

**A theory-based approach to evaluating a
Continuing Teacher Professional Development Programme
aimed at strengthening environment and sustainability education**

A thesis submitted in fulfilment of the requirements of the degree of

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by

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Abstract

This study uses a theory-based approach to evaluate the Fundisa for Change training programme, a continuing teacher professional development programme aimed at strengthening environment and sustainability education. The aim of the study was to surface assumptions that underpin the design and implementation of the Fundisa for Change training programme.

The Fundisa for Change Teacher Education programme is a national collaborative programme that is implemented in all the nine provinces of South Africa. The study reports on the implementation of the programme in five provinces. The study aimed to surface the Fundisa for Change training programme's implementation theory and programme theory as these affect programme delivery. The Fundisa for Change training programme was implemented in diverse contexts by different facilitators to different participants. To determine how training programme outcomes were achieved, use was made of context-mechanism-outcome (CMO) configurations for each site where the programme was implemented.

Data used to construct CMO configurations was generated through document analysis of Fundisa for Change documents, interviews with stakeholders and participants, as well as observations of programme implementation at five sites. There were three phases to data analysis: content analysis of Fundisa for Change documents, content analysis of observation transcripts and use of the CMO configuration, an analytical tool used in realist evaluation. An initial CMO configuration was constructed prior to observing implementation of the programme and a refined CMO configuration for the Fundisa for Change training programme was constructed based on similarities between the CMO configurations constructed for each of the five sites under study.

The partnership model of the Fundisa for Change training programme brought diverse expertise and resources (material, cognitive, social and emotional) which were conducive to the achievement of programme outcomes. The programme's action context (structure, culture, agency and relations) contributed to the achievement of programme outcomes by participants. Participants' subject content knowledge, teaching practice and assessment practice was enhanced through attending the Fundisa for Change training. On-course tasks were mediated during training and this created opportunities for participants to discuss and reflect on current practice in ways that could lead to a change in practice.

In evaluating professional development programmes, an elaborated definition of context in terms of structure, culture, agency and relations enables a comprehensive exploration of potential programme mechanisms that can be activated when programmes are implemented. It is also important to disaggregate resources and reasons when identifying mechanisms as this assists with differentiating between context and mechanisms.

The study offers insights into the professional learning of teachers grappling with new content and pedagogical content knowledges related to environment in the context of recent curriculum changes where the South African national school curriculum has come into focus. Environmental education programmes in South Africa have implicitly used a realist approach. This study offers the first substantive professional learning evaluation that develops this approach explicitly using Theory of Change and Realist Evaluation in combination.

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List of Acronyms

CAPS	Curriculum and Assessment Policy Statement
DBE	Department of Basic Education
DEA	Department of Environmental Affairs
DHET	Department of Higher Education and Training
DWA	Department of Water Affairs
HEI	Higher Education Institution
NGO	Non-governmental Organisations
SACE	South African Council for Educator
SADC	Southern African Development Community
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SES	Senior Education Specialist
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISA	University of South Africa
WESSA	Wildlife and Environment Society of South Africa

CHAPTER 1: INTRODUCTION AND CONTEXT

1.1 Introduction

This chapter sets the scene with the context and background of the study. The chapter starts by providing the rationale for this study focusing on evaluation of teacher professional development and proceeds by introducing the Fundisa [Teach] for Change teacher education programme as the case under research. This is followed by a brief discussion on the education and training context both in the school and teacher education sector. The chapter further touches on the theoretical framework guiding the study – realist underlabouring philosophy. Research questions and goals are presented. The chapter concludes with an outline of the structure of the thesis.

1.2 Rationale for the study

I have been a high school teacher for 11 years and in those years I attended numerous teacher professional development programmes. Some of these programmes were linked to formal qualifications and others were not (curriculum orientation workshops and meetings). My experiences with the different programmes were as diverse as the programmes themselves. Some of these programmes challenged how I saw and enacted my role as a teacher. These kinds of programmes enabled a re-thinking of my practices and I was encouraged to innovate and improve my practice. Over the years I have wondered what is it about some programmes that foster learning that fundamentally changes how and what teachers do in the classroom (Opfer & Pedder, 2011).

Unfortunately, some of the programmes I attended left me thinking that I could have made better use of my time. When teachers attend a teacher support course, programme, training or workshop, it should have an impact on their professional practice (Moon, 2001). Teacher professional development programmes should be designed to enhance teachers' practice so teachers can appreciate the need to invest time in professional development.

