources in teaching 'South Africa's long-term energy resources'. In the same lesson, Teacher C also undertook to cultivate a desire to fit new perspectives into the broader context of one's life when referring to solar geysers installed at an area nearby as examples. Teacher C

also tried to enhance learners' level of awareness through examples when teaching 'drought and desertification'.

Teacher D attempted to develop pro-environmental behavior by linking globalisation to impacts caused by industries. In the same lesson, she also strove to develop a sense of fairness, sustainability and equality by giving examples on negative impacts of industries to the environment. In teaching 'resources and sustainability', Teacher D encouraged dialogue on population numbers to develop a concern for sustainable and fair use of resources. She also encouraged learners to apply geographical knowledge and skills in their personal lives when discussing 'the impacts of urban heat islands'.

Teacher E's lesson on 'trade and development' was focused on clarifying terms and not linked to environment and sustainability values. Teacher E wanted learners to recognize the significance of making informed decisions when teaching 'the use of resources' by referring to the use of resources and population numbers. In teaching about 'soil and soil profile', Teacher E developed pro-environmental behaviour in learners' lives by encouraging them to reduce soil erosion.

From the above discussion, it is evident that participating teachers are attempting to enhance and develop environmental and sustainability values in their lessons through examples, discussions and dialogue. The participating teachers seem to find it easy to spontaneously integrate values in teaching. The participating teachers referred to issues that were happening at the time, which helped to enhance learners' awareness, without writing these in their lesson plans. The participating teachers show evidence of transformative thinking and action in the integration of attitudes and values in teaching. However, it would be more desirable if teachers could integrate values deliberately in their practices.

The next section will present and analyse the views of the officials of the Department of Basic Education in terms of the role of the structural conditions and culture in the implementation of learned practices.

## 5.5 What did the officials of the Department of Basic Education say about teachers' practices in the curriculum?

The interviews conducted with the officials of DBE assisted in explaining participating teachers' agency in relation to the structure and culture of the DBE. Agency, structure and culture, used as an analytical framework in this section, are derived from Margaret Archer's (1995; 1998) realist social theory of morphogenesis. This section will discuss the views and perspectives of the DBE officials (the district official, the provincial official and the national official) in terms of the provision and the use of generic lesson plans, common assessments, and resources used during lessons.

### 5.5.1 Generic lesson plans

Interviews were conducted with the district subject advisor and the officials from the provincial office and the national office on the position of the DBE in terms of the use of generic lesson plans to teach Geography and environment and sustainability concepts. The interview questions asked are as follows:

> *What is the view of the Department of Basic Education in terms of the generic lesson plans to teach Geography? Are they implemented as expected?*

The district official said:

> *Teachers are expected to adapt the lesson plans to their own situation. They use them as they are without additions.*

The provincial official said:

> *Lesson plans are supposed to be adapted. They just take the generic lesson preparations as they are and file them, without adapting them to their own needs.*

The national official said:

> *Teachers who know their work use the generic lesson plans as baseline.*

The analyses of the responses to interviews with the DBE officials reveal that the generic lesson plans provided by the DBE are supposed to be adapted to teachers' needs.

However, all the participants use the generic plans without making any alterations (see section 5.4.1.1). The district official said that generic lesson plans are not working as expected because teachers use them without adapting them to their own needs. The provincial official emphasized that most teachers do not plan their lessons and that they just file the generic lesson plans. This shows that the provincial office has noted the challenge of teachers who are not planning their lessons. The national official pointed out that provinces have the latitude to use generic lesson plans. He also indicated that generic lesson plans make the work easy for teachers and equip novice teachers, even though the experienced teachers use them as baseline. The national official was more concerned with quality assurance, based on the idea that all schools are seen to be delivering the same quality of education. Therefore, the use of generic lesson plans without adapting to individual teachers' needs can be seen as an inhibiting factor in transformation.

The impression of the district and provincial officials is different from that of the national official. This could be because the district and provincial officials' work is more concerned with compliance, support and development of teachers; whilst the national official is concerned with quality assurance in the education system. There is a need for the district and the provincial officials to ensure that teachers plan lessons as expected.

The next section will present the DBE officials' views on common assessments.

### 5.5.2 Common assessments

The DBE officials were asked the following interview question based on common assessments in Geography to assess environment and sustainability:

> *What are the views of the Department of Basic Education in terms of common assessments (common tests, common tasks and common exams) in assessing environment and sustainability knowledge in Geography? Are there effective ways of assessing the content knowledge?*

The district official said:

*Common assessments work well in terms of maintaining standards, but they also create lazy teachers.*

The provincial official said:

*Schools are encouraged to use previous question papers. This is done to expose learners to questions that are asked during examinations.*

The national official said:

*Provinces use common assessments because they are quality assured and of good standard.*

It is evident from the analysis of the responses above that DBE prefers common assessments to ensure quality and maintain standards in education. The district official has alluded to the reality that teachers are lazy to setting their own question papers. To this end teachers rely on the question papers provided even though they are allowed to set their own papers. The responses to interview question on assessment from Teacher C and D indicate that teachers can set their own question papers, but they should submit them to the DBE for moderation purposes. Teachers do not do this because they claim that it is time consuming. The provincial and the national officials are concerned that most teachers ask more factual/recall questions (level 1 questions) than questions that assesses deep learning when they set their own papers. Consequently, the DBE provides all the formal assessments that assesses content, skills and values (see section 5.4.2.1). The participating teachers do not practice what they have been taught in the *Fundisa for Change* intervention course. The fact that teachers are encouraged to use common assessment tasks shows that the structure and culture of the DBE hinders participating teachers' autonomous thinking in designing assessments.

In the next section, the choice and use of resources in classroom practice is related to the structural conditions of the DBE.

### 5.5.3 Resources

The DBE officials were further asked the following question, on the use of resources, during interviews:

> *What resources are teachers advised to use in teaching Geography in order to develop environment and sustainability concepts?*

The DBE officials acknowledged that most Geography teachers in the Gauteng province do not expose learners to different resources in teaching. They do not show any initiative. This shows that participating teachers' actions might be a mirror of what most teachers in the province are doing in terms of the use of resources in teaching environment and sustainability concepts. Once more, the DBE prepares resources for the teachers, which might hinder teacher participants from exercising their agency in the choice of resources to use during lessons.

The constraints and enablers in implementing ESD in the teaching of Geography are presented in the ensuing section.

## 5.6 What are the constraints and enablers in implementing ESD in the classroom?

This section explores factors that constrain or enable the implementation of ESD for the participating teachers. The structure and culture surrounding participating teachers' work influences the possibilities of the implementation of ESD in teaching Geography. The generic lesson plans, common assessment, the use of resources in teaching and the teachers' values systems either constrain or enable the possibilities of implementing ESD in teaching.

### 5.6.1 Constraints in implementing ESD

This section will examine the constraints in implementing ESD in relation to the structure and culture of DBE. The use of generic lesson plans and common assessments provided by the DBE might constrain the implementation of ESD.

The DBE in the Gauteng province provides the participating teachers with the generic lesson plans. Even though the DBE provided the generic lesson plans as a baseline to

planning, most teachers use them without making any alterations. These generic lesson plans act as a constraint in the implementation of ESD because participating teachers use them as they are which is not what they were intended for (see section 5.4.1.1). The use of generic lesson plans results in participating teachers not implementing the practices that they have learned in the *Fundisa for Change* TPD course.

The generic lesson plans influence the choice of teaching strategies and resources used during teaching. As already outlined, the following teaching strategies are proposed in the generic lesson plans, namely discussion, illustrations, and question and answers (see section 5.4.1.1 above). These do not relate to the teaching strategies that the participating teachers learned in the *Fundisa for Change* intervention course. Teachers A and C did not implement the teaching strategies learned in the *Fundisa for Change* course, whilst Teachers B and D each used dialogue in one of the lessons observed. However, Teacher E uses different teaching strategies in her lessons, such as showing videos and fieldwork within the school. Teacher E used a video for a lesson on where she referred to population numbers and their effect on the use of resources, and fieldwork in the schoolyard in teaching a lesson on soil formation and soil erosion. It must be noted that transformative learning is a very complex process and it is difficult to determine when it occurs. Even though Mezirow's transformative learning theory indicate that individuals must choose to change (See Chapter 3), generic lesson plans are part of the structural system of DBE which inhibit the agency of individual teachers.

The resources that teachers are expected to use for different lessons are also suggested in the generic lesson plans, namely the white or chalk board, textbooks, work guides, world maps, cartoons and diagrams (see section 5.4.3.1 above). There is no problem with the resources suggested in the generic lesson plans; one could envisage that the participating teachers could try some of the resources suggested in the *Fundisa for Change* course. Table 5.2 above indicates the references that could influence teachers' climate change knowledge, which they can use to teach environment and sustainability knowledge. The participating teachers' agency and the adoption of generic lesson plans without alterations don't demonstrate transformative thinking. The design of the lesson plan has an impact on the pedagogy used in the classroom. All the participants rely so

much on the textbooks, except Teacher E, who uses other sources in her teaching. This enables Teacher E to easily integrate environment and sustainability concepts into her lessons. Therefore, there is evidence of autonomy in Teacher E's classroom practice as compared to the other participants.

The DBE provides schools with common assessment tasks, tests and examinations for School Based Assessments (SBA) in the Gauteng province. The one-on-one interviews with the participating teachers revealed that they do not set their own question papers for tests, tasks and examinations (see section 5.3.4). The one-on-one interviews with the DBE officials reveal that teachers are encouraged to use the common assessment tasks provided because they are quality assured and of the required standard (see section 5.5.2). The DBE encourages the use of generic assessments because they are more interested in pass rates than meaningful learning, as suggested by the provincial official. Consequently, the participating teachers' assessment practices do not promote transformative thinking and action, because teachers do not set their own tests and tasks.

In the one-on-one interviews with the participating teachers, Teachers A, B, C and D said they use different kinds of assessment for the class activities and homework activities, except Teacher E who said she uses the textbook and previous question papers for classwork and homework activities (see Table 5.9). Lesson observations reveal that all participants rely on textbook exercises and previous question papers for classwork and homework activities (see section 5.4.2.3). Thus, evidence do not suggest that the participating teachers deviated from the textbook exercises. I would therefore argue that over-reliance on the textbooks and previous question papers are hindering teachers' transformative thinking and action.

Despite the constraints that have been mentioned above, there are other factors that enabled participating teachers to implement ESD in teaching Geography to a certain extent.

### 5.6.2 Enablers to implementing ESD

This section will present and analyse data to reveal participating teachers' ability to identify environment and sustainability content in the curricula; the influence of the

environment and sustainability concepts addressed in the common assessment tasks and the way participating teachers integrate values during lessons are seen as enablers in the implementation of ESD. In terms of integration of values, teachers' agency and the structural condition of the DBE enable the implementation of ESD to some extent. Common assessments enable the integration of environmental and sustainability concepts in classroom practice.

The one-on-one interviews with the participating teachers reveal that all the participating teachers could identify the environment and sustainability content knowledge in the curricula, except where Teacher D said that there are "*small aspects that deal with environment and sustainability content in Economic Geography*" (see section 5.3.2). The above remark by Teacher D is questionable because Economic Geography is related to environment and sustainability knowledge in the sense that trade and economy depend on the availability of resources in an area. Therefore, teaching such a section will require a teacher to also refer to the exploitation of resources for the benefit of the economy in an area. However, Teacher D could identify the other topics related to environment and sustainability content knowledge. Participating teachers' ability to identify environment and sustainability content knowledge in curricula indicates autonomy in their thinking. By virtue of this autonomy in thinking, participating teachers might transform the way they view the content in the CAPS in relation to climate change units.

The DBE's programme of assessment enables participating teachers to use different kinds of as suggested in the CAPS document (see Table 5.11). The research tasks for Grade 11 and 12 in 2017 and 2018 respectively show the integration of environment and sustainability concepts (see Table 5.12 a and b). These enable participants to apply environment and sustainability concepts in teaching and assessing learners to some extent. Even though tasks are set by the DBE, they advance participating teachers' understanding of environment and sustainability and encourage them to apply these concepts in their teaching practices.

The *Teaching Climate Change* manual reflects environment and sustainability values reflected in the CAPS (see section 5.2.4). The *Fundisa for Change* intervention course advocated that teachers should empower learners to become agents in the climate

change discourse. The teacher participants were able to integrate some of the environment and sustainability values through examples, discussion and dialogue during lesson observations (see Table 5.14). Teacher B related the informal sector to learners' experiences and encouraged dialogue on aspects of the informal sector they know and related that sector to the associated social ills. Teacher D also encouraged dialogue on population numbers in relation to resource use and sustainability. The values integrated ranged from raising concern on fair use of resources, through a sense of stewardship, cultivating a desire to fit new perspectives into the context of one's life, and pro-environmental behavior, to making informed decisions. These indicate transformation in participating teachers' value systems.

## 5.7 Summary

This chapter analysed the intentions of the *Fundisa for Change* TPD short intervention course from the *Teaching Climate Change* manual, what participating teachers said in one-on-one interviews, what participating teachers did during lesson observations, and what the DBE officials said in one-on-one interviews. Data were analysed for evidence of participant teachers' transformative thinking and action. Evidence was presented according to the following themes: subject content knowledge, teaching strategies, assessment practices, the use of resources and the integration of attitudes and values in teaching environment and sustainability knowledge using climate change units. The chapter also presented constraints and enablers which arose from the analysis in the implementation of ESD in teaching Geography in secondary schools in relation to institutional structural conditions and teacher's agency.

In brief, the preceding analysis indicates that lesson plans and assessments provided by DBE inhibited transformation in the teachers' classroom practice. However, teachers were more successful at incorporating values consistent with environment and sustainability content.

Chapter 6 will discuss these results in relation to Mezirow's transformative learning theory (1991; 2000; 2003), Margaret Archer's realist social theory of morphogenesis (1995; 1998) and the ESD literature reviewed in Chapter 2.

# Chapter 6

# Discussion of findings

## 6.1 Introduction

The previous chapter presented, interpreted and analysed data obtained through examining the *Teaching Climate Change* manual, semi-structured interviews with participating teachers, lesson observations, and analysis of documents (namely the generic lesson plans and common assessment tasks). Data were analysed to determine the transformation of teachers' content knowledge, teaching and assessment practices, the use of resources and the integration of values in teaching, as well as constraints and enablers in implementing ESD. This chapter focuses on the discussion of findings in relation to the analytical framework used as a lens in this study, namely Mezirow's transformative learning theory (1991; 1994; 2000; 2003), Archer's realist social theory of morphogenesis (1995; 1998) and the ESD literature.

The focus of this research is on the influence of the *Fundisa for Change* teacher professional development course in transforming teachers' content knowledge, teaching and assessment practice and integration of values, as well as constraints and enablers in implementing ESD in teaching Geography in secondary schools. The *Fundisa for Change* programme was offered as a short course with the intention of transforming environmental and sustainability content knowledge and practice for Geography teachers. The main finding of the study so far is that the course has transformed teachers' content knowledge to a certain extent but showed limited potential in transforming teaching practices.

The chapter is structured in terms of the findings that are aligned to themes elicited from the data (see Table 4.1, Chapter 4) as follows:

- Teachers' conception of environment and sustainability content knowledge.
- Teaching practices.
- Assessment practices.
- The use of resources.

- The integration of attitudes and values in teaching.
- Constraints and enablers in implementing ESD.
- A summary of the analysis.

## 6.2 Teachers' conceptions of environment and sustainability content knowledge

This section answers the sub-question that addresses participating teachers' conceptions of environment and sustainability knowledge and how they identified such knowledge in the Grade 10 to 12 Geography Curriculum and Assessment Policy Statement (CAPS) document. The section is divided into two sub-sections which include participating teachers' expanded frames of reference on climate change, and teachers' knowledge of the relationship between climate change units and the CAPS.

### 6.2.1 Participating teachers' expanded frames of reference on climate change

***Key finding: The participating teachers' frames of reference on climate change may have been expanded through informal learning with or without their awareness and through the knowledge gained from the Fundisa for Change course.***

It was found that all the participating teachers had different understandings on climate change before the *Fundisa for Change* intervention course, which were shaped either by personal perspectives or cultural paradigms. This was strengthened by the intervention course. The participating teachers were prompted to reflect on their views on climate change during the one-on-one interviews (see Table 5.5, Chapter 5). In the one-on-one interviews, Teacher A said that she thought climate change '*was a myth'* and '*it happens after a long time'* before the course, but she now knew that climate change was caused by human actions and people should know how to reduce or eliminate its impacts. This response suggests that there is some change in how Teacher A thinks about environmental sustainability as a result of participating in the *Fundisa for Change* intervention course. Teacher B said she knew that climate change happened after a long time and that it was caused by human actions before the course. Teacher B said her belief was still the same after the course. Teacher C said her knowledge of climate change 'was strengthened' by the *Fundisa for Change* intervention course. Teacher D said she knew about climate change before the course, but she '*now knows more about the causes*

*and impacts of climate change*'. Teacher E said she knew about climate change before doing the course and her views were still the same, but *'one can always learn more*'. The participating teachers were engaged in content reflection through interviews. Teachers B, C, D and E's responses show that they reflected on the content and realized that they already knew something about climate change. This implies that the course confirmed their knowledge and understanding about climate change.