The support and assistance given to teachers is particularly important and of concern to teachers when they have to implement a new curriculum (Du Toit & Sguazzin, 2000, p. 12). Support that has been given to South African teachers in reorienting them to a new curriculum has tended to be 'once-off', 'one size fits all' workshops that only focus on the official requirements of a curriculum but not necessarily on how the requirements influence classroom practice (Bantwini, 2009; Songqwaru 2012).

The Minister of Basic Education, Mrs Angie Motshekga stated, in a speech she delivered in January 2015 at the announcement of the 2014 National Senior Certificate (NSC) examinations results, that the quality of education of any system is predicated on the quality of its teachers (<http://www.education.gov.za/>). She was reiterating a statement from the UNESCO 2004 EFA report: “the benefits of early childhood, literacy and life-skills programmes largely depended on the quality of their contents and of their teachers” (UNESCO, 2004, foreword). This has implications for teacher professional development programmes and suggests that quality teacher development is a prerequisite for quality education.

Reasons for undertaking this study with a focus on the evaluation of a professional development programme were twofold. The first is related to my personal experience of professional development activities shared above. Secondly, at the beginning of this study (2013), I was the national co-ordinator of the Fundisa for Change Teacher Education programme from 2013 - 2015. As the co-ordinator of the programme, I was responsible for the monitoring and evaluation of the programme. One of the key impact areas of the Fundisa for Change programme focuses on teachers’ knowledge and practice, that is, the extent to which the Fundisa for Change programme improves teachers’ subject knowledge, pedagogical content knowledge and assessment practice.

Since I had to monitor and evaluate the programme, I decided to explore how I could evaluate the training component of the Fundisa for Change programme in ways that would investigate conditions that enable or constrain the achievement of the programme’s training objectives.

1.3 The Fundisa for Change Teacher Education Programme

The Fundisa for Change Programme is a national, collaborative teacher education programme. ‘Fundisa’ is an isiXhosa word that means ‘Teach’. The programme aims to support teachers to teach for change. The Fundisa for Change Teacher Education programme was established in 2011 with a specific focus on strengthening environmental learning through teacher education. Partners collaborating in the programme are from government departments, parastatals (intergovernmental organisation separate from government but with activities that serve the government), non- governmental organisations (NGOs) and institutions of higher education throughout South Africa¹.

¹ DEA, DBE, DWA, WESSA, SANBI, SANParks, Delta Environmental Centre, GreenMatter, Lewis Foundation, GIZ, SACE, Rhodes University, Stellenbosch University, UNISA, University of KwaZulu-Natal, North-West University, University of Zululand, University of Cape Town, University of Fort Hare, University of Pretoria, Walter Sisulu University and the University of Witwatersrand.

Fundisa for Change aims to strengthen and expand the environmental and sustainability content knowledge specified in the subjects offered in the South Africa's national school curriculum (grades R – 12). The programme thus supports teacher educators in universities, teacher educators in the environmental sector and Department of Basic Education subject education specialists to prepare teachers to engage with environment and sustainability knowledge and skills specified in the national school curriculum. The ultimate aim is to enable teachers to contribute to building an environmentally sustainable and healthy society that is envisaged in the South African Constitution (Fundisa for Change, Introductory Core Text, 2013a). The main objective of Fundisa for Change is to enhance transformative environmental learning through teacher education. The programme defines transformative learning as learning that draws on appropriate content and values in ways that support learners to solve problems and to develop social practices for 'a more just and equitable society' (Fundisa, 2013a, p. 13).

The Fundisa for Change programme has five sub-objectives that feed into the main objective, these are elaborated in chapter five. Chapter Five discusses each of the sub-objective. The focus of this study is professional development component of the programme that is discussed extensively in Chapter Six. This component of the programme falls under the capacity development objective of the Fundisa for Change programme. The programme offers university short course certificates to teachers and subjects education specialists (previously known as subject advisors or curriculum advisors in the Department of Basic Education) who have successfully completed the professional development training. The short courses are offered by institutions of higher education who are partners in the programme in partnership with other Fundisa for Change partners from government and environmental sectors. The programme recognises that institutions of higher education are lead agents in the support of teachers' professional development. The short courses have received endorsement from the South African Council for Educators (SACE). Teachers who attend Fundisa for Change short courses can accumulate professional development points through the SACE professional development point system.