UNESCO (2012) reports that teachers should link the curriculum with environment and sustainability knowledge and that the education community should decide on the sustainability issue that will become part of the curriculum. The sustainability issue chosen to be part of the curriculum in the *Teaching Climate Change* manual is climate change. Therefore, there was a need to establish participating teachers' understanding of the concept of climate change. The Lucerne Declaration on Geographical Education for Sustainable Development proposed the integration of sustainable development into teaching and learning (Haubrich et al, 2007). In a way, embedding climate change in the curriculum is in line with the proposition in the Lucerne Declaration on Geographical Education. The participating teachers' knowledge on climate change is significant in this case as it serves as a foundation for understanding environment and sustainability knowledge in teaching Geography.

Mezirow (2000) maintains that frames of reference are perspectives through which we filter ideas formed within or outside awareness. He further argues that how people are socialized and interpret experience often bring out personal perspectives or cultural paradigms derived from life experience (Mezirow, 1991; 2000). The participating teachers' assumptions on climate change could be the results of socialisation or learning from the course. Since this research started only after the teachers had completed the course, it is difficult to say with absolute certainty when, how and to what extent transformation has occurred for the participants. Their responses seem to suggest that the course confirmed knowledge they had gained from other ways of learning. However, the participating teachers' frames of reference on climate change could be the results of informal learning or formal knowledge obtained from the *Fundisa for Change* course.

One of the findings related to the teachers' understanding of environment and sustainability knowledge is their ability to reflect on climate change content in relation to the curriculum topics.

### 6.2.2 Content reflection on climate change in relation to the CAPS

***Key finding: All the participating teachers could identify environment and sustainability knowledge in the Geography curriculum, as well as relate the climate change content to the CAPS themes.***

The *Fundisa for Change* teacher development programme exposed participating teachers to climate change content which is related to the topics in the national curriculum (CAPS). The climate change units in the *Teaching Climate Change* manual used for training teachers are energy exchange, energy resource use and change, and responses to energy exchanges and climate change. It is evident that all the topics in the Grade 10 to 12 Geography curricula can be connected to the climate change units (see Table 5.1, Chapter 5). The relationship of the climate change content and the CAPS topics is more explicit in the Grade 10 to 12 Climatology, Grade 10 and 12 Geomorphology, Grade 11 Development and Resource use and sustainability, Grade 12 Settlement geography and the Grade 10 Population geography. However, the analysis of the *Teaching Climate Change* manual revealed that the relationship was not made explicit for Grade 12 Economic geography and Grade 11 Geomorphology. An important suggestion, therefore, is that there is a need for the relationship between climate change content and the CAPS topics that are not explicit to be clarified in the *Teaching Climate Change* manual, so that teachers are aware of the links between Economic geography and climate change.

Mezirow (2003) argues that learning is understood as a process of using prior interpretation to construct new interpretations of problematic experiences. In the context of this study, problematic experiences imply lack of teachers' environment and sustainability knowledge and related issues. The participating teachers were asked to reflect on the content during one-on-one interviews based on what they had learned from the course. With reference to Mezirow's (2000) transformative learning theory, this is

content reflection. In this study, participating teachers reflected on the climate change content in relation to the CAPS.

Teacher participants reflected on the content in the one-on-one semi-structured interviews when they were asked to identify environment and sustainability knowledge in the curriculum. Evidence from the interviews revealed that all the participating teachers could identify environment and sustainability knowledge in the Geography curriculum (see Table 5.6, Chapter 5). However, Teacher D said there are only small aspects of such knowledge in the Grade 12 Economic Geography section. This misconception could have resulted from the teacher's inability or lack of knowledge to make connections between the climate change content and Economic geography. Nonetheless, environment and sustainability knowledge is found in all the Geography themes in the curriculum. According to Ferreira (2014) teaching and learning cannot improve if teachers lack the necessary knowledge and skills to facilitate learning. The objective of the *Fundisa for Change* intervention course was to strengthen the teaching of environmental concepts in schools (Fundisa for Change, 2013). This was done, but still needs to be strengthened for all the themes.

The participating teachers' transformative thinking and action should be evident in their teaching and assessment practices, the use of resources and the integration of values in teaching. These findings are discussed in the ensuing sections.

### 6.3 Teaching strategies

This section addresses the research question about teaching strategies that the teachers resorted to when teaching environment and sustainability knowledge. The participating teachers were taught experiential, active and investigative teaching strategies in the *Fundisa for Change* intervention course (see Table 5.3, Chapter 5). Each teaching strategy was linked to skills that could be developed in learners. The participating teachers were expected to use the teaching strategies taught in the intervention course to teach environment and sustainability or use other learner-centred approaches in their classroom practices. In Chapter 2, transformative pedagogies were described as teaching and learning methods that are participatory, learner-centred, interactive and

transformative (see 2.4.1). With respect to Mezirow's transformative learning theory, reflection on teaching strategies was regarded as process reflection. Mezirow (1991) argues that process reflection is concerned with *how* we perform the functions of perceiving, thinking, feeling or acting. Therefore, in this study the teaching strategy chosen to teach sections on environment and sustainability knowledge is part of process reflection.

***Key finding: Four out of five teacher participants did not implement transformative teaching and learning strategies in teaching environment and sustainability knowledge.***

In the one-on-one interviews, teacher participants were asked to reflect on the teaching strategies they used to teach environment and sustainability before and after the course. The participating teachers reflected on the teaching strategies they used after the course in relation to teaching strategies taught by the *Fundisa for Change* course. Four out of five teacher participants said that they changed their teaching methods after the course, except Teacher E who said teaching methods remained the same after the course (see Table 5.8, Chapter 5). Teachers A and B said that they now use learner-centred approaches, Teacher C said she uses the textbook, fieldwork within the school and information from different websites. Teacher D said she now uses information transfer, research, fieldwork and cellphones, whilst Teacher E said she uses videos, practical work and fieldwork within the school.

The participating teachers' responses to the one-on-one interview question were compared to the results of the lesson observations. There was no alignment in what teachers said and what they do for four of the five participants. Lesson observations revealed that Teacher A relied on reading for information; Teachers B and D used reading for information, information transfer, class discussion, dialogue, and question and answer methods; Teacher C also used reading for information, class discussion, group discussion, and question and answer methods; whilst Teacher E depended on writing notes, fieldwork within the school, media and reading for information. It is evident that most of the participants relied on reading from the textbooks to get through the section, discussion and information transfer. Of the five participants, Teacher E attempted to vary

teaching strategies. Despite the transformative intentions of the *Fundisa for Change* course, it seems as if most participants did not desire to change their habits of mind. Consequently, four of the five participants' teaching strategies did not reflect much change because they were still using the teaching methods that are not learner-centred.

Borg *et al* (2012) contend that traditional teaching from the front of the class is still a common teaching method in Swedish schools, even though it is utilized in combination with other approaches. Borg *et al* (2012) further argue that the most commonly used teaching methods in teaching sustainable development in Swedish schools are discussion, lectures, small group research, interdisciplinary work and class debates. In a study conducted in Lesotho after teachers were trained on ESD, Raselimo and Wilmot (2013) found that teachers did not adopt teaching strategies that encouraged learner participation. This shows that what most teacher participants have been doing in this study is not unique to South Africa. I would therefore argue that most participating teachers were not implementing the teaching strategies that they have learned from the course, except Teacher E who had been implementing a few of those methods. Studies from Sweden and Lesotho indicate that it is not easy for teachers to adopt different teaching strategies after the TPD course.

Nawab (2017) contends that students benefit if teachers implement what they have learned from the TPD programmes. Nawab (2017) further argues that improving teaching skills during the intervention course does not guarantee implementation in the real situation. Individual teachers scrutinize the applicability and practicality of what they have learned when courses end. In this case, most of them did not implement most of the teaching strategies that they had learned in the course or other transformative teaching strategies. Smith (2013) argues that teachers need to adopt transformative teaching strategies, where learners are encouraged to think critically and reflect on issues around them in teaching environment and sustainability. There is still a need to promote such teaching methods in teaching environment and sustainability knowledge. One can deduce that the short intervention course was not adequate to bring about effective change in teaching strategies. Several studies show that prolonged or continuous teacher professional development is more effective in developing knowledge and skills than

shorter programmes (Avalos, 2011; Steyn, 2010; Singh, 2011 & Nawab, 2017). Ono and Ferreira (2010) argue that short intervention programmes are less likely to result in improvement of teaching, because they are brief, fragmented and isolated from classroom situation.

The challenges observed in participating teachers' ability to engage in process reflection on teaching strategies are also evident on assessment practices.

### 6.4 Assessment practices

This section answers the research question on the assessment practices that teachers resort to when assessing environment and sustainability knowledge. The question is answered by comparing and contrasting evidence from the *Teaching Climate Change* manual, interviews, lesson observations and assessment documents. The *Teaching Climate Change* manual exposed the participating teachers to central geographic questions (see Table 5.4, Chapter 5). The central geographic questions in the *Teaching Climate Change* manual are aligned to the key questions that geographers can ask that are listed in the CAPS and are related to Geography's big ideas (Department of Basic Education, 2011). The central geographic questions range from factual to deep levels of thinking. In addition, the national curriculum stipulates that formal assessments must cover a range of cognitive levels which include low, middle and high order questions (Department of Basic Education, 2011).

As with teaching strategies, reference will be made to Mezirow's (1991) critical reflection, and in particular process reflection, to discuss this section. According to Mezirow (1991), process reflection refers to the examination of *how* we perform functions of perceiving, thinking, feeling and acting. Cranton and King (2003) argue that process reflection involves how we handle problem solving strategies. Findings are discussed to reveal evidence of transformative thinking and action for the participating teachers.

***Key finding: There was no evidence of any change in the manner in which participating teachers assessed learners on environment and sustainability knowledge. They relied on common formal assessments provided by the***

***Department of Basic Education and activities from the textbooks and previous question papers for informal assessments.***

Evidence from the one-on-one interviews revealed that the participating teachers did not set questions on their own for formal and informal assessments. All the participating teachers relied on common assessments that are provided by the DBE. Teacher D said even though the DBE allows them to set their own papers, they did not do so because the process of moderation is time consuming. The provision of common assessments by the DBE does not give the teacher participants a chance to practice what they have learned from the course. Lesson observations also reveal that the participating teachers relied on textbooks and previous question papers for informal assessments (see Table 5.13, Chapter 5). Teacher A relied on the textbook and previous question papers for class activities whilst Teachers C and E used the textbook for class activities and homework activities respectively. Teachers B and D did not expect learners to write in their workbooks, but asked questions orally. Evidence does not suggest any change in the way the participating teachers conducted informal assessments, because they relied on textbooks and previous question papers for classwork and homework activities. Therefore, this indicates that the participating teachers are weak on process reflection despite attending the course.

One could conclude that even after participation in the *Fundisa for Change* course, with its transformative intentions, the participating teachers did not show any change in the way in which they assessed learners. During the one-on-one interviews with the Department of Basic Education officials, both the provincial and national officials indicated that the participating teachers were encouraged to use common assessments in assessing learners. The provincial official said that teachers are encouraged to use common assessments in order to expose learners to questions that require different cognitive levels. The national official from DBE said provinces prefer common assessments because they are "*quality assured and of good standard"*. According to Archer (1995), any event in social life is determined by the interactions between structure and agency. Consequently, how teachers as agents chose to assess learners was influenced by the structure that governs their teaching practice.

UNESCO (2017) argues that assessment is an integral part of teaching and learning, which includes assessment ‘as’, ‘for’ and ‘of’ learning. This means that assessment should not only be utilized for progression to the next grade. Assessment should allow learners to monitor their own learning and be developmental. The participating teachers did not set their own questions for either formal or informal assessments, which made it difficult to determine the depth of their knowledge of the concepts of environment and sustainability. Noguera, Darling-Hammond and Friedlander (2015) argue that highly effective teachers support the process of meaningful learning by crafting ambitious and meaningful tasks that reflect how knowledge is used in the field. Cooper and Cowie (2010) argue that teachers should not just rely on assessment of learning, but also assessment for learning and assessment as learning.

Evidence from assessment plans for Grade 11 and 12 revealed that different types of formal assessments are administered (see Table 5.11, Chapter 5). One of the formal assessment tasks required of the Grade 11 and 12 learners is a research task (see Tables 5.12a and b, Chapter 5). The research task is administered to determine learners’ ability to conduct observation, experiment, investigation and interpretation. These research tasks were provided by DBE. The research tasks exhibit the integration of environment and sustainability concepts. The integration of environment and sustainability concepts in assessments encouraged participating teachers to include them in teaching the content knowledge. However, the participating teachers still did not show autonomy in setting the tasks. This was exacerbated by DBE through the provision of common assessments.

Ferreira and Molala (2017) argue that assessing environment and sustainability is a challenge for most teachers. Ferreira and Molala (2017) further argue that one of the concerns that render assessment ineffective is teachers’ inadequate knowledge of the concept of the environment and limited awareness of teaching approaches. There is also a challenge of inadequate assessment of affective skills where learners can express their own views, feelings or critical matters with respect to sustainability concerns (Bholah & Shumba, 2018). In this study, it was not possible to tell if participating teachers could set questions on environment and sustainability as a result of weak process reflection. This would be an area of further study.

The choice and use of resources are also important in teaching environment and sustainability knowledge.

### 6.5 The use of resources in teaching

This section deals with responses to the question on the resources that teachers use to teach environment and sustainability knowledge. Evidence to answer the question is drawn from the *Teaching Climate Change* manual and lesson observations. Once more, reference is made to process reflection in terms of Mezirow's transformative learning theory as discussed in sections 6.3 and 6.4 above.

***Key finding: Four out of five teacher participants relied heavily on the textbook rather than exposing learners to different resources to encourage them to analyse and evaluate information.***

Evidence from lesson observations unveils that four out of five participating teachers relied heavily on the textbook, except for Teacher E. Table 5.10, in Chapter 5 above, showed that Teachers A, B and C relied on reading for information from the textbook with learners in class, followed by explanation. The teaching strategies used were not different to those they had utilised prior to participating in the *Fundisa for Change* course. Teacher D used the textbook in conjunction with notes that she had prepared for the learners independently from the textbook. Teacher E used a variety of resources, which meant she displayed transformative thinking and action in the use of different kinds of resources to teach environment and sustainability knowledge. This suggests that four of the five participating teachers have stuck to traditional kinds of resources, which could be because of lack of initiative. Again, process reflection is found to be weak in the way most participants used the resources in teaching environment and sustainability knowledge.

Knight (2015) argues that textbooks are generally viewed as reliable sources of credible information that support and enhance students' understanding and learning of concepts, but they do not always provide up to date information. Knight (2015, p.4) further argues that "*when information is transmitted traditionally to the learner through the textbook, the learner is viewed as a passive recipient*". The textbooks could have been handed to the learners so that they could make meaning and interpretation of the concepts on their own

(Adler, 2000). Table 5.10 shows that information was read from the textbook during lesson observations, where learners were instructed to read aloud. Laurie *et al* (2016) argue that quality education is not based primarily on fact acquisition, because information is easily acquired in today's interconnected world. Laurie *et al* (2016) further contend that education requires knowing how to analyze information, make sense of its abundance and complexity, cooperate with others and communicate results. However, most participating teachers, despite having been exposed to different and more inspiring pedagogical strategies, have resorted to traditional resources. To be transformative, teachers needed to break with traditional methods and adopt the use of different kinds of resources. In terms of process reflection, participating teachers seemed to remain unaware of developing practices that would engage learners in analysis and evaluation. The *Fundisa for Change* intervention course was an attempt to inspire teachers to use 'different kinds of resources in order to encourage analysis and evaluation rather than transferring information.

The Department of Basic Education has provided most public schools in the Gauteng province with smart boards so that multiple sources can be used in teaching and learning. However, the smart boards can only be a useful resource if people know how to use them. Teacher A had challenges in using the smart board. Teacher B did not try to use the smart board during lesson observations. Teacher C used the smart board to show images of anabatic and katabatic winds. Teacher D used the smart board to show images of resources that can be recycled and reused while teaching 'resource use and sustainability'. Teacher E used a PowerPoint presentation and other media which allowed her to use recent information to integrate environment and sustainability from the internet. One could argue that the participating teachers should have the know-how to use ICT (Information and Communications Technology) in their classroom practices, which includes the use of smart boards. This will allow them to use up-to-date information in teaching. Transformative thinking and action, in this instance, would include showing willingness to learn to use the technology in the teaching and learning process.

Knight (2015) argues that today's learners are highly exposed to technology, which can be used to enhance their learning. Millar and Schrier (2015) argue that the generation of

learners which is at school now and its teachers are constantly connected through technology, but it seems to be a challenge for many teachers who did not grow up using it in schools. Haubrich *et al* (2007) argue that ICT literacy is becoming a major learning tool because the reach of print media is gradually diminishing while digital media is on the rise. As much as the participating teachers might have grown up without technology, they should be willing to learn so that they can enhance their teaching practices. Their willingness to learn will help them to effect change in their teaching practices.

The integration of attitudes and values is also important in teaching and learning for ESD.

### 6.6 The integration of values in teaching ESD

Lewis et al (2008) define values as principles or convictions that guide people's behavior. Values in education are integral to ESD. The research question that is answered in this section is, "*In what ways do teachers integrate environment and sustainability values in their teaching and assessment practices?*" In this study, the integration of environment and sustainability values, and local and community values in teaching was examined. Evidence is drawn from the *Teaching Climate Change* manual and lesson observations.

***Key finding: All the participating teachers integrated environment and sustainability values spontaneously into their lessons without stating them in their lesson plans. The values were fostered through examples, discussion and dialogue during lessons.***

The *Teaching Climate Change* manual supports the development of values in learners as described in the CAPS (see 5.2.4, Chapter 5). The following values were drawn from the national curriculum:

- *A concern for the sustainable and fair use of resources for the benefit of all;*
- *Recognising the significance of informed decision making;*
- *The application of geographical knowledge and skills in learners personal lives;*
- *Respect for the rights of all people; and*
- *A sense of fairness, sustainability and equality* (Department of Basic Education, 2011, p.9).

The *Teaching Climate Change* manual indicates that learners should be afforded a chance to explore values held by other communities. Learners are also encouraged to engage and share ideas with the local community to develop a sense of stewardship, citizenship and agency. The teachers and learners are empowered to become active agents of change in the climate change discourse. Vogel *et al* (2013) argue that the teaching methods such as critical deliberation and values clarification may be used to foster attitudes and values. Rosenberg *et al* (2008) argue that critical deliberation is a teaching method that enables learners to express their views and values so that they can come to a newly improved understanding, whilst values clarification enables learners to challenge the values they hold in relation to their actions.

The *Teaching Climate Change* manual outlined the attitudes and values as stipulated in the national curriculum. However, the *Teaching Climate Change* manual did not clarify the environment and sustainability values. These need to be clear to ensure that they are applied in the process of teaching and learning.

The participating teachers fostered the following environment and sustainable values during lesson observations (see Table 5.14, Chapter 5):

- a concern for sustainable and fair use of resources;
- the application of geographical knowledge and skills in learners' personal lives;
- enhancing the level of awareness;
- a sense of stewardship;
- cultivating the desire to fit new perspectives into the broader context of one's life;
- pro-environmental behavior; and
- recognizing the significance of informed decision making.

The participating teachers promoted the above environment and sustainability values without writing them into their lesson plans. I elicited these values from the examples, discussion and dialogue implemented during lesson observations. The integration of values in teaching involves the participating teachers' awareness of what is happening in their world, which might include their value systems (Kitchenham, 2008). Mezirow (1991) argues that becoming aware of *why* we think, feel and act in a particular way is referred

to as premise reflection. Cranton and King (2003), Kitchenham (2008) and Merriam and Bierema (2014) maintain that premise reflection has the potential to transform meaning perspectives.

All the teacher participants integrated different values during lesson observations through examples, discussion and dialogue in classroom practice (see Table 5.14, Chapter 5). Teacher A used examples and discussion to foster a concern for sustainable and fair use of resources when teaching *sustainable development*, and the application of geographical knowledge and skills in learners' personal lives when teaching the monsoon and fohn winds. Teacher B enhanced the level of awareness and a sense of stewardship through dialogue when teaching about the informal sector. She again tried to enhance the level of awareness through class discussion when teaching anticyclonic travelling disturbances. Teacher C fostered a concern for sustainable and fair use of resources and also cultivated a desire to fit new perspectives into the broader context of one's life when referring to solar geysers installed at an area nearby as an example in teaching long term energy use in South Africa. Teacher C also tried to enhance learners' level of awareness through examples when teaching drought and desertification. Teacher D tried to promote pro-environmental behavior and a sense of fairness, sustainability and equality in teaching globalisation. Teacher D utilized dialogue to support a concern for the sustainable and fair use of resources in teaching resource use and sustainability. She also encouraged the application of geographical knowledge and skills in learners' personal lives in teaching urban heat islands. Teacher E adopted discussion to foster the recognition of the significance of making informed decisions and the application of geographical knowledge and skills in learners' personal lives in teaching the use of resources and soil respectively. Table 5.14 in Chapter 5 above shows that the participating teachers were fostering environment and sustainability values by drawing examples from discussions and debates on social and cultural issues in learners' communities, in their country and globally. This shows that the participating teachers were aware of what is happening in their world, which means their value systems reflected an element of transformation. As mentioned above, we should bear in mind that we cannot tell when and how transformation takes place. The fact that the participating teachers could spontaneously infuse values into their lessons could indicate the effect of the

course. Regardless of the gaps in content and process reflection, interestingly there was a significant leap on how teachers express values in teaching and learning. On that account, the participating teachers' value system might have been changed or affirmed by the *Fundisa* for Change intervention course, which seems to indicate the capacity for premise reflection.

The examples given by the participating teachers in explaining concepts during lesson observations were drawn from the community in which learners live. This practice can improve learners' understanding because concepts are explained by referring to a community's issues that are known to learners, which might develop or transform their values. Chineka and Mukundu (2017) contend that classrooms provide platforms for dialogue where teachers and learners' concerns are valued. They further argue that dialogue results in quality education as learners choose and adopt sustainable lifestyles. The quality of interaction between students and teachers has implications for students' learning and the nurturing of values. Hernando (1998) argues that values in education are inspired by social and cultural considerations and they should be reflected in learners' behaviour. Therefore, teachers have a role in nurturing values that promote positive and responsible behaviour that is transferable beyond the classroom.

Vogel *et al* (2013) argue that the integration of values can be strengthened by implementing teaching methods that are more communicative, such as case studies, role play, investigation methods, deliberative methods and values clarification strategies as reflected in the *Teaching Climate Change* manual. Deliberative and values clarification teaching strategies can be promoted through dialogue in class. According to Mezirow (2000), dialogue is about finding agreement, welcoming difference, considering other viewpoints and identifying common contradictions. Cranton and King (2003) argue that people engage in dialogue so that they can challenge and construct new meaning. Dialogical lessons take the form of conversation involving alternative views. Even though teacher participants have shown transformative thinking and action in integrating values in teaching, there is still a need for the participants to consider other teaching methods that encourage critical deliberation and values clarification to strengthen the development of values. The participating teachers also need to include attitudes and values into their

lesson plans to ensure that they are deliberately incorporated into the lessons. The participating teachers are including values spontaneously rather than deliberately in the design of activities that learners engage with.

It would have been interesting if participating teachers could have shown the importance of working as a collective in addressing environmental problems, as advocated in the *Ubuntu* framework. As discussed in the literature review in Chapter 2, *Ubuntu* philosophy stresses collectivity which contributes to sustainable lifestyles (Shumba, 2011). Bolden (2014) argues that *Ubuntu* principles include caring and community, harmony and hospitality, respect and responsiveness that expresses people's interconnectedness (see section 2.4.4, Chapter 2). One could argue that these principles can strengthen sustainability values because they emphasize caring for others and the environment as a collective. Therefore, one expects such principles to be integrated into teaching and learning so that learners can understand that solving environmental problems needs all community members to be involved. Embracing such principles in education might help learners to acknowledge humanity in themselves and others.

The one-on-one interviews and lesson observations reveal aspects that constrain or enable the implementation of ESD in classroom practice. The findings discussed above show that teachers' practices are not only a result of teachers' action or agency; they are also influenced by the structural conditions and culture of the Department of Basic Education.

### 6.7 Constraints and enablers in implementing ESD

The effectiveness of the *Fundisa for Change* intervention course was influenced by the structure and culture of the Department of Basic Education which has an influence on participating teachers' classroom practices. This section answers the question on the constraints on and enablers for implementing ESD in teaching practices. In Chapter 2, practice is described as an action that is informed by traditions in the field (Kemmis and Smith, 2008). This implies that teaching practice is informed by the customs that guide the actions of teachers. In discussing constraints and enablers in implementing ESD, reference will be made to Archer's (1995; 2010) realist social theory of morphogenesis

(see section 3.3 in Chapter 3). Archer (1995) argues that social change is an outcome of the interaction between agency and structure. Agents in this study refer to teachers, whilst structure refers to the rules and regulations of the Department of Basic Education and the curriculum. This means that teaching practices result from the interaction between teachers' agency and the structure of the Department of Basic Education. Teaching practices for ESD are either constrained or enabled by this interaction.

### 6.7.1 Constraints to implementing ESD

***Key finding: The Department of Basic Education hindered teachers' transformative thinking and action by providing generic lesson plans and common assessment tasks, tests and examinations.***

All the participating teachers use the generic lesson plans and common assessment tasks, tests and examinations that are provided by DBE. The Department of Basic Education provides generic lesson plans, but teachers are expected to adapt them to their needs. However, all the participants use the generic lesson plans without making any alterations (see section 5.6.1, Chapter 5). Pang (2016) argues that lesson planning should be flexible to cater to the nature of learning in the learning context. One could argue that teachers need to consider the learning context or be flexible in planning lessons. There is a need for teachers to alter the generic lesson plans in order to cater for the needs of their classes and to ensure that environment and sustainability concepts are incorporated in their lessons where necessary.

Department of Basic Education officials encourage teachers to use common tests, tasks and examinations set at district, provincial and national level. The official from the National Department of Basic Education argues that common assessments help in maintaining standards and preparing learners for examinations because they require learners to be able to answer low, middle and high order question which is a challenge for some teachers to set on their own. The stance of the official from the Gauteng province on assessment is that most teachers set lower order (objective) questions when they design their own assessments, which does not train learners to answer higher order questions (see 5.4.6, Chapter 5). Common assessments enhance and improve learners understanding and application of the concepts. It could be better if teachers could learn

to set these papers on their own. These suggest that the Department of Basic Education is hindering participants' transformative thinking and action by providing them with generic lesson plans and common assessments tasks.

The use of generic lesson plans has an impact on the choice of teaching strategies, resources used and assessment practices. Molapo (2014) and Loubser and Simalumba (2016) have noted different challenges in implementing ESD in Lesotho and Namibia respectively. Molapo (2014) argues that teachers in Lesotho have adequate knowledge and awareness of environmental problems, but they are not able to translate these into everyday practices. Loubser and Simalumba (2016) argue that teachers in Namibia know and understand environmental concepts, but they do not use a variety of teaching skills and alternative assessment in their practice. This implies that the constraints in implementing ESD are not just peculiar to South Africa. However, the constraints noted in this study are exacerbated by the use of generic lesson plans and common assessments. This suggests that the provision of generic lesson plans and common assessments by DBE weaken process reflection, which has a negative impact on transformative teaching practices for ESD.

Teacher participants' thinking and actions are not just individualistic, but they are also influenced by the social context in which they occur (Clark & Wilson, 1991; Taylor & Cranton, 2013). According to Porpora (2013), any social change can be explained in terms of particular structure, culture and the agents involved. Porpora (2013) argues that people always act out of structural circumstances which either modify or sustain their actions (see 3.3.2 in Chapter 3). Even though the *Fundisa* for Change intervention course attempted to inspire teachers to transform their classroom practices, the use of generic lesson plans and common assessments seem to be sustaining the classroom practices that were operational before the course. Archer (1995) argues that when a system maintains its structure, morphostasis occurs, as it is in this instance, where the DBE system is acting as a constraint in the implementation of ESD. The generic lesson plans and common assessments are specific structures that are locking the system in morphostasis. This suggest that teachers within the DBE system believe that the generic

lesson plans and common assessments that they are provided with are of quality, which add to the maintenance of the status quo.

In the ensuing section, aspects that enable the implementation of ESD are discussed.

### 6.7.2 Enablers in implementing ESD

***Key findings:***

- ***All the participating teachers had adequate knowledge and understanding of environment and sustainability knowledge.***
- ***All the participating teachers could integrate environment and sustainability values in teaching***

Whilst it appears that teachers were constrained by the DBE system, there were a few elements that could be seen as enablers for the implementation of ESD in classroom practice. These were the participating teachers' ability to identify environment and sustainability knowledge, assessment and the integration of values in teaching environment and sustainability knowledge. Section 6.2 above showed that participating teachers had adequate knowledge that enabled them to identify environment and sustainability knowledge in the Geography national curriculum statement (CAPS). This suggests that the participating teachers had adequate knowledge and understanding of ESD.

The assessment plan provided by DBE showed that there are different kinds of assessment tasks that are to be conducted in the Geography classes in secondary schools. The assessment tasks that learners are exposed to have environment and sustainability concepts. These enabled the participants to apply environment and sustainability concepts in teaching. The participants demonstrated transformative thinking in the application of the concepts in teaching environment and sustainability knowledge. However, it was not the teacher participants' agency that drove this change, instead the structural conditions of the DBE influenced the change seen in the application of those concepts.

The participating teachers also exercised their powers in the integration of environment and sustainability values in teaching (see 6.6 above). All the participating teachers could incorporate values in teaching ESD using examples, discussion and dialogue, even though they did not include them in their lesson plans. Evidence from lesson observations shows that values promoted by the participating teachers in classroom practices mirrored what was happening in the communities in which learners lived (see Table 5.14, Chapter 5). As discussed in Chapter 2, classroom dialogue stimulates and extends learners' thinking, and advances understanding of concepts (Sedova *et al*, 2016). Larrain *et al* (2018) argue that dialogue allows learners to support a particular position in discussing issues and to reach an understanding of the concepts. Most of the participants used examples and discussion, but Teachers B and D also engaged learners in dialogue to nurture values. All the participants exhibited a degree of premise reflection in the integration of values in teaching ESD, which resulted in transformative thinking and action.

Putnam and Borko (2000) argue that learning is about understanding the concepts and developing skills, as well as enculturation of individuals into communities' ways of life. Mandikonza and Lotz-Sisitka (2016) argue that agents' functions are either enabled or constrained by structures and cultures in which they find themselves. In this case, the teacher participants' agency enabled the implementation of ESD to a certain extent. This means that participating teachers chose to transform their knowledge to a certain extent which enabled them to be able identify environment and sustainability content in the curriculum, and also to integrate such knowledge and values in classroom practice.

### 6.8 Summary

In this chapter, I have discussed findings based on the data presented, interpreted and analysed in Chapter 5. The discussion focused on the following themes: namely teachers' conceptions of environment and sustainability content knowledge, teaching strategies and assessment practices used in teaching ESD, resources utilized to teach environment and sustainability knowledge, the integration of attitudes and values in the teaching environment and sustainability knowledge, and the constraints and enablers in implementing ESD. Evidence shows that there is little change on content knowledge and

values, but no change is evident on teaching strategies and assessment practices used by the participating teachers. With reference to Figure 3.1 (see Chapter 3, section 3.3.2 page 66), teaching and assessment practices are sustained which results in morphostasis. In the discussion, reference was made to Mezirow's transformative learning theory and Archer's realist social theory of morphogenesis and the ESD literature. The discussion focused on whether teacher participants showed evidence of transformative thinking and action after attending a short teacher professional development course on ESD.

An analysis of the five cases employed in investigating teacher practice indicates that some transformation pertaining to ESD occurred as a result of participating in the *Fundisa* for Change intervention course. In one case, the teacher indicated a change in beliefs towards ESD, whilst others indicated that change was related to strengthening what they already knew about climate change. In all of the five cases, there was an indication of expanded frames of reference brought about by the intervention course. In terms of the expanded frames of reference, the participating teachers now know how to identify and relate climate change units to the Grade10 to 12 Geography curricula.

Another significant finding is associated with how teaching strategies and resources were used in the five cases. One out of five teacher participants varied teaching strategies, whilst four were dependent on traditional teaching strategies. In addition, one out of five participating teachers varied resources in teaching environment and sustainability knowledge, which shows that four did not engage their learners in analysis and evaluation of information as suggested in the *Fundisa for Change* intervention course. One can deduce that the *Fundisa for Change* intervention course was not enough to bring about effective and far reaching change in teaching strategies and the use of different resources in teaching environment and sustainability knowledge.

In terms of assessment practices, all the participating teachers relied on textbooks and previous question papers for informal assessments such as classwork and homework. They also depended on common tests, tasks and examinations provided by DBE for formal assessments. It was difficult to determine the depth of participating teachers' knowledge on assessing environment and sustainability because they did not design their

own informal and formal assessments activities. However, the Grade 11 and 12 research tasks provided by the Department of Basic Education promoted the integration of environment and sustainability in the teaching practices of participating teachers.

All the participating teachers integrated environment and sustainability values into their classroom practices through examples, discussion and dialogue. They all integrated environment and sustainability values spontaneously rather than deliberately in the design of activities that learners engaged in. These activities were not recorded in lesson plans. Even though the integration of values was found to be spontaneous rather than deliberate, it is evident that participating teachers were able to identify what was happening in their world. The ability of the teacher participants to spontaneously integrate environment and sustainability values knowledge enabled the implementation of ESD in classroom practices.

The implementation of ESD in classroom practices was constrained by the system of education. The Department of Basic Education promotes ESD through integration in the curriculum, yet they are stifling teachers' creativity by providing them with generic lesson plans and common assessments. In this case, the generic lesson plans and common assessments are part of the structural conditions of the South African education system that are negatively affecting teachers' autonomous thinking and action. However, the assessment activities provided by the Department of Basic Education to schools also promoted the application of environment and sustainability concepts in teaching, even though change was not driven by the teachers themselves.

In the ensuing and concluding chapter, I provide an overview of the thesis, describe the limitations of the study, make recommendations for further research and outline my contributions.