Fundisa for Change short courses have been offered in all the nine provinces² of South Africa since implementation started in 2012 (see Table 5.2). Funding for Fundisa for Change professional development courses came from its key partners (state, private, national and

²Gauteng, Western Cape, Limpopo, Mpumalanga, Eastern Cape, Northern Cape, Free State, North-West and KwaZulu-Natal

international). The number of participants trained to date is 1024 (training is continuing). This number includes trainers, subject education specialists and teachers. It is these professional development courses which were the focus of this study. Data for the study were generated from five sites where Fundisa for Change professional development training was conducted between 2014 and 2015. The modules that were used in the five sites were three Fundisa for Change generic modules (see Table 5.1), two climate change modules one for grades 10-12 Geography and the other for grades 7-9 Natural Sciences and two water modules for Social Sciences in grades 4-6 and grades 7-9 (see Table 5.2).

The location of the sites where data was generated is indicated in the South African map below.

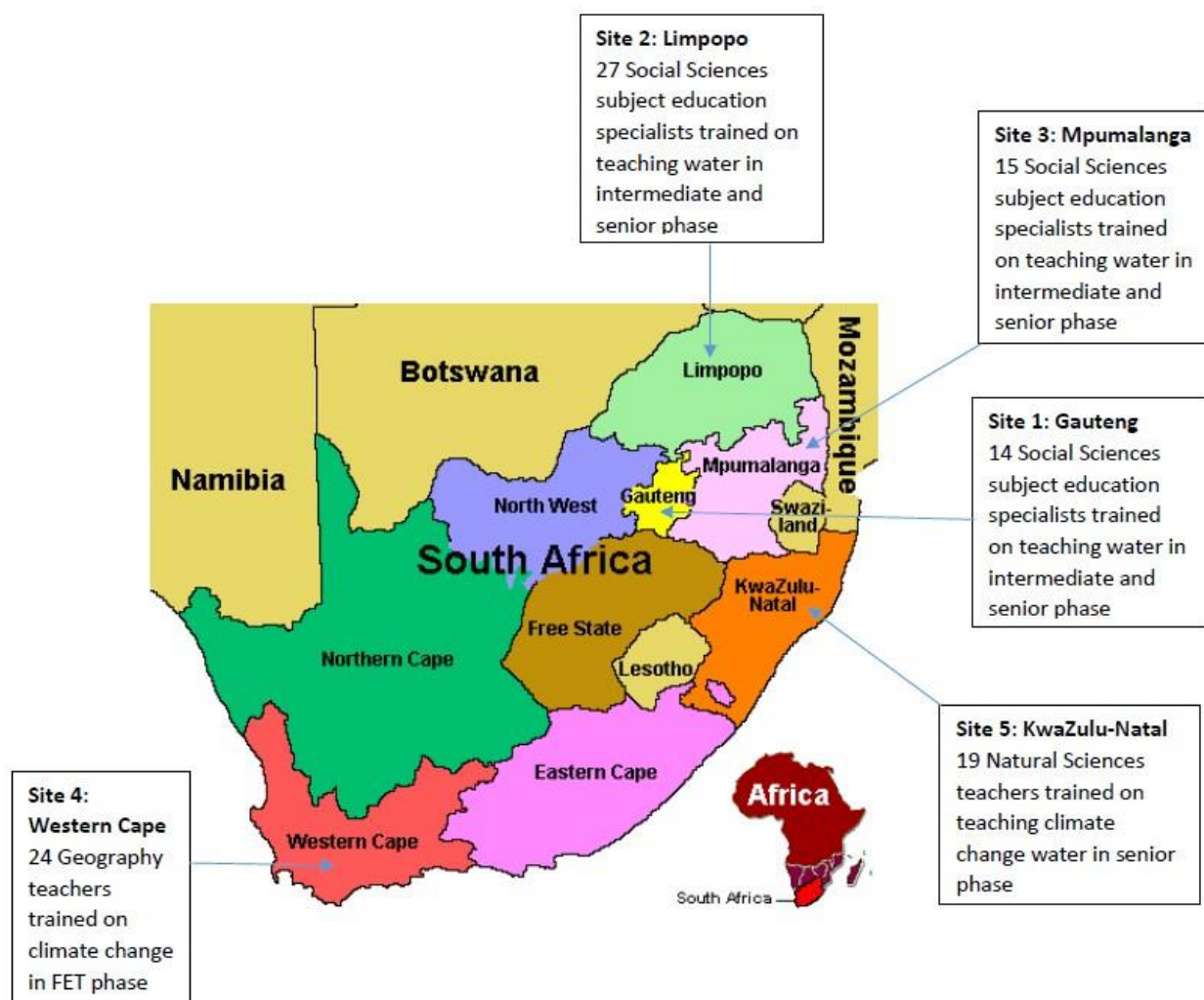


Figure 1.1 Provincial sites where data was generated in 2014 – 2015
(Map adapted from <http://www.bing.com/images>, 2019)

1.4 Education and training context

The conceptualisation of Fundisa at the end of 2010 came at a time when the national school curriculum, the Revised National Curriculum Statement (RNCS) was under review and being repackaged as the Curriculum and Assessment Policy Statement (CAPS) to be implemented in 2012. It was also at a time when the Department of Higher Education and Training replaced the Norms and Standards for Educators with the 2011 Minimum Requirements for Teacher Education Qualifications (Lotz-Sisitka, 2011).

1.4.1 The school context