# Chapter 7

# Recommendations and conclusions

## 7.1 Introduction

The research presented here sought to contribute to an understanding of the influence of the *Fundisa for Change* teacher professional development short intervention course in improving Geography teachers' capacity for effective implementation of ESD in secondary schools. The relevance of teacher training and teacher preparation for the development of a sustainable society was raised in Chapter 1, where the study's questions were outlined. The short course aimed to improve in-service teachers' environment and sustainability content knowledge, teaching practices and assessment practices, as well as transforming their value system in relation to classroom practices. To ensure that learners acquire knowledge and skills that promote sustainable development, teachers need to transform their thinking and action, which will in turn transform their classroom practices. However, a significant finding was that the structural conditions of the DBE and the culture of the participating teachers' workplace influenced their thinking and action.

This final chapter is organized as follows:

- An overview of the study in relation to the research questions;
- A description of the limitations;
- Recommendations for further research;
- Contributions of the study; and
- Reflections and concluding remarks.

## 7.2 An overview of the study

This study focused on investigating the transformation of teachers' environment and sustainability content knowledge, pedagogical practices and the integration of values in teaching Geography in secondary schools. In this study, the participating teachers attended the *Fundisa for Change* short teacher professional development course, where they were trained in ESD using the *Teaching Climate Change* manual. The main aim of

the study has been to determine the effectiveness of the *Fundisa* for Change intervention course for improving teachers' capacity for effective implementation of ESD.

The literature review chapter described the origin and development of ESD and its transformative learning intentions. The chapter highlighted different types of teacher professional development (TPD) programmes, their significance and ESD transformative practices. Patton *et al* (2015) argue that TPD is important in improving teachers' knowledge, skills and values that intensify learners' performance. The implementation of ESD in schools both nationally and internationally reveals challenges and different levels of implementation experienced in the different countries considered in this study. The level of implementation of ESD in schools can be realized in teachers 'sayings', 'doings' and 'relatings' in their practice (Kemmis & Mutton, 2012). The 'sayings' reflect teachers understanding, the 'doing' reflects their action, whilst the 'relatings' refer to the influence of structural conditions and the culture of the Department of Basic Education on teaching practices in ESD. TPD is expected to help transform teaching and assessment practice.

Chapter 3 examined Mezirow's (1991; 2000) transformative learning theory and Archer's (1995; 1998) realist social theory of morphogenesis as theoretical lenses used to describe teachers' transformative thinking and action in their classroom practices. The significance of transformative learning theory is the transformation of habitual frames of reference in order to change individual perspectives. Grabove (1997) argues that teaching is a social activity; therefore, Archer's realist social theory of morphogenesis was used to understand change in teaching practices in the social context. Indeed, this study found that the structure of the Department of Basic Education and the culture of teachers' workplace have an influence on the teachers' classroom practices.

In Chapter 4, the research design and methodology used to conduct the investigation was discussed. The qualitative interpretive research design based on a case study research method was employed to explore the influence of the *Fundisa for Change* teacher development programme, with five cases (teacher participants) embedded in it. Purposive sampling was conducted to select the teacher participants and their sites. Data were analysed using thematic content analysis, where themes were drawn both inductively and deductively from the data sets.

This thesis has revealed its findings by analysing the intentions of the *Fundisa for Change* course through document analysis, interviews and lesson observations. Based on the findings which are uncovered in Chapter 5 and discussed in Chapter 6, it could be argued that the *Fundisa for Change* short teacher professional development intervention course was not sufficient to transform teachers' frames of reference to enable them to implement ESD effectively. According to Singh (2011), teacher professional development programmes must become part of the teacher's daily work and not be viewed as an event. To this end, Putnam and Borko (2000) and Nawab (2017) argue that teacher learning is effective and meaningful when it is continuous and ongoing.

In the next section, the limitations of the study are highlighted.

### 7.3 Limitations

The study has limitations that are related to the case study method conducted for investigation. The case study method was implemented because the research sought to gain the richness of real-life context and lived experiences of the teachers who attended the *Fundisa for Change* short intervention course. While the case study method limits generalizability of the findings (Gall *et al*, 2010), the study provides insight into the effectiveness of a short teacher intervention programme for capacitating teachers. Simon and Goes (2013) argue that the case study approach might suggest what can be considered in similar situations, even though additional research might be needed to verify the findings.

The study was conducted in five school sites with five Geography teacher participants in a single district of the Gauteng Department of Education. The study could have included schools in other districts in the Gauteng province and also from other provinces in South Africa in order to generalize the findings more widely. The participating teachers from a single district were chosen because *Fundisa for Change* trained teachers from that particular district at that particular time. A more extensive sample of schools in different districts could yield results that could be generalized. Additional research would be needed to establish ESD practices for teachers who were not involved in the course.

The teacher participants who took part in the study were selected purposively because the intention of this study was to work with teachers who attended the *Fundisa for Change* course. I have used multiple data sources in order to confirm the emerging findings so as to ensure their credibility (Merriam, 2009). This helped to trace if data from one source concurred with data from another source. To reduce the researcher's bias, member checking was conducted after transcribing data to ensure that participants' ideas were represented accurately.

Based on the findings and limitations, recommendations for further research are presented in the next section.

### 7.4 Recommendations and further research

It is worth noting that mediation has a limited potential to enhance teachers' capacity for mainstreaming ESD, based on the discussion of findings highlighted in Chapter 6. The recommendations highlighted in this study include the structure of the teacher professional development courses; the influence of school organization and recommendations for further research.

#### 7.4.1 The structure of the course

The *Fundisa for Change* short teacher development course had an impact to some extent on participating teachers' content knowledge and the integration of values in teaching and learning. However, it had minimal impact on the implementation of ESD pedagogies, assessment practices and the use of resources. Patton *et al* (2015) argue that teacher development courses are more likely to have an impact if they are continuous and ongoing. Nawab (2017) argues that the improvement of knowledge and skills during an intervention course does not necessarily guarantee implementation in the real situation. *Fundisa for Change* could have made more impact if it was structured as a continuous rather than a short intervention programme.

There is a need for the *Fundisa for Change* intervention course to be structured differently so that it can continue to support teachers' content knowledge, teaching and assessment practices, as well as the integration of values in teaching and learning. *Fundisa for*

*Change* need to include a component on participant reflection on current lesson plans and common assessments, so that they can implement new learning from the course. Ono and Ferreira (2010) and Steyn (2008) claim that short intervention programmes are less likely to result in improvement in teaching. Ono and Ferreira (2010) further argue that short courses are brief, fragmented, incoherent encounters that are decontextualized and isolated from real classroom situations. Thus, continuous teacher learning courses are seen to be more effective in improving practices (Patton *et al*, 2015) than short courses.

### 7.4.2 School culture and organization

It is also important to consider the school culture for the change that we envisage in classroom practices. It has been argued that participating teachers relied on DBE material (lesson plans and common assessments) because they are valued in the school and organizational culture. School organizations will always have an influence on teaching and assessment practices. Borg *et al* (2012) argue that it will be difficult to implement ESD effectively, if it is not part of the school culture. Hargreaves (2008) also maintains that a whole-school approach which advocates for active and participatory learning, where the entire school is engaged in working towards a sustainable school with ESD fully integrated into the curriculum, needs to be considered. Accordingly, further research is necessary on whole school approaches in the implementation of ESD.

Not only does the school organization influence teaching and assessment practices, the structure of the system of education also has a huge effect on how individual teachers teach. It has been found that the structural conditions of the DBE has a huge influence over teaching and learning in schools. Teachers are seen as primary agents lacking the role and agency to shift things on their own practices (Karlsson, 2020). This means that teachers as primary agents reproduce the structure of DBE because of lack of agency. If courses like *Fundisa for Change* can facilitate greater networking among participants after the course, teachers could support each other and increase their agency, with the goal of teaching ESD more effectively. In this way, teachers' collective and collaborative action as corporate agents might result in structural transformation or morphogenesis (Karlsson, 2020). DBE monitors and influences practices in schools through the District, the Provincial and the National office-based educators. I therefore strongly recommend that

the officials of the DBE should also be capacitated on ESD to ensure effective support for its implementation in schools.

### 7.4.3 Learners' understanding of environmental sustainability

The study was based on teacher development in ESD with a focus on climate change. Teaching practices were observed during lesson observations. Teachers were the unit of analysis in this study, which resulted in the learners' responses not being recorded during lesson observations. Borg *et al* (2014) argue that the relationship between teachers' understanding and what students learn might promote students' understanding of sustainable development. Further research is needed in assessing learners' understanding of the concept of environment and sustainability and the sustainability values that they carry into their lives from learning. It is important to equip learners with knowledge and nurture their values of environment and sustainability so that they can think critically about environmental problems and participate in alleviating environmental issues in their community.

## 7.5 Contributions of the study

In addition to the recommendations for further research, this study has contributed to the literature on short teacher professional development intervention courses for ESD in secondary school geography education. As mentioned above, short course teacher professional development has limited potential in transforming pedagogical practices. The findings in this study support the views propounded by Putnam and Borko (2000), Steyn (2010), Singh (2011) and Nawab (2017) who have argued that professional development is effective if it is a continuous and ongoing learning process.

One of the practical considerations relates to the implementation of transformative teaching methods and using different resources in teaching environment and sustainability knowledge. The participating teachers were found to be able to identify climate change knowledge from the curriculum, but most of them could not implement transformative teaching methods nor vary teaching resources in teaching environment and sustainability knowledge. A study conducted in Namibia by Loubser and Simalumba (2016) found that teachers did not use a variety of teaching skills in teaching environment

and sustainability knowledge. Loubser and Simalumba (2016) suggested that the DBE and external environmental education centres must support teachers in improving their skills. The support given by the environmental centre was studied in this case, but it did not necessarily yield the desired results because of the way the course was structured and the influence of the social context. McNaughton (2012) conducted a study with post-initial teachers reflecting on effective pedagogy for ESD on projects and initiatives used with learners in schools. These teachers reported that they had not used transformative pedagogies in teaching, even though they found them to be effective, enjoyable and interesting ways to teach. McNaughton (2012) contends that teacher-learning effective pedagogy results from reflection and not from planning and implementation.

Another practical contribution of this study relates to the integration of environmental and sustainability values in teaching practices. The participating teachers could integrate environmental and sustainability values into their teaching practices spontaneously through the design of activities that learners engaged in after attending the *Fundisa for Change* intervention course. However, the integration of values in learning should be part of the teacher's lesson planning so that it becomes deliberate. Putnam and Borko (2000) argue that learning is about enculturation of individuals into a community's ways of thinking and dispositions. Chineka and Mukundu (2017) argued that teachers should instill good citizenship by addressing learners' concerns that abide by the Earth Charter. My argument is that teaching should include local and community values, and environment and sustainability values in order to instill pro-environmental behavior and good citizenship.

Both the theoretical framework and empirical findings contribute to the understanding of the influence of this teacher professional development intervention course on participating teachers' teaching practices. This study contributes to examining the applicability of Mezirow's (1991, 2003) transformative learning theory to ESD in understanding teachers' transformation of frames of reference and how that influences individual teaching practices. Figure 7.1 below shows the influence of structure to teaching practices in this study. Archer's (1995) realist social theory of morphogenesis was used to explain the influence of the social context on participating teachers' change in pedagogical practices.

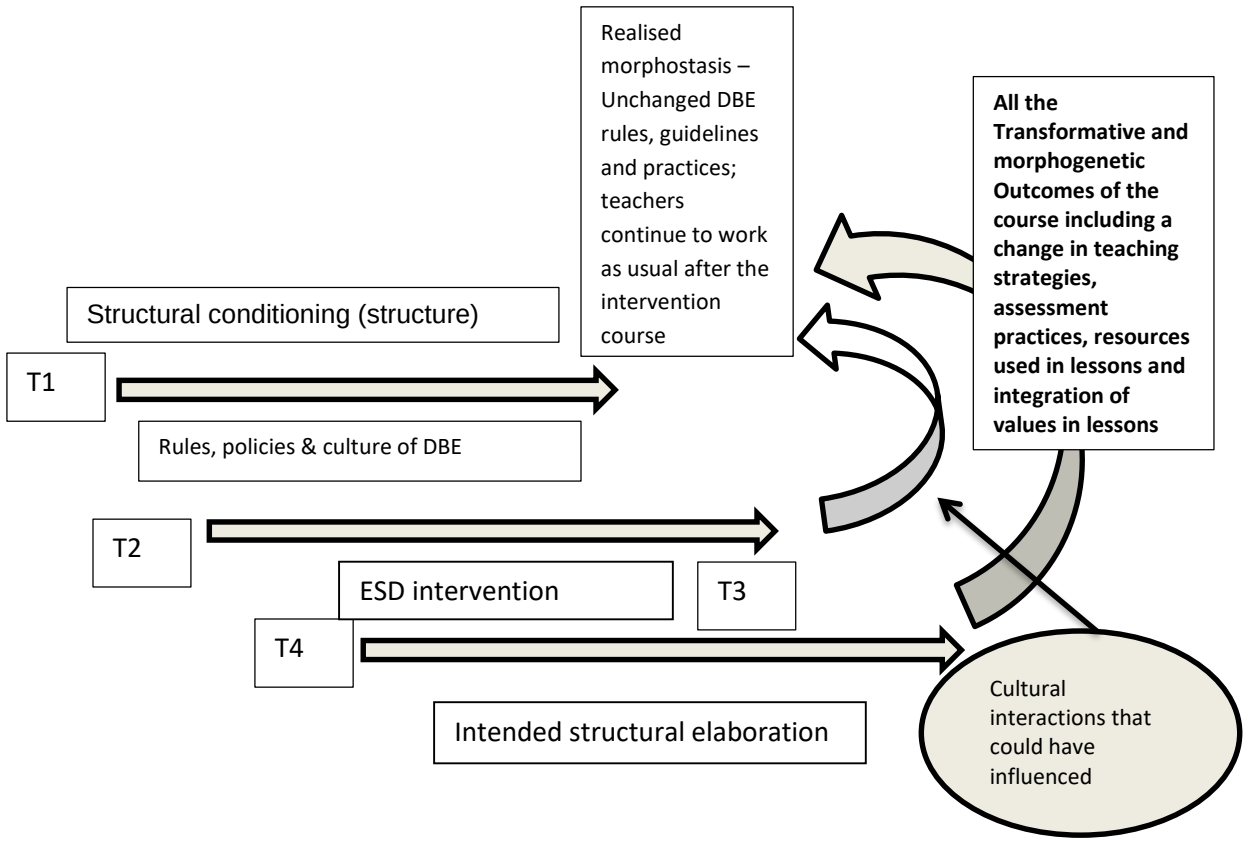


Figure 7.1 Morphogenetic cycle in this study

Archer's realist social theory of morphogenesis indicates that structure and culture influence agency. The period **$T^1$** indicates structural and cultural conditioning before the course. The period **$T^2$** - **$T^3$** indicates socio-cultural interaction before and during the intervention course, where teachers interacted with the *Fundisa for Change* course. The cultural interaction that could have influence teacher practice in this study are teaching strategies, assessment practices, resources used in lessons and values integrated in lessons in the implementation of ESD. The period **$T^4$** shows intended structural elaboration, where there are changes in school, DBE rules as well as teaching practices and assessment practices. The course resulted in morphostasis, where there is structural reproduction of rules and organization leading to sustained pedagogical practices. To this end, teachers continue to work as usual after the course and rules guiding their practice have not changed. If teachers engage with the teaching practices as expected from the

course, the practices would be transformed showing transformative morphogenesis outcomes. One would argue that the structure and culture of the DBE has an influence on teachers' pedagogical practices. These helped in explaining that teaching practices result from psychological factors (as explained using Mezirow transformative learning theory) and social factors (based on Archer's realist social theory of morphogenesis).

### 7.6 Reflections and concluding remarks

The co-operation of the Delta Environmental Centre made this research possible because managers provided the list of teachers who had attended the *Fundisa for Change* teacher professional development programme and the materials used in training them. The GDE granted permission to access the school sites and the teachers who participated in the study. Moreover, the willingness of the five participating teachers enabled me to gather the necessary data for the study.

In conclusion, the South African national curriculum has embedded ESD in Geography education as reflected in the CAPS document for Grade 10 to 12 (Department of Education, 2011). *Fundisa for Change* tried to close the gap through a short intervention course by teaching FET Geography teachers' environment and sustainability knowledge, teaching practices and assessment practices. The objective of the *Fundisa for Change* intervention course was to transform teachers' knowledge and teaching practices for ESD. However, it was found that short intervention courses have limited potential in transforming teaching practices. This study confirms Ono and Ferreira's (2010) argument that short courses are less likely to result in improvement in teaching because they are isolated from real classroom situations. As mentioned above, continuous and ongoing teacher professional development might be a remedy to transform teaching and assessment practices. It is noteworthy to emphasize that the change that is anticipated is individualistic and also bound by the social context of the teaching practices. The teaching practices that are enacted in class are a result of individual teachers' thinking and action and are influenced by the structure and culture of the teachers' work circumstances.

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# Appendices

## Appendix 1: Example of a course evaluation form

### COURSE EVALUATION – TEACHERS COURSES (all courses)

This questionnaire must be completed by teachers once they have completed a Fundisa for Change teachers' course. This will help the F4C coordinator and course facilitators to continuously improve the programme and individual courses. The aim is also to get an overview of responses to the course, to give stakeholders a quantitative sense of the value of the programme. The responses will be aggregated before being reported, and will always be treated as confidential.

**Part 1: Teacher's Profile**

In addition to personal details already obtained, and details of the course attended, ask: ...

1.1 I have been teaching in schools for:

- 0-1 years
- 2-5 years
- 6-10 years
- ✓10-20 years
- More than 20 years
- I am not a school teacher

1.2 The school where I currently teach or most recently taught is best described as a ...

- Rural school
- ✓Township school
- Model C school
- Private school
- Home school
- Other: (Please specify)

1.3 I teach the following Grades and Subjects

| Subjects | Grades |
|---|---|
| Geography | 10 + 11 |

1.4 Before the course, my experience of environmental learning in the school curriculum was as follows ...

- ✓I was very familiar with environmental learning in the school curriculum
- ✓I was quite familiar with it
- I have heard of it but I knew very little about it

1

I have not heard of it before I heard about the course

1.5 I attended the Fundisa for Change Teachers Course because ..... [insert own answer]

I want to know more

## Part 2: Response to Course Components

2.1 The aspect of the course I enjoyed most was ... [insert own answer]

2.2 The aspect of the course I least enjoyed was ... [insert own answer]

2.3 The length of the course was ...

Too long
Too short
✓ Just right

2.4 The content provided in this course was ...

Very relevant to my needs as a teacher
✓ Mostly relevant to my needs
Only sometimes relevant to my needs
Not at all relevant to my needs

2.7 The amount of information provided in the course was ...

Too much information
Not enough information
✓ The right amount of information

2.8 The course materials were used effectively to support our learning on the course

✓ Strongly agree
Agree
Disagree
Strongly disagree
Unsure

2.9 How would you rate the Fundisa for Change materials? ( you may choose more than one option)

✓ I have not given much attention to the materials so far
The materials are generally excellent
I have picked up some problems in trying to use the materials

**Appendix 2: Interview guide with participating teachers**

1. What is your highest qualification in Geography?
2. How many years have you been teaching Geography?
3. What is your position in the Geography department at your school?
4. How do you identify environment and sustainability content in the curriculum? Explain.
5. Did you see environment and sustainability knowledge as “new knowledge” before the course? How do you see it now?
6. How did the *Fundisa* for Change assist in developing environment and sustainability subject content knowledge? Explain.
7. What teaching methods did you use to teach environment and sustainability subject content knowledge before the *Fundisa* for Change intervention course?
8. What teaching methods are you using to teach environment and sustainability subject content knowledge after the *Fundisa* for Change intervention course?
9. How do you assess learners in your subject?
10. Are there any changes in the way you assess learners after the course?
11. Are you implementing what you have learned in the course in your practice?

    11.1 If **no**, what are the constraints that are hindering implementation of what you have learned?

    11.2 If **yes**, what is enabling you to do so?
12. What were your beliefs/views on climate change before and after the course?
13. How did the intervention course influence your actions in response to climate change?
14. Is your school involved in any environment and sustainability project?

**Appendix 2a: Interview with Teacher A**

**Date: 23.08.2017**

**Time: 12h00-12h30**

1. What is your highest qualification in Geography?
   *Geography 3*
2. How many years have you been teaching?
   *21 years*
3. How many years have you been teaching Geography?
   *10 years with breaks in between*
4. What is your position in the Geography department at your school?
   *Post level 1 geography teacher teaching Grade 8 and 11*
5. How do you identify environment and sustainability content in the curriculum? Explain.
   *There is section on sustainability in the Grade 11 curriculum, environment and sustainability content is found in all the Geography topics*
6. Did you see environment and sustainability knowledge as "new knowledge" before the course? How do you see it now?
   *Even though sustainability and environment content was partly covered during my teacher-training years, this was an eye –opener. I used to rely on the textbook in teaching the subject and mainly reading for the learners. There are changes in the way I teach the subject now since I have attended the course.*
7. How did the *Fundisa* for Change assist in developing environment and sustainability subject content knowledge?

8. What teaching methods did you use to teach environment and sustainability subject content knowledge before the *Fundisa* for Change intervention course?

   *Textbook based teaching, where I read with the learners.*

9. What teaching methods are you using to teach environment and sustainability subject content knowledge after the *Fundisa* for Change intervention course?

   *Teaching methods used are more learner-centred than teacher centred approaches.*

10. How did you assess learners in your subject before attending the intervention course?

    *I used questions from the textbook and previous question papers.*

11. Are there any changes in the way you assess learners after the course?

    *I use different kinds of assessment for class activities such as peer, group and teacher –based. District of education provides all tests and examinations as common assessments.*

12. Are you implementing what you have learned in the course in your practice?

    11.1 If **no**, what are the constraints that are hindering implementation of what you have learned?

    11.2 If **yes**, what is enabling you to do so?

    *Yes, 80% of the time. The remaining 20% is used for mapwork*

13. What were your beliefs/views on climate change before the course?

    *Myth- that it happens because of seasonal changes*

14. What were your beliefs/views on climate change after the course?

    *I now believe that it is caused by human actions and people should know how to eliminate or reduce the causes of climate change.*

15. How did the intervention course influence your actions in response to climate change?

    *Case studies used in the course such as flooding has made me realize the impacts and how to minimize impacts of environmental problems. The environment doesn't need us, but we need the environment for our survival. I am making my colleagues and members of the community of the environmental problems*

16. Is your school involved in any environment and sustainability project?

*Yes, to a small extent. We are involved in paper recycling. The school also has an environment committee that I intend joining. I am also encouraged to join the committee because that will also help raise my point for Integrated Quality Management Systems (IQMS).*

**Appendix 2b: Interview with Teacher B**

**Date: 22.08.2017**

**Time: 12h00 – 12h30**

1. What is your highest qualification in Geography?
   *Geography 2.*
2. How many years have you been teaching?
   *21 years.*
3. How many years have you been teaching Geography?
   *21 years.*
4. What is your position in the Geography Department at your school?
   *Geography and History Head of department.*
5. How do you identify environment and sustainability content in the curriculum? Explain.
   *Environment and sustainability content is found in all the Geography topic.*
6. Did you see environment and sustainability knowledge as “new knowledge” before the course? How do you see it now?
   *No.*
7. How did the Fundisa for Change assist in developing environment and sustainability subject content knowledge?
   *The course made me aware of the environment.*
8. What teaching methods did you use to teach environment and sustainability subject content knowledge before the Fundisa for Change intervention course?
   *It was mainly textbook method. The problem is that in some textbook, certain sections are not correct. In such cases, I correct the information for learners.*
9. What teaching methods are you using to teach environment and sustainability subject content knowledge after the Fundisa for Change intervention course?
   *Teaching methods used are more learner-centred than teacher centred approaches; e.g fieldwork, observations and others.*
10. How did you assess learners in your subject before attending the intervention course?

*I used textbook activities and previous question papers.*

11. Are there any changes in the way you assess learners after the course?

    *Yes, there are changes in the way I handle informal assessments. I assess them either as individuals, peers or groups. I set my own questions for such activities. Unfortunately all SABs and examinations are provided by the department of education (at district level).*

12. Are you implementing what you have learned in the course in your practice?

    11.1 If **no**, what are the constraints that are hindering implementation of what you have learned?

    11.2 If **yes**, what is enabling you to do so?

    *Yes*

13. What were your beliefs/views on climate change before the course?

    *I believed that climate change happens after a long time and is caused by human actions such as pollution.*

14. What were your beliefs/views on climate change after the course?

    *My belief is still the same.*

15. How did the intervention course influence your actions in response to climate change?

    *I wouldn't say the course has influenced my actions. I always and have always have been encouraging learners to take care of the environment.*

16. Is your school involved in any environment and sustainability project?

    *Yes, the school is involved in waste recycling. There is an organization that has brought containers where waste is sorted into different categories for recycling.*

**Appendix 2c: Interview with Teacher C**

**Date:25.08.2017**

**Time: 9h00- 9h30**

1. What is your highest qualification in Geography?
   *Geography 2.*
2. How many years have you been teaching?
   *27 years.*
3. How many years have you been teaching Geography?
   *27 years.*
4. What is your position in the Geography department at your school?
   *Head of department for Geography and History.*
   *Teaching grade 11 and 12*
5. How do you identify environment and sustainability content in the curriculum? Explain.
   *Environment and sustainability content is found in all the Geography topics. In grade 11 it is mainly in development and sustainability, energy and resources and in climatology.*
6. Did you see environment and sustainability knowledge as “new knowledge” before the course? How do you see it now?
   *No. My knowledge was just strengthened.*
7. How did the Fundisa for Change assist in developing environment and sustainability subject content knowledge?
   *The course strengthened my knowledge on environment and sustainability. Carbon footprint, calculating emission from cars through how much distance a car has travelled and the type of fuel use was new.*
8. What teaching methods did you use to teach environment and sustainability subject content knowledge before the Fundisa for Change intervention course?
   *I used the textbook and fieldwork within the school. The problem is that in some textbook, certain sections are not correct.*

9. What teaching methods are you using to teach environment and sustainability subject content knowledge after the Fundisa for Change intervention course?
   *I am still continuing with the textbook method and fieldwork within the school yard. It is difficult to conduct fieldwork away from the school due to time constraints. I am also incorporating information from websites since we now have smartboards.*
10. How did you assess learners in your subject before attending the intervention course?
    *I used textbook activities and questions from previous question papers.*
11. Are there any changes in the way you assess learners after the course?
    *Yes, I now incorporate little information from recent newspapers. I also use information from the handouts provided in the course and I also download information from the internet for daily or informal assessment. I also use these for class tests. We use departmental common tests for all SABs and examinations (at district level). We are not forced to use them, but if we decide to do so they have to be sent to the district for moderation. I have not used anything that I have set on my own after this course. Before I had prepared question papers for my cluster for grade 12 SBAs.*
12. Are you implementing what you have learned in the course in your practice?
    11.1 If **no**, what are the constraints that are hindering implementation of what you have learned?
    11.2 If **yes**, what is enabling you to do so?
    *Yes, we do try to implement even though circumstances don't allow us sometimes- time factor; e.g. not being able to take learners for fieldwork within an hour as you will be expected to be back and be in another class.*
13. What were your beliefs/views on climate change before the course?
    *I always loved the environment. Even my kids know that they are not supposed to litter or pollute the environment.*
14. What were your beliefs/views on climate change after the course?
    *My beliefs are strong now. The course has opened my eyes and made me fall in love with the environment. Wherever I go I always find a reason to talk about the*

*environment. I always give examples about the environment within the school yard and their homes context.*

15. How did the intervention course influence your actions in response to climate change?

    *My actions were already for the environment e.g. saving water, saving energy through erecting solar panels and switching off lights when not in use. It is not easy but we need to keep trying I also try to convince my family members of the right thing to do for the environment. This is an eco-school; therefore we have projects that we run. Like, next week we will be planting trees and we tell eco-learners that we are doing this so that carbon emissions are absorbed by trees as (Tembisa) the area is surrounded by industries. And I always tell my learners that if you don't have a tree or any greening in your family, it means you are stealing oxygen from your neighbours.*

16. Is your school involved in any environment and sustainability project?

    *Yes, our school is twinned with a school called Malta in Italy- it's an island. We communicate with them. We have a garden project. We are involved in recycling of wastes organized by Coca-cola. We use biogas for cooking in the school's feeding scheme. We also have solar panels donated by Anglo to save energy. There are learners that are involved in the cleaning of toilets. They check from time to time if toilets are always clean.*

**Appendix 2d: Interview with Teacher D**

**Date: 31.08.2017**

**Time: 9h30-10h15**

1. What is your highest qualification in Geography?
   *Geography 4 in my BEd. I have also attended a GIS course through University of Johannesburg.*
2. How many years have you been teaching?
   *15 years.*
3. How many years have you been teaching Geography?
   *15 years.*
4. What is your position in the Geography department at your school?
   *Geography teacher*
   *Teaching Grade 11 and 12*
5. How do you identify environment and sustainability content in the curriculum? Explain.
   *Environment and sustainability content is clear and straight forward in topics such as climate, the role of the oceans. In some topics it's not clear such as in economic geography. It focuses more on how to improve the economy, trade relationships, but there will a small aspect that deals with the environment. As a teacher, you have to take that small aspect and show learners how such aspects of economy impact the environment.*
6. Did you see environment and sustainability knowledge as "new knowledge" before the course? How do you see it now?
   *Before the course, environment was not a big thing. We always focused on the environment when we see it in the books. It was not clear to us that we had to make sure that in each and everything we do with the learners, we had to refer to the environmental issues. After the course, I realized that I need to include the environment in every topic, even if it's not clear in the textbook.*
7. How did the Fundisa for Change assist in developing environment and sustainability subject content knowledge?

*Fundisa had good tutors that made us aware of environmental issues that we were not aware of. It has helped me a lot, because I can now see the importance of the environment. I also show my learners the importance of the environment.*

8. What teaching methods did you use to teach environment and sustainability subject content knowledge before the Fundisa for Change intervention course?
   *I used information transfer. We mainly rely on textbooks because we don't have much resources in the school.*
9. What teaching methods are you using to teach environment and sustainability subject content knowledge after the Fundisa for Change intervention course?
   *Information transfer is still one of the methods. Sometimes we allow learners to research for information and we also conduct fieldwork within the school yard. We go out of the school to familiarize learners with certain aspects of the environment, unlike relying on talk and listen in class. We are also using smart boards than talking about things they don't see. We are also using cellphones sparingly as they can be both positive and negative.*
10. How did you assess learners in your subject before attending the intervention course?
    *Tests. Remember assessment is not done by teachers. If we were setting on our own assessment of environment and sustainability knowledge would be better, we would be able to give learners research tasks where learners would gather information and take pictures which will allow us to see the real impact of the environment.*
11. Are there any changes in the way you assess learners after the course?
    *Formal assessment is still being done by the department. I think it has to change from what we have right now to something better and more effective. Informal assessment allows me to give learners different things such as presentations and bring their own pictures to show their understanding. Formal assessment is set by the department. There is nothing that we can do about it. If you have to change it's a process because it has to go through moderation by the subject head and the facilitators, which takes a lot of time.*
12. Are you implementing what you have learned in the course in your practice?

11.1 If **no**, what are the constraints that are hindering implementation of what you have learned?

11.2 If **yes**, what is enabling you to do so?

*Of course. I am implementing a lot of what I have learnt in a lot of topics that I cover, e.g. topics like population increase are now related to issues such as food production and food insecurities. This makes learners to enjoy the lessons. Before, I would just glide through issues without getting learners to interrogate them.*

13. What were your beliefs/views on climate change before the course?

    *As a geography teacher, I knew about it and believed in it (especially the concept of global warming). I had an idea of global warming. After the course, I learnt more about the causes and impacts.*

14. What were your beliefs/views on climate change after the course?

    *My beliefs are that climate change is here and it's not going anywhere. It's getting worse year in year out. I think it will still be extremely hot in years to come. It's here to stay.*

15. How did the intervention course influence your actions in response to climate change?

    *I have more information and I am proud. I am not scared to share with anyone. I know that I have facts and I know what I am talking about. I share in class and out in the community. I once shared with my brother who is a farmer who plants sunflower. During drought last year his harvest was down and he started asking questions. I then shared the causes and impacts of causes. I also shared the cycle of drought in our country.*

16. Is your school involved in any environment and sustainability project?

    *No. There are factors I cannot explain due to issues in the school. The school should plan for the future. We have never had a Geography HoD and this has an influence. We need support so that we can be stable.*

**Appendix 2e: Interview with Teacher E**

**Date: 04.09.2017**

**Time: 10h00 – 10h45**

1. What is your highest qualification in Geography?
   *Degree in Geography (Geography 3)*
2. How many years have you been teaching?
   *32 years (from 1985).I started Afrikaans, then later taught Geography.*
3. How many years have you been teaching Geography?
   *30 years, so I know the subject (...and she laughed).*
4. What is your position in the Geography department at your school?
   *Geography subject head and also responsible for setting district test papers and SBAs*
   *Teaching grade 11 and 12* How do you identify environment and sustainability content in the curriculum? Explain.
   *It's easy (then she opened the textbook and explained using the textbook, showing me sections in the grade 11 textbook).*
   *In term 3 and 4, there are sections on 'development geography' and "energy and resources' that addresses issues of environment and sustainability. (Then she also explained the textbooks she uses for teaching grade 10-12).*
5. Did you see environment and sustainability knowledge as "new knowledge" before the course? How do you see it now?
   *I didn't see it as new knowledge. I already had knowledge about it, but I believe you can always learn more. I learnt more on it during the course, especially on applying it in and outside the classroom.*
6. How did the Fundisa for Change assist in developing environment and sustainability subject content knowledge?
   *The course has helped me in how to apply the knowledge in and out of the classroom.*
7. What teaching methods did you use to teach environment and sustainability subject content knowledge before the Fundisa for Change intervention course?

*I don't think I have changed my teaching methods a lot. I like starting my lessons with a video or a story. It's not always possible, just to get them to be interested in what I am going to say. Most of the time I either summaries or show them pictures or something like that. So that's stayed the same, but I now try to do something practical or actual for the kids - I get them to experience. For example using a piece of material on the stoep to show desertification and keep on folding it to show them show them how we reduce the ground- this was to show that they should look after our soil. I started thinking about doing practical work and not just show pictures, but they have to experience it would put up some flash cards around the school in places they think we are not looking after our environment. But this need more time- you have to be somebody that can discipline your class to do stuff like that. If you are somebody that kids can walk all over, you can't do that because you will struggle to get them back in class or have control them again Young teachers struggle with this, but older teachers can and I don't know why.*

***Resources*** *– textbooks, PowerPoint, videos, flash card and summaries.*

***Examples*** *– I give both local and global environment from news articles, magazines and what we see on TV. There is also a reading corner where they go if they finish their work before others.*

8. What teaching methods are you using to teach environment and sustainability subject content knowledge after the Fundisa for Change intervention course?