Since South Africa became a democratic country in 1994, many changes have taken place in the national school curriculum (see Figure 1.2). Each curriculum review and subsequent change required that teachers be oriented to a new curriculum. A significant change in education in the post-apartheid era was the recognition of the importance of integrating environmental education, also known as education for sustainable development (ESD), into the national school curriculum.

National school curriculum reforms since democracy (1994)

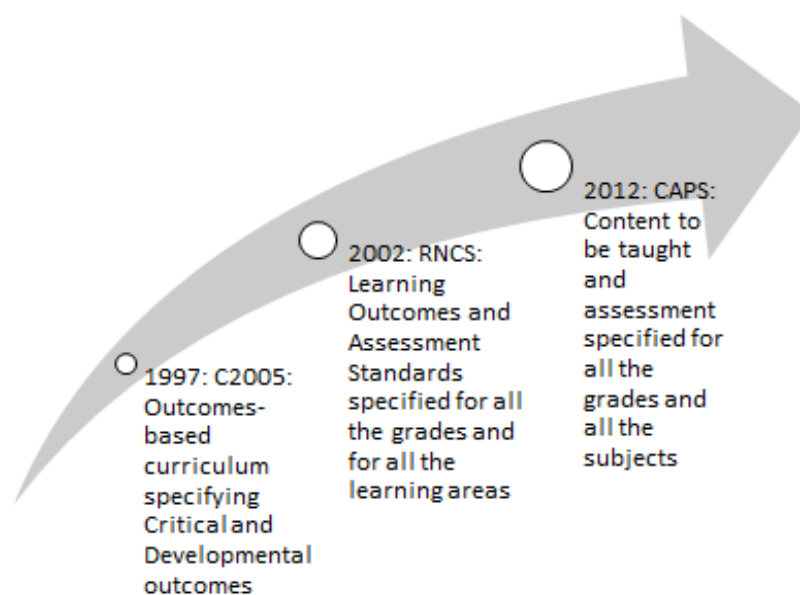


Figure 1.2 Curriculum changes in South Africa since democracy in 1994

In 1997, an outcomes-based curriculum, Curriculum 2005 (C2005), was developed in South Africa with environment integrated as a phase organiser in all the learning areas (subjects). A phase organiser was a cross-cutting curriculum theme across a phase (school grade levels). This meant that all the teachers in a phase were required to have an environmental focus in their

lessons. This inclusion of environmental education in the school curriculum was influenced by the 1995 White Paper of Education and Training, which called for the integration of environmental education (EE) across all phases and levels of the education and training system (Republic of South Africa [RSA], 1995).

The prioritisation of environment as one of the basic needs also found expression in the South African Constitution. The Constitution states that the environment should be protected for the benefit of present and future generations as every South African citizen has a right to an environment that is not harmful to their health or well-being (RSA, 1996). But for that right to be protected, South African citizens would need to be environmentally literate, hence the integration of environmental education across all phases and levels of the education and training system.