   ***Answered in question 7***

9. How did you assess learners in your subject before attending the intervention course?

   *Assessments stayed the same. We get the tests and SBAs from the district. These tests also integrate with environment and sustainability content knowledge. They love that, which is a good thing. Questions on sustainability are asked which make me to think that they have the right idea. Our district is doing well. We work very well with our facilitator. We share a lot of teaching resources in clusters e.g. videos. Informal assessments are mainly done using past question papers where they mark themselves. I also use the textbook activities.*

10. Are there any changes in the way you assess learners after the course?

    ***Answered in question 9 above***

11. Are you implementing what you have learned in the course in your practice?

    11.1 If **no**, what are the constraints that are hindering implementation of what you have learned?

    11.2 If **yes**, what is enabling you to do so?

    *Yes. Because I have been teaching for ages I know the subject. I think other people could have learned a bit about the subject lessons. If I didn't there could have been something wrong with me (she said this giggling). It makes a person think a little bit further because we teach different children. Our school has very rich children and very poor children- where there isn't enough food on the table. As a teacher you cannot be the same to all learners. I cannot be strict with her for not bringing anything.*

12. What were your beliefs/views on climate change before the course?

    *I believe there is climate change. I know there are people that think its just a rhythm that climate has changed in the past and it will change again in the future. I believe there is global warming.*

13. What were your beliefs/views on climate change after the course?

    *My beliefs are the same. I have always believed that there is climate change.*

14. How did the intervention course influence your actions in response to climate change?

    *I enjoyed the course so much. The course didn't change my belief, but just strengthened my beliefs.*

15. Is your school involved in any environment and sustainability project?

    *Yes- paper recycling and there are bins in our classes and there are paper, plastic and tin bins in the cafeteria. There is a company involved, but I am not sure because I am not involved. We also have a wall that has been painted by our kids to make them aware about recycling.*

**Appendix 3: Observation schedule**

1. General atmosphere in the classroom.
2. Choice of the topic.
3. Teachers' knowledge of environment and sustainability concepts.
4. How do the teachers present the lesson (teaching approaches)?
5. How do the teachers' assess learners?
6. How do the teachers' integrate environment and sustainability values in teaching and learning
7. What is the context of the examples used to explain environment and sustainability content?

## Appendix 4: Interview guide with the Department of Education Officials

### Interview questions for the District of Education official

1. How did you choose teachers for the Fundisa for Change teacher professional development programme?
2. What were the Department of Education's expectations of the Fundisa for Change teacher professional development programme?
3. What are the benefits of this short course in classroom practice?
4. What is the view of the Department of Education in terms of generic lesson plans to teach Geography? Are they implemented?
5. What are the views Department of Education in terms of common assessments (common tests, common tasks and common exams) in assessing environment and sustainability knowledge in Geography? Are they an effective way of assessing the subject knowledge?
6. What resources are teachers advised to use in teaching Geography?
7. Do you think meaningful learning is taking place in you district?

### Interview questions for the Provincial and National Education officials

1. What is the view of the Department of Education in terms of generic lesson plans to teach Geography? Are they implemented?
2. What are the views Department of Education in terms of common assessments (common tests, common tasks and common exams) in assessing environment and sustainability knowledge in Geography? Are they an effective way of assessing the subject knowledge?
3. What resources are teachers advised to use in teaching Geography?
4. Do you think meaningful learning is taking place in you district?

**Appendix 4a: Interview with the District of Education official**

1. How did you choose teachers for the Fundisa for Change teacher professional development programme?
   *I didn't choose the teachers that attended the course because I started working at the district in 2017. However, all of them are good teachers' and they go an extra mile in their work.*
2. What were the Department of Education's expectations of the Fundisa for Change teacher professional development programme?
   *I don't know since I wasn't here when they were selected. However, some of the teachers are trying to integrate EE in their teaching.*
3. What are the benefits of this short course in classroom practice?
   *They are positive. One of the teachers who attended the course looks at what happen at home and how it can be implemented in schools. She is interested in the social side of the learners.*
4. What is the view of the Department of Education in terms of generic lesson plans to teach Geography? Are they implemented?
   *Generic lesson plans are not working. They create lazy teachers. Teachers are expected to adapt the lesson plans to their own situation. They just copy them and file without adding anything.*
8. What are the views Department of Education in terms of common assessments (common tests, common tasks and common exams) in assessing environment and sustainability knowledge in Geography? Are they an effective way of assessing the subject knowledge?
   *Generic assessments work well in terms of maintaining standards, but they also create lazy teachers. Teachers do not want to set their own question papers. I have tried to get them to set their own question papers, but it didn't work.*
5. What resources are teachers advised to use in teaching Geography?
   *25 out of 75 secondary schools in the district have interactive boards- these can be of good use to teachers who prepare*. *Some schools use projectors. Most teachers do not expose learners to maps.*
6. Do you think meaningful learning is taking place in you district?

*No. Learners always don't study on their own. Teachers' spoon feed them because learning is exam driven. Learners do not benefit from spoon feeding as they don't gain the tools to do it.*

**Appendix 4b: Interview with the Provincial Department of Education official**

1. What is the view of the Department of Education in terms of generic lesson plans to teach Geography? Are they implemented?
   *Lesson plans are supposed to be adapted. We are seating with a challenge of teachers' who do not prepare for their lessons. They just take the generic preparations as they are and file them, without adapting them to their own needs.*
2. What are the views Department of Education in terms of common assessments (common tests, common tasks and common exams) in assessing environment and sustainability knowledge in Geography? Are they an effective way of assessing the subject knowledge?
   *Schools are encouraged to use previous question papers. This is done to expose learners to questions that are asked during examinations. Most teachers set objective questions (level 1questions) when they set their own questions, which disadvantages learners because they do not learn the skills of answering high order questions (level 3 questions).*
3. What resources are teachers advised to use in teaching Geography?
   *Teachers in Gauteng are very spoiled. They ask for everything. Very few are innovative. Most of the township schools wait to be given everything. They are given a variety of resources such as mind maps, models, work guides, videos, power points and home works.*
4. Do you think meaningful learning is taking place in you district?
   *We are so exam focused. The Department of Education stresses results- we are exam driven.*

**Appendix 4c: Interview with the National Department of Education official**

1. What is the view of the Department of Education in terms of generic lesson plans to teach Geography? Are they implemented?
   *Provinces have the latitude to use generic lesson plans if they want to. This makes the work easier for the teachers and equips the novice teachers. However, some teachers feel that generic lesson plans limit their innovations. The providing of generic lesson plans ensures that every teacher will have lesson plans and enough content to teach a lesson.*
   *Teachers who know their work use the lesson plans as baseline. They try to find more information on their own. Those who are lazy use them as they are without adapting them to their own needs.*
2. What are the views Department of Education in terms of common assessments (common tests, common tasks and common exams) in assessing environment and sustainability knowledge in Geography? Are they an effective way of assessing the subject knowledge?
   *Provinces use generic assessments because they are quality assured and of good standard. School based assessments set by teachers have more level 1 questions. Provinces hire experienced teachers to set the papers and provide marking guidelines so as to uphold standards. The allocation of marks is considered for common standards.*
3. What resources are teachers advised to use in teaching Geography?
   *The National Department of Education provide a catalogue with different textbooks that are recommended for use in the classroom. The Department of Education also provides notes, study guides on challenging topics. The Department of Education prepares resources in relation to the diagnostic reports from school visits by national and provincial offices. Various subject advisors are called to write the materials that are distributed electronically via Thutong portal.*
4. Do you think meaningful learning is taking place in geography?
   *Meaningful learning takes place in some of the classes in the country depending on the passion of the teachers. Passionate teachers develop learners' interest in the subject. Such teachers use cell phones and YouTube to show videos. Some*

*of the township school teachers do not make efforts to teach the subject in an innovative way.*

## Appendix 5: Examples of the lesson plans from the Department of Education

education
Department: Education
GAUTENG PROVINCE

**CURRICULUM AND ASSESSMENT POLICY STATEMENT**
**LESSON PREPARATION**

| GRADE | 12 | SUBJECT | Geography | WEEK | | TOPIC | Causes and effects of urban Heat Island |
|---|---|---|---|---|---|---|---|
| LESSON SUMMARY FOR: DATE STARTED: | | | | | DATE COMPLETED: | | |
| LESSON OBJECTIVES | • *Understand the causes and effects of urban heat island* | | | | | | |

| EDUCATOR ACTIVITIES | LEARNER ACTIVITIES | TIMING | RESOURCES NEEDED |
|---|---|---|---|
| 1. *Questions and answers approach*<br>2. *Prepare a lesson and consider the following:*<br>***2.1 <u>Introduction</u>***<br>*Baseline questions*<br>*Why is the city warmer thatn the rural areas*<br>*Why is the city experience higher rainfall than the rural farmlands*<br>***2.2 <u>Lesson presentation(The teacher must refer to the work guide section A)</u>***<br>*Key discussion*<br>• *What is an Urban Heat Island*<br>• *What are the causes of the urban heat island*<br>• *How does the urban heat island affect the people living in the city*<br>***2.3 Conclusion***<br>• ***Summarise the discussion***<br>• ***Ask the learners to complete the activity in section B of the work guide*** | *2.1 Respond to baseline questions*<br><br>*2.2 Discuss the key questions with the educator and write down the summary*<br><br>*2.3 Complete the activity in the work guide* | *10 min*<br><br>20 min<br><br>10 min | • *Work guide*<br>• *Textbooks*<br>• *The board and something to write* |

education
Department: Education
GAUTENG PROVINCE

**CURRICULUM AND ASSESSMENT POLICY STATEMENT**
**LESSON PREPARATION**

Name of Teacher_____

Sign:_____

Date:_____

HOD:_____

Sign:_____

Date: _____

**WORKGUIDE**

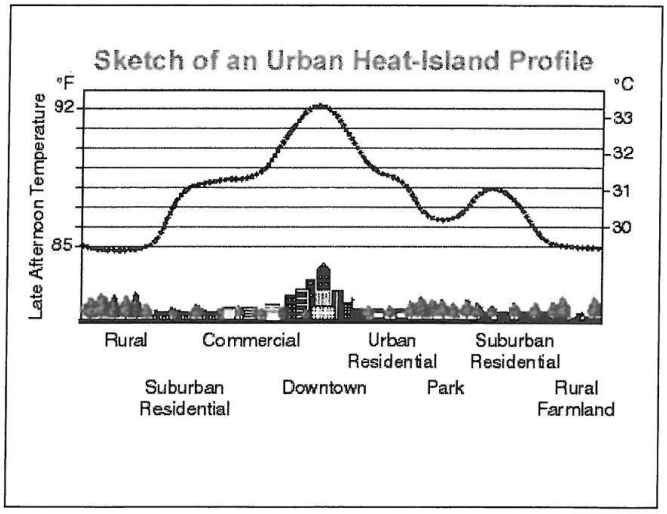
**Section A: Additional Notes**

What is an Urban Heat Island?

In the simplest term, a heat island is a metropolitan area that is at a warmer temperature than the surrounding countryside.

This heat island phenomenon is "an example of an unintentional climate modification when urbanization changes the characteristics of the Earth's surface and temperature" (

Figure 1: A sketch of a typical heat island



***NOTE: HEAT ISLAND MAY BE TAUGHT WITH THE DIFFERENCE BETWEEN RURAL AND CITY CLIMATE (TEMPERATURE ONLY)***

**What are the Causes of Urban Heat Islands?**

The two major causes of urban heat islands are the presence of more dark surfaces and the absence of vegetation.

Dark surfaces contribute to heat islands due to their low "albedo" or reflectivity. Dark and dry surfaces, such as pavements and buildings, absorb sunlight. This produces thermal energy, causing the surface to become hotter.

The absence of vegetation contributes to the formation of urban heat islands because it can no longer provide two important cooling mechanisms

Accumulation of pollution (industries, vehicles) over the urban areas is also a major cause of urban heat island

**Effects Of Urban Heat Island (UHI)**

A direct relationship has been found between UHI intensity peaks and heat-related illness and fatalities, due to the incidence of thermal discomfort on the human cardiovascular and respiratory systems. Heatstroke, heat exhaustion, heat syncope,and heat cramps, are some of the main stress events, while a wide number of diseases may become worse, particularly in the elderly and children. In a similar way, respiratory and lung diseases have shown to be related to high ozone levels induced by heat events.

- The anomalous warm of the city creates relatively low air pressures that cause cooler, rural air to converge on the urban center, thus forcing warm air to ascend (i.e. convection), which at higher altitudes condensates and precipitates.
- urban-induced precipitation and thunderstorm events are mainly initiated by the UHI.
- Other meteorological impacts of the UHI are associated with reductions in snowfall frequencies and intensities, as well as reductions in the diurnal and seasonal range of freezing temperatures.
- Lastly, high temperatures may produce physiological and phonological disturbances on ornamental plants and urban forests.

## Section B – Activity

**Use your summary and your knowledge to answer the following questions.**

**QUESTIONS:**

1. **Define urban Heat Island. (2)**
2. **Discuss three main contributors to the formation of urban heat island (6)**
3. **In a short paragraph of not more than 8 lines briefly explain ways in which urban heat island affect people. (8)**

**TOTAL:16**

**Section C**

**MEMO**

1. **Define urban Heat Island. (2)**

   It the zone of high temperature in the city as compared to the cooler surrounding rural areas

2. **Discuss three main contributors to the formation of urban heat island (6)**

   Lack of vegetation in the urban areas

   Darker artificial surfaces in the urban areas

   High level of pollution in the urban areas

3. **In a short paragraph of not more than 8 lines briefly explain ways in which urban heat island affect people. (8)**

   Heatstroke, heat exhaustion, heat syncope, and heat cramps, respiratory and lung diseases.

   UHI also give rise to heavy thunderstorms, accept any impact related to thunderstorms as well

**TOTAL:16**

education
Department: Education
GAUTENG PROVINCE

**NATIONAL CURRICULUM STATEMENT**
**LESSON PREPARATION**

| GRADE | 11 | SUBJECT | Geography | WEEK | | TOPIC | CAUSES OF DROUGHTS |
|---|---|---|---|---|---|---|---|
| LESSON SUMMARY FOR: DATE STARTED: | | | | | DATE COMPLETED: | | |
| LESSON OBJECTIVES | • *Learners should know the causes of droughts*<br>• *Learners should also be able to prevent the effects of droughts* | | | | | | |

| EDUCATOR ACTIVITIES | LEARNER ACTIVITIES | TIMING | RESOURCES NEEDED |
|---|---|---|---|
| ***Methodology:***<br>• *Discussion of the types of droughts and also causes of droughts*<br>• *Work guide activities to be written on class work books*<br><br>***1.1 Introduction***<br>• *What is drought?*<br>• *Which African countries have experienced droughts recently?*<br><br>*1.2* ***Lesson presentation***<br>• *Discussion of the types of droughts and causes of droughts*<br>• *Discussion of Case study of Ethiopia; Kenya and Somalia*<br><br>***1.3 Conclusion***<br>• *Work guide activity to be written as homework/class work on learners books* | 1. *Learners to answer the questions asked by the educator*<br><br>2. *To discuss the causes of droughts and the different types of droughts*<br><br>3. *Learners to write activity on work guide as homework or class work* | *5 min*<br><br>*15 min*<br><br>*10 min* | • *Textbook*<br>• *Physical Map of South Africa and Africa* |

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**NATIONAL CURRICULUM STATEMENT**
**LESSON PREPARATION**

Name of Teacher_____ HOD:_____

Sign:_____ Sign:_____

Date:_____ Date: _____

# WORKGUIDE – CAUSES OF DROUGHTS

## SECTION A – ADDITIONAL NOTES

Droughts and floods often occur in cycles in areas that are semi arid

**What is Drought?**

- a long period with less than the average amount of rainfall
- The amount of rain fall can vary from area to area to lead to a drought e.g. if KZN gets 500mm of rain in a year it is much less than their average and will lead to a drought, while the Free state will have normal rain if it gets 500mm of rain in a year.
- Areas that often experience droughts are in danger of desertification
- Drought and the associated famine occur more often in Africa than on any other continent

**TYPES OF DROUGHTS**

- Scientist categorize droughts into different types:

- Meteorological drought: occurs when there is a prolonged period of rainfall below the regional average. It is region specific
- Agricultural drought: occurs when shortages of precipitation and soil moisture affect crop yields. It occurs during dry , hot periods of low rainfall
- Hydrological drought: occurs when water reserves fall below an established average . Even during time of above average precipitation droughts occur especially if the demand of water is high and increased usage lowers the water reserves
- Socio – economic drought : occurs when reduced water supplies result in the inability to address socio , economic, and environmental demands.