In 2002 the Revised National Curriculum Statement (RNCS) was approved for implementation. This revision brought changes in how environmental education was represented in the curriculum. Environment was no longer a phase organiser but integral as one of the key principles that underpinned RNCS. A new principle articulating an environmental focus in the formal curriculum highlighted the relationship between social justice, human rights, a healthy environment and inclusivity, reflecting principles of ESD (South Africa. Department of Education [DoE], 2002).

The next curriculum review was in 2011 which led to a content and assessment referenced curriculum, the Curriculum and Assessment Policy Statement (CAPS) to be implemented in 2012. Curriculum reforms from 1997 to 2012 brought a shift from a curriculum that emphasised learning outcomes and assessment standards to one that places content knowledge and assessment at the core. Throughout the curriculum changes, the environmental focus has remained an underpinning principle.

The integration of environmental education into the national school curriculum in the form of environmental and sustainability concepts varies from subject to subject. In some subjects the concepts are explicitly stated in the subject's specific aims and form part of the content knowledge but in others, the environmental focus is only represented as one of the specific aims and/or purpose of the subject. It is difficult to quantify the magnitude of the environmental and sustainability concepts as these concepts are scattered across different topics in the grades and across the grades in each of the subjects analysed (Appendix 1).

The 2013 and 2015 Department of Basic Education (DBE) grade 12 examination performance diagnostic reports³ indicated that the integration of environmental education in the schooling system has not necessarily meant that all South African teachers and learners have been able to engage successfully with the environmental content knowledge and sustainability concepts. Some of the issues identified are tabulated below.

Table 1.1 Learner performance concerns related to environmental content knowledge in different subjects (Analysis from 2013 & 2015 DBE diagnostic reports)

Subject	Comments	Source
Economics	Candidates could not distinguish between ‘global warming’ and ‘globalisation’.	DBE, 2013, p. 58
	Failure of candidates to understand environmental sustainability as an economic concept led to poor performance in this question.	DBE, 2013, p. 63
	Candidates discussed the public sector and not environmental sustainability. Learners’ responses to this question indicated that environmental sustainability had not been well taught so they tended to be generic and vague in their answers.	DBE, 2013, p. 63
	Many learners wrote about climate change in general, instead of relating to its influence on agricultural production.	DBE, 2015, p. 67
	Some candidates struggled with the phrase ‘overexploitation of land’ and could not associate it with agricultural output. As a result, their responses did not address the question.	DBE, 2015, p. 68
	Candidates discussed how pollution affected the economy and the factors causing environmental damages, as opposed to linking the <i>environment as a common resource</i> to market failure.	DBE, 2015, p. 68
Geography	The question required candidates to provide sustainable solutions to improve the living conditions in Tsakane Extension Six. The candidates were intimidated by the word sustainable and many could not come up with four different solutions that could be ongoing. Many candidates mentioned sanitation, water, electricity and basic needs which are the collective names for all those services mentioned. They failed to discuss how these can be sustainable in the future.	DBE, 2015, p. 95
	Many candidates struggled with the definition of food security.	DBE, 2015, p. 95
	Candidates struggled to explain how data can be collected for an environmental impact study. The term environmental impact study was problematic to some candidates.	DBE, 2015, p. 104

³ These DBE reports are a comprehensive analysis of candidates’ performance in the National Senior Certificate (grade 12) examinations in Accounting, Agricultural Sciences, Business Studies, Economics, English First Additional Language, Geography, History, Life Sciences, Mathematics, Mathematical Literacy and Physical Sciences.

Life Sciences	Candidates demonstrated very limited knowledge of concepts relating to environmental studies.	DBE, 2013, p. 117
	Candidates spoke of ‘rhinos becoming extinct’ without elaborating on the impact of them becoming extinct such as ‘thus reducing biodiversity’. They <i>listed</i> the consequences of increasing rhino poaching rather than <i>explaining</i> the impact of the consequences.	DBE, 2013, p. 121
	Generally questions on environmental studies were poorly answered giving the impression that this topic, which is scheduled towards the end of the year, was neglected by both teachers and learners.	DBE, 2013, p. 121
	Candidates’ performance indicates that the questions on environmental studies which were taught in Grade 11 were not revised properly or covered again in Grade 12.	DBE, 2015, p. 127
Physical Sciences	Most candidates were very vague when answering the impact of excess fertilisers in water resources on humans.	DBE, 2013, p. 201

The extent to which learners’ overall performance is affected by their performance in environmental content knowledge depends on the weighting given to the assessment of the environmental content knowledge in the various subjects. What these reports indicate is that teachers need support with regard to the teaching and learning of environmental and sustainability concepts.