The Sahel had a drought that started in 1968 and in 2004

- People had to move to the wetter South because the wells and rivers dried up
- The vegetation was destroyed and live stock died of hunger

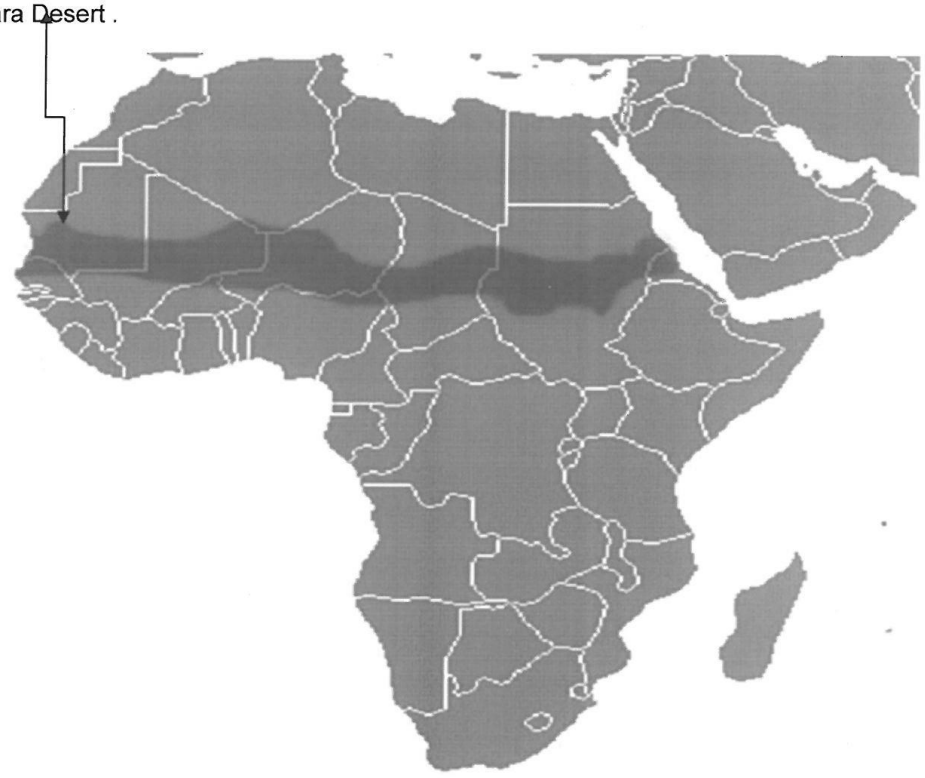
- In 1983 Ethiopian people walked through the desert to Sudan to find refuge there. 200 000 died along the way.
- 1983 – Bushfires destroyed 65% of the vegetation in the Ivory Coast
- 1984 & 1991 & 1998 Sudan was hit by severe droughts
- 1989 The capital of Sudan Khartoum was hit by a flood
- In 1990 4 million people faced starvation in Somalia

**The Sahel**

Since 1968 , wells have dried up , rivers have failed to flood and the land stripped of vegetation

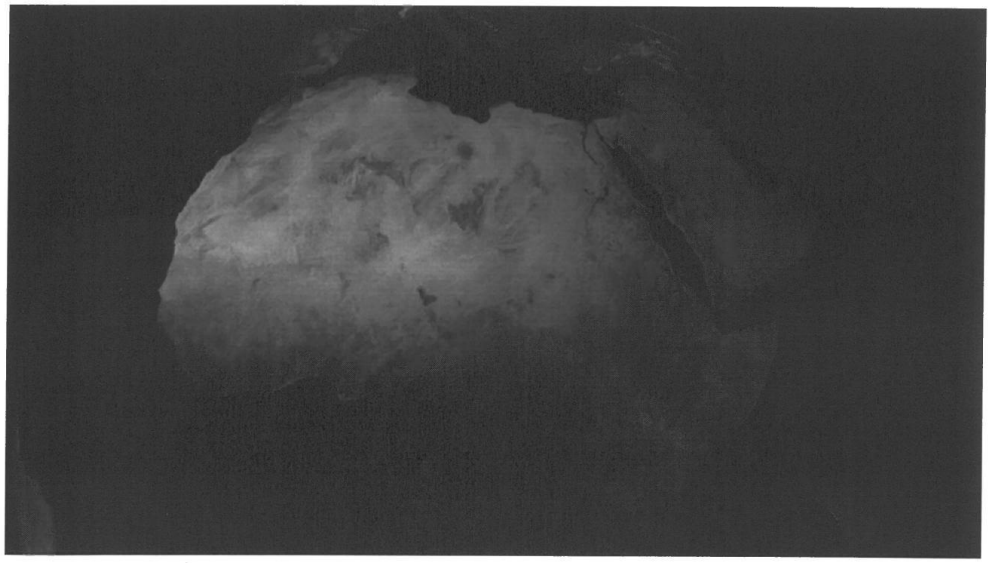
The Sahel – an area next to the Sahara desert that is very sensitive to droughts

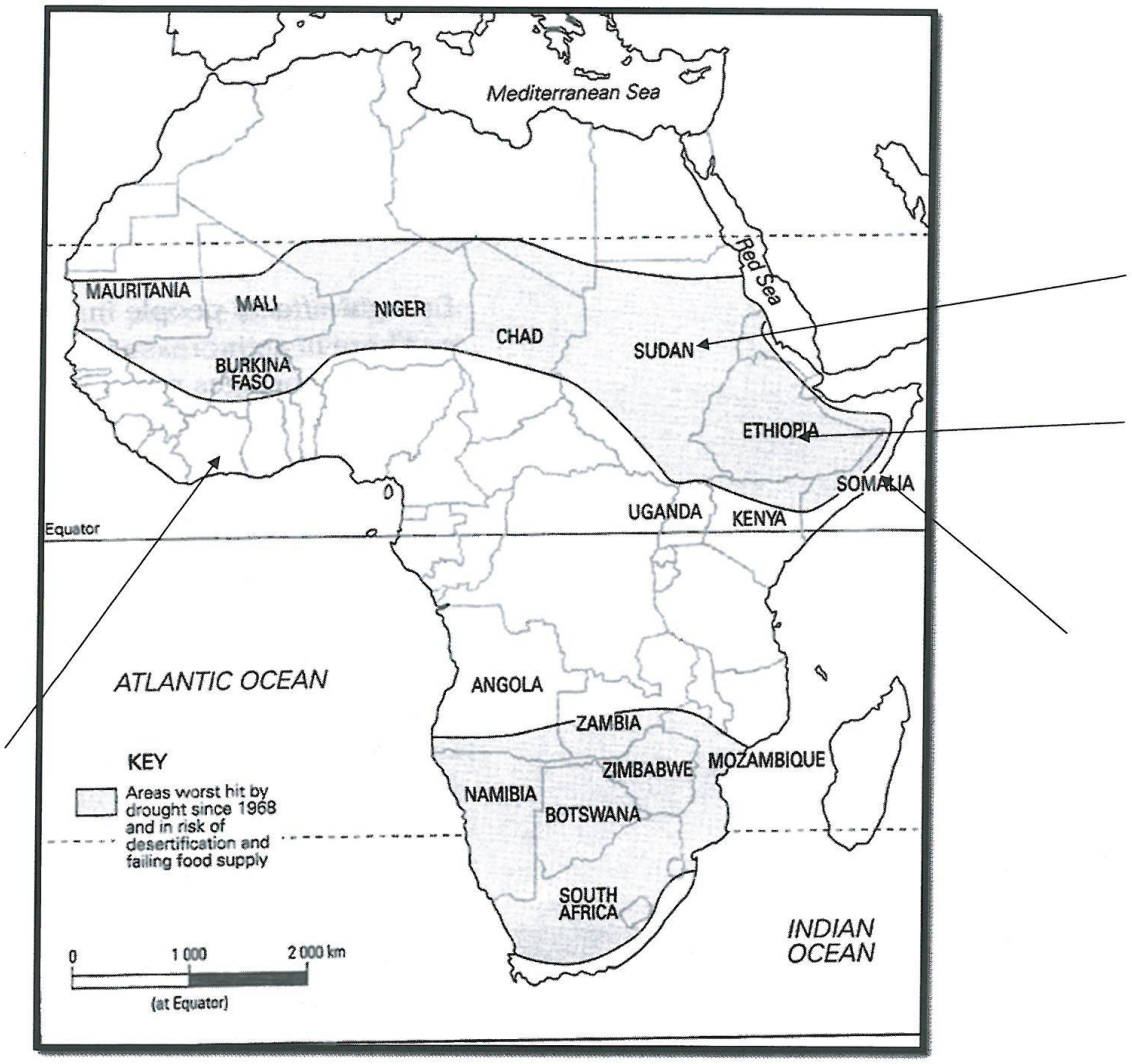
The Sahel is a narrow strip of land across Africa bordering the southern edge of the Sahara Desert .



**CAUSES OF DROUGHTS:**

- Changing weather patterns are the major cause of droughts
- Excessive build up of heat on the earth's surface
- Meteorological changes e.g. reduction in the amount of water vapour available and the ability of the air to rise and cool to dew point temperature, which results in a reduction of rainfall
- High pressure systems becoming more common
- Winds carrying continental air masses with reduced water content rather than carrying moist oceanic air masses
- Reduced cloud cover leading to great evaporation rates
- Oceanic and atmospheric weather cycles such as El Nino- Southern Oscillation which make drought a regular recurring phenomenon along the Midwest and Australia




Mediterranean Sea
Red Sea
MAURITANIA
MALI
NIGER
CHAD
SUDAN
BURKINA FASO
ETHIOPIA
SOMALIA
UGANDA
KENYA
Equator
ATLANTIC OCEAN
ANGOLA
ZAMBIA
ZIMBABWE
MOZAMBIQUE
NAMIBIA
BOTSWANA
SOUTH AFRICA
INDIAN OCEAN
KEY
Areas worst hit by drought since 1968 and in risk of desertification and failing food supply
0
1 000
2 000 km
(at Equator)

## *AFRICA, 1972-74*

In 1972 part of Africa was in one of the worst droughts ever to hit earth. To the South of the Sahara Desert lies the marginal zone, better none as the Sahel. This area has been the home to nomads and settling agriculturalists for many hundreds of years. From 1968 the rain slowly decreased until in 1972 there was hardly any rain fall at all.....

Major rivers in the area like the Niger and Senegal fell to their lowest levels known in this century. Even the great Lake Chad evaporated into one-third of its normal size. These major water suppliers provided water for millions of animals, humans and their crops of coffee, cocoa and peanuts were totally ruined.

The drought most badly hit the states of Mali, Chad, Mauritania, Senegal, Upper Volta and Niger. In these area the death toll reached a total of 200 000. It was only until the middle of the 1973, that the world came to learn about the devastation that was hitting the countries in Africa.

This particular drought affected the government of these countries as well. The Emperor of Ethiopia was not informed about the extent of the drought in the country, and because he was unable to help he lost his 40 year reign of power. The drought in Niger also indirectly caused political crisis. This resulted in the overthrow of the Government by a military **coup.**

Drought has a major effect on the people, especially the Nomads. They have had to change thier lifestyles totally. The Nomads have deserted their usual camps and moved to the outskirts of towns which will be able to provide food and water for them to survive.

For many years after the drought **Nomad** grazing lands had been reduced to support their herds of cattle which is the basis of Nomadic life, so Nomads have had to learn the ways of **sedentary** farmers.

*DROUGHT Main Page*

## SECTION B – ACTIVITY

1. Which African countries have had droughts in the past century?
2. Looking at these countries what is the contributing factor of droughts?
3. How will food security be affected by droughts?
4. How is the latitudinal position of these areas contributed to these countries having droughts?

## SECTION C - MEMO

1. **Countries in Africa that have experienced Droughts**

- Horn of Africa: Somalia; Ethiopia and Kenya

2. **Contributing factors for these African countries to experience droughts**

- Changing weather patterns are the major cause of droughts
- Excessive build up of heat on the earth's surface
- Meteorological changes e.g. reduction in the amount of water vapour available and the ability of the air to rise and cool to dew point temperature, which results in a reduction of rainfall
- Bushfires destroyed 65% of the vegetation

3. **Food security affected by droughts**

- No vegetation leading to food shortages
- Malnutrition is rife due to droughts and lack of food
- Huge numbers of people are forced to migrate and deaths of people is very high due to hunger

4. **How is the latitudinal position of these East African countries contributing**

- They are next to the a very warm ocean (Indian Ocean
- Along the equator
- High temperature ranges

## Appendix 6: Assessment plans

### ASSESSMENT PLAN (FORMAL ASSESSMENT)

### HUMANITIES DEPARTMENT

YUWANI SEC SCHOOL

| TERM I | | |
|---|---|---|
| GEOGRAPHY | TASK | DATE |
| GRADE 12 | - DATA HANDLING<br>- PHYSICAL GEO TEST | FEBRUARY<br>MARCH |
| GRADE 11 | - DATA HANDLING<br>- 1ST TEST ( THE ATMOSPHERE AND GEOMORPHOLOGY) | FEBRUARY<br>MARCH |
| GRADE 10 | - MAPWORK TASK<br>- 1ST TEST (THE ATMOSPHERE, WEATHER AND CLIMATE) | 23 FEBRUARY<br>22 MARCH |

| | | |
|---|---|---|
| TERM 2 | | |
| GRADE 12 | - REPORT WRITING( ENVIRONMENTAL HAZARDS)<br>- JUNE EXAM( PHYSICAL AND RURAL AND URBAN SETTLEMENT) | APRIL<br>JUNE |
| GRADE 11 | - REPORT WRITING<br>- JUNE EXAM( WATER MASSESS AND ECOSYSTEM | APRIL<br>JUNE |
| GRADE 10 | - REPORT WRTING<br>- JUNE EXAM( CLIMATE AND GEORMORPHOLOGY) | APRIL<br>JUNE |

| | | |
|---|---|---|
| TERM 3 | | |
| GRADE 12 | - MAPWORK TASK<br>- PREP EXAM | AUGUST<br>SEPTEMBER |
| GRADE 11 | -MAPWORK TASK<br>- TEST( DEV AND SUSTAINABILITY) | AUGUST<br>SEPTEMBER |
| GRADE 10 | - MAPWORK TASK<br>- TEST( PEOPLE AND PLACES )<br>- (PEOPLE AND THEIR NEEDS) | AUGUST<br>AUGUST |
| TERM 4 | | |
| GRADE 12 | -REVISION<br>- FINAL EXAM | OCT<br>NOV-DEC |
| GRDADE 11 | TEST( PEOPLE AND THEIR NEEDS)<br>EXAM | OCT<br>NOV |
| GRADE 10 | TEST<br>EXAM | 24 OCT<br>NOV |
| | | |

## Appendix 7: Summative assessment tasks

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**GEOGRAPHY GRADE 12**
**PEOPLE AND THEIR NEEDS**

**TEST 2: TERM 3 (24 AUGUST 2017)**
**DURATION: 1 HOUR**
**MARKS: 75**

**Instructions:**

- Answer all the questions and number them correctly as indicated on the question paper.
- All diagrams are included in the annexure and refer to them as per question asked.
- Do not change the numbering system in the answer sheet.
- Write clearly and legibly.

**QUESTION 1**

**1.1. Choose a term from Column B that matches a statement in Column A. Write only the letter (A–J) next to the question number (1.1.1 to 1.1.6) in your answer sheet**

| COLUMN A | NO | COLUMN B |
|---|---|---|
| 1.1.1 Activities that deals with information and research | A | Imports |
| 1.1.2 A country's statement showing its transactions with the rest of the world | B | Tertiary |
| 1.1.3 Goods and services that are produced in a country | C | Balance of trade |
| 1.1.4 The way in which social, economic, political and Cultural activities of countries are interconnected throughout the world. | D | GNP |
| 1.1.5 The value of imports minus the value of exports | E | Informal sector |
| 1.1.6 Goods and services that are produced in a country in a year by foreigners. | F | Quaternary |
| | G | Exports |
| | H | Globalisation |
| | I | GDP |
| | J | Balance of payment |

**(6X2)(12)**

1

**1.2 Read the passage below to answer the questions that follows**

> Agriculture contributes about 3, 2 % of South Africa's Gross Domestic Product and about 7% of the formal employment. However challenges in this industry affect the production of crops and breeding of animals. Thegovernment aims to assist farmers by improving on their skills to increase production on both large scale and small scale commercial and subsistence farming. These will try and alleviate the food security associated with population boom across the world.

1.2.1 What is the difference between?
- a ) Commercial farming (1x2) (2)
- b ) Subsistence farming (1x2) (2)
- c ) Specify the type/level of farming in terms of large scale or small scale for the explanations given on 1.2.1 a) and b). (2x1) (2)

1.2.2 What measures are in place by government to assist farmers to increase on production? Name any **ONE**? (2x1) (2)

1.2.3 Which primary economic activity is the mainstay/pillar of the South African economy? (1x2) (2)

1.2.4 What are some of the challenges facing this industry in South Africa? Give any **THREE**. (3x2) (6)

1.2.5 Give any two major agricultural products that are exported in majority and are part of South Africa's stable diet. (2x2) (4)

1.2.6 Challenges in agriculture lead to the food shortages in a country, what do we call this event /situation? (1x2) (2)

**[22]**

**1.3 Refer to the picture below based on informal sector in South Africa and answer the following questions** (Source: Google Image)



1.3.1 Define the term ***informal sector***. (1x2) (2)
1.3.2 Give **ONE example** of informal traders in South Africa. (1x2) (2)
1.3.3 Give any **TWO possible reasons** why the informal sector is so popular in South Africa (2x2) (4)
1.3.4 In spite of the challenges faced by informal sector, it has an important role to play in community. Write a paragraph of 8 lines to **explain the importance** of the informal sector. (4x2) (8)
**[16]**

**1.4 Refer to the pie chart below in relation to the pictures to answer the following the following questions**

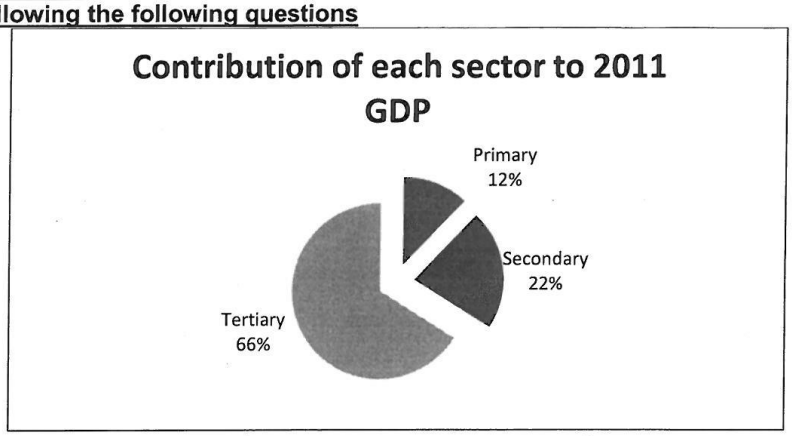
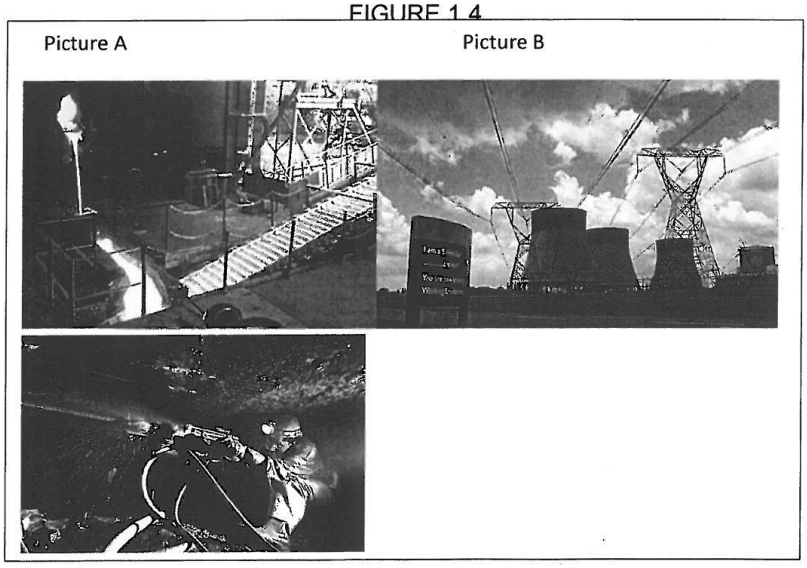



FIGURE 1.4



1.4.1 Match the **THREE** economic activities from (Pie Chart) with the relevant pictures in in FIGURE 4.1. (3x1) (3)

1.4.2 In which industrial area are the pictures indicated, available to sustain the economic development? (1x2) (2)

1.4.3 List **THREE** factors that **favour industrial development** in the area mentioned in QUESTION 1.4.2 above. (3x2) (6)

1.4.4 Briefly explain the difference between the following types of industries
a ) Bridge industry
b ) Footloose industry
c ) Ubiquitous industry (3x2) (6)
**[17]**

**1.5 Briefly explain the aim of the following:**

1.5.1 a) Industrial Development Zone (IDZ)
b) Spatial development Index (SDIs) (2x2) (4)

1.5.2 Explain the Lesotho Highlands water project under the following headings:
a) Areas they supply with water
b) Benefits for the two countries involved (2x2) (4)
**[8]**

**TOTAL MARKS: 75**

## GRADE 12 GEOGRAPHY TASK 2 RESEARCH – 2017

**GENERAL INSTRUCTIONS:**

**Plan and carry out a research on a problem/issue that is being experienced in your local community. The problem/issue must have been reported in a newspaper that is either local to your area (community news) or a newspaper that is provincial or national. Once you have gathered the required information through your research, you will write a report in which you will discuss your findings. When choosing a problem/issue to investigate, ensure that:**

- ✓ It has a strong geographical link to the grade 12 syllabus
- ✓ It is not going to be too difficult to gather information
- ✓ You will not be put into a dangerous situation while doing your investigation
- ✓ Your gathered information is not entirely from the internet
- ✓ Strictly stick to the time frames that your teacher gives to you
- ✓ Ensure that all resources, extracts, quotations are referenced (declared/acknowledged) where required in a bibliography

**Note to learner:**

1. **You are required to do a research and write a report in your own words. Learners who merely 'cut and paste' articles and pictures or copy information directly from the source will be penalized**
2. **You will be given two weeks to complete this task**
3. **You may hand in a typed or hand written report**
4. **Failure to hand in the research task on the due date (determined by the educator) will result in you receiving a penalized/reduced mark for this task**

**Note to the teacher:**

1. **Teachers must give the assessment rubrics to the learners before they start with the research/essay task**
2. **This task is due in term 2 and teachers must give the learners a clear management plan with due dates and deadlines**
3. **Teachers must check he articles which the learners have chosen before they begin the task to ensure that the article has a link to the Geography syllabus**

**EXAMPLES OF THE PROBLEMS/ISSUES THAT CAN BE REPORTED ON:**

| PROBLEM/ISSUE | LINK WITH SYLLABUS |
|---|---|
| Non delivery of RDP housing | People and places |
| Flooding in the area | Climate/Geomorphology |
| Poor service delivery | People and their needs |
| Poverty alleviation | People and their needs |
| Job creation programmes | People and their needs |
| Industrial area issues e.g. pollution | People and their needs |
| Transport problems | People and places / People and their needs |
| Mining issues – e.g. pollution/environmental damage | People and their needs |
| Damage due to old and outdated infrastructure | People and places |

## TASK 2: WRITE A RPORT OF 3-5 PAGES LONG (EXCLUDING PICTURES)

**Use the following 5 steps as headings when completing the investigation and writing the report: (You will lose marks if you do not do all 5 steps – see assessment rubric)**

**STEP 1**: Find your **own article** in a **local** or **other** newspaper/magazine/internet that highlights a problem in **your** local community. (Original articles only will be accepted). Directly above or below your article write (not more than three lines) what the article is all about (8)

**STEP 2**: Explain briefly the **causes** of the problem/issue that you have discovered or investigated
- Do **not** re-write the article
- Explain why you chose to research this problem/issue
- Explain the causes of the problem/issue in your own words and only quote from the article when needed (8)

**STEP 3**: Explain the **effects** (results) of the problem/issue
- There must be evidence that you actually investigated the problem physically where possible. Explanations must be with regard to: Social and/or Economic and/or Environmental problems
- Use pictures/photos to enhance (8)

**STEP 4**: How did the **government/municipality/community** respond to the problem/issue? (8)

**STEP 5**: Provide **possible** geographical **solutions or future actions** to prevent the problem/issue. (8)

6. No plagiarism is allowed. Learner must use his/her own words (6)

7. Use a bibliography – reference all sources used. (4)

**[50]**

**For steps 2, 3, 4 and 5 try to give at least 5 good thought provoking facts.** **(CONVERTED TO 100 ON THE 'RUBRIC)**

## ASSESSMENT RUBRIC

| MARKS | 1-2 | 3-4 | 5-6 | 7-8 |
|---|---|---|---|---|
| **STEP 1**<br><br>(Article) | -Article chosen is not relevant or partially relevant to the topic and not original<br>-Learner needs to be guided in choosing relevant article | -Article chosen is relevant to topic<br>-Article is of a local nature<br>-Article shows some understanding of requirements<br>-Learners vaguely able to say what the article is all about | -Article is relevant to topic and deals with a local geographical issue<br>-Learner can make the link with syllabus<br>-Learner is able to say what the article is all about | -Excellent article and deals with a relevant local geographical issue<br>-Learner was not given any guidance in choosing article-<br>-Learner is very able to say what the article is all about |
| **STEP 2**<br><br>(Causes) | -No explanation of the problem or issue provided<br>-Can state **one** relevant **cause** of the problem or issue<br>-Needs guidance in discussing | -Can state **two** relevant **causes** of the problem or issue<br>-Explanation of problem is based very little on geographical facts<br>-Shows some understanding of what caused the problem or issue | -Can explain at least **three** relevant **causes** of the problem or issue. -<br>Explanation of problem is good and explanation based on geographical facts<br>-Shows understanding of what caused the problem or issue | -Can explain **four** or **more** relevant **causes** of the problem/issue in detail<br>- Explanation of problem is very good based on geographical facts<br>-Learner has interpreted the causes of the issue masterfully |
| **STEP 3**<br><br>(Results) | -Cannot state any effects/results<br>-Can only list **one** social/ economic or environmental effect<br>-No pictures are provided | -Can only state **two** social, economic and/or environmental effects with some evidence<br>-Explanation given is satisfactory<br>-Pictures provided are limited | -Can explain/discuss at least **three** social, economic and/or environmental effects<br>-Explanation given is good<br>-Pictures provided are adequate | -Can explain/discuss **four** or **more** relevant social, economic and environmental effects -<br>Explanation given is excellent<br>-Pictures provided are very good and shows the effects |
| **STEP 4**<br><br>(Responses) | -Cannot state any responses<br>-Can list **one** response that is not clearly relevant | -Can state and explain partially at least **two** ways in which government, municipality or community has responded | -Can explain/discuss adequately at least **three** ways in which government, municipality or community has responded | -Can explain or discuss **four** or **more** ways in which government, municipality or community has responded<br>-Discussion provided is excellent (with relevant references provided to support discussion) |
| **STEP 5**<br><br>(Possible solutions or future actions) | -Only **one** possible solution or future action listed to the problem/issue<br>-Not geographical<br>-Poor attempt at referencing sources | -Only able to list **two** possible solutions or future actions to prevent the problem or issue<br>-Solution is partially geographical<br>-Fair attempt made at referencing sources | -Able to explain or discuss at least **three** possible solutions or future actions to prevent problem/issue<br>-Solutions or future actions are geographical<br>-Good attempt made to reference all sources | -Able to explain or discuss **four** or **more** possible solutions or future actions to prevent problem/issue<br>- Excellent geographical discussions are given on possible solutions or future actions that could be taken<br>-All sources of information has been referenced |
| **Plagiarism** | Learner did not use his/her OWN WORDS<br>(0 may be awarded) | Learner only partially used own words | Learner creatively used OWN WORDS | |
| **Bibliography** | No Bibliography (0 marks)<br>Poor mentioning of sources | Good referencing made to bibliography | | |

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# RUBRIC MARKSHEET

**GRADE: 12** **TASK 2: REPORT WRITING** **TOTAL:100**

**NAME:** _____

| STEPS | MARK | EDUCATOR COMMENTS | MODE-RATED MARK | MODERATOR COMMENTS |
|---|---|---|---|---|
| STEP 1: | ___/8 | | ___/8 | |
| STEP 2: | ___/8 | | ___/8 | |
| STEP 3: | ___/8 | | ___/8 | |
| STEP 4: | ___/8 | | ___/8 | |
| STEP 5: | ___/8 | | ___/8 | |
| 6.PLAGIARISM / OWN WORDS | ___/6 | | ___/6 | |
| 7.BIBLIOGRPHY AND REFERENCING | ___/4 | | ___/4 | |
| TOTAL MARKS 50 | ___/50 | | ___/50 | |
| CONVERTED MARK 50X2 = 100 | ___/100 | | ___/100 | |

**Comment:** _____

_____

**Educators Signature:** _____

**Moderators Signature:** _____

## GRADE 11 DATA HANDLING

### Memorandum

**Question 1**

1.1 Asia

1.2 Asia

1.3 The role of poor land use management in desertification

- Overcultivation
- Overgrazing
- Deforestation
- Poor irrigation management

**1.4**.1 When an arable land is turned or becomes arid/semi-arid (**concept)**

1.4.2 learner may choose any of the factors and use their understanding:

- **Wind-strong blowing winds blows away fertile soil and makes the area infertile turning it into a desert.** .
- **Increased population- more people lead to cutting of trees for different reasons, leaving the land barren which leads to desertification.**
- **Competition for scarce resources-leads people exploiting depleted plant resources and causing desertification.**
- **Abuse by people and livestock-land that is abused by people and livestock will be infertile and eventually be turned into a desert**
- **Large cattle herds-over grazing removes vegetation and leads to desertification.**
- **Dust storms-removes fertile topsoil and leads to poorer soils and desertification.**
- **Encroaching sand dunes spreads sands around the area turning it into desert.**
- **Large areas under cultivation-poor farming methods will lead to soils losing fertility and becoming desert.**

**Question 2**

2.1 Hadley cell

2.2 **B**=Divergence **C**=Rising **D**=Convergence

2.3 Heating/air is heated

2.4 -Cloud formation .

-Heavy rainfall/thunderstorm/rainfall

2.5 South east winds.

**Question 3**

3.1 A – South Atlantic High/St Hellena high pressure cell

B – South Indian High/Mauritious High pressure cell

3.2 Sub – tropical High pressure belt

3.3 4 MB

3.4 C – cold front

D – Warm front

3.5 C- cold air

D – Warm air

3.6

3.6.1 17 degrees

3.6.2 0 degrees

3.6.3 Not supplied

3.6.4 10 knots

3.6.5 South east

**Question 4**

4.1 El Nino Southern Oscillation

4.2

4.2.1 1980

4.2.2 1991

4.2.3

- the annual rainfall fluctuates between high and low,
- the trend indicates a clear increase in occurrences of below average rainfall years,
- Decrease in average annual rainfall

4.2.4 1982 and 1991

4.2.5

- Planting drought resistant crops
- Use of ground water
- Implementation of water restrictions
- Re-using water for irrigation and other farming purposes.

(accept other logical strategies)

4.2.6

**Question 5**

5.1 July

5.2 January

5.3

5.3.1 Winds that blow seasonally in India.

5.3.2 **A** =Summer/wet Monsoons **B**=Winter/dry monsoons

5.3.3 (a) A

(b) Rain falls over the land.High pressure over the ocean and low pressure over the land .

5.3.4 **Blessing-**

More rain is experienced,more water available,Farming activities take place,Employment is created,Economy grows

**Curse**

More rain results in flooding,causes soil erosion,destruction of property,loss of lives,poverty.

5.3.5

- Most of the time during the summer, the land is warmer than the ocean.
- This causes air to rise over the land and air to blow in from the ocean to fill the void left by the air that rose.
- Rising air leads to cloud formation and precipitation.
- These monsoon clouds that form are full of moisture from the ocean, so they can produce heavy rainfall for long periods of time. Because the land stays warmer than the ocean for most of the summer and the ocean is a constant source of moisture, these heavy rains last for months at a time.

## Appendix 8: Ethics clearance letter

**Wits School of Education**
27 St Andre ws Road, Parktown, Johannesburg, 2193 OR Private Bag 3, Wits 2050, South Africa. Tel: +27 11 717-3064 Fax: +27 11 717-3100 E-mail: enquiries@educ.wits.ac.za Website: www.wits.ac.za
02 June 2017
Student Number: 8900452X
Protocol Number: 2017ECE018D

Dear Muofhe Thenga

**Application for Ethics Clearance: Doctor of Philosophy**
Thank you very much for your ethics application. The Ethics Committee in Education of the Faculty of Humanities, acting on behalf of the Senate has considered your application for ethics clearance for your proposal entitled:

**The influence of a short intervention programme on professional development of in-service teachers in environment and sustainability education in secondary schools**
The committee recently met and I am pleased to inform you that **clearance was granted**. However, there were a few small issues which the committee would appreciate you attending to before embarking on your research.

**The following comments were made:**
While you indicated that you have appended the Interview and observation schedules you failed to include them. However, you have provided all the necessary assurances about the ethical conduct of your research

Please use the above protocol number in all correspondence to the relevant research parties (schools, parents, learners etc.) and include it in your research report or project on the title page.
**The Protocol Number above should be submitted to the Graduate Studies in Education Committee upon submission of your final research report.**

All the best with your research project.

Yours sincerely,
Wits School of Education
011 717-3416

Cc Supervisor: Dr's Paul Goldschagg and Rene Ferguson

## Appendix 9: GDE Research Approval letter

**GAUTENG PROVINCE**
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

### GDE RESEARCH APPROVAL LETTER

| | |
|---|---|
| **Date:** | **10 August 2017** |
| **Validity of Research Approval:** | **06 February 2017 – 29 September 2017**<br>**2017/208** |
| **Name of Researcher:** | **Thenga M.C** |
| **Address of Researcher:** | **31 Normandy** |
| | **Trefnant Road** |
| | **Ormonde, 2091** |
| **Telephone Number:** | **011 717 3801 076 114 2439** |
| **Email address:** | **muofhe.thenga@wits.ac.za** |
| **Research Topic:** | **The influence of a short course intervention programme on professional development of in-service teachers in environment and sustainability education in secondary schools** |
| **Number and type of schools:** | **Six Secondary Schools** |
| **District/s/HO** | **Ekurhuleni North** |

***Re: Approval in Respect of Request to Conduct Research***

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

14/08/2017

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*Making education a societal priority*

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