The Minister of Basic Education views the inclusion of environmental and sustainability concepts in learner assessment in CAPS as a strategy to raise the standard and quality of education: “learners were expected to deal with real life challenges, such as El Nino and La Nina in relation to their impact on productivity and other aspects of human life” (Motshekga, 2015). Teachers and learners are expected to incorporate current developments and contemporary information in the classroom in efforts to produce learners who have the knowledge to deal with current and future challenges using analytical and critical thinking skills, problem solving and innovation and be able to interact effectively with the environment (ibid.). The skills envisaged can be developed as teachers and learners engage with current socio-ecological issues specified as content knowledge in the school subjects.

1.4.2 The teacher education context

In 2014, the Minister of Basic Education stated that in 1990 only 53% of teachers in classrooms were qualified to teach but that the number has increased to 97% by 2013. She added that whilst this increase was encouraging, different studies still point to the need to continuously ensure that teachers and subject advisors’ competencies are improved (<http://www.education.gov.za/>).

The Department of Basic Education (DBE) statistics indicate that in 2013 there were 12 883 888 learners in the basic education system, who attended 30 027 education institutions and were served by 447 149 educators (South Africa. Department of Basic Education [DBE], 2015a, p. 3).

Nationally the South African government has developed policies and programmes to identify and address issues of educational quality to improve the quality of teachers and teaching in the schooling sector.

In July 2009, a Teacher Development Summit was held to bring together all the stakeholders in the Teacher Education and Development sector. The primary goal of the summit was to address challenges faced by teacher education and teachers. Stakeholders who participated in the summit included the national Department of Basic Education (DBE), the Higher Education South Africa – Education Deans’ Forum (HEAS-EDF), Training and Development Practices Sector Education and Training Authority (ETDP SETA), the South African Council for Educators (SACE), the Education Labour Relations Council (ELRC) and teacher unions (South Africa. DBE & Higher Education and Training [DHET], 2011).

The Summit led to the drafting of an integrated national plan for teacher development called an *Integrated Strategic Planning Framework for Teacher Education and Development in South Africa, 2011- 2025* (hereafter referred to as the Plan).

Some of the challenges discussed at the summit were:

- Lack of access to quality Teacher Education and Development (TED) opportunities for prospective and practising teachers.
- Failure of the system to achieve dramatic improvement in the quality of teaching and learning in schools.
- A fragmented and uncoordinated approach to Teacher Education and Development.
- Tenuous involvement of teachers, their organisations and other stakeholders in Teacher Education and Development. (South Africa. DBE & DHET, 2011)

The primary outcome of the Summit was a plan to improve the quality of teacher education and development in order to improve the quality of teachers and teaching in the schooling system. The Plan caters for all educators (classroom teachers, school leaders and managers, subject advisors and other professionals who support teaching and learning at school level). According to the Plan, teachers are at the centre of teacher development and as such, are

expected to lead their own professional development with support from other stakeholders who have an interest in teacher education and development (South Africa. DBE & DHET, 2011).

In 2011, the DBE released an action plan, *Action Plan to 2014: Towards the Realisation of Schooling 2025* (hereafter referred to as Action Plan 2014). Action Plan 2014 is DBE's strategy for improving the quality of basic education. One of the goals of Action Plan 2014 focuses on 'improving the professionalism, teaching skills, subject knowledge and computer literacy of teachers throughout their entire careers' (South Africa. DBE, 2011, p. 107). This is in response to the 2009 review (*Report of the Task Team for the Review of the Implementation of the National Curriculum Statement*) that indicated that the main focus of in-service training has been on how to make the transition to the new national curriculum, without strengthening or updating subject knowledge, i.e. training concentrated on the theory of the new curriculum rather than on the implementation of the curriculum. Educators in the schooling system (departmental officials, school principals and teachers) feel they do not have adequate capacity to realise fundamental and positive change in the way teaching and learning takes place in schools (ibid.).

In 2011, the Minister of Higher Education and Training, Dr Bonginkosi Emmanuel Nzimande, approved a national policy document on the Minimum Requirements for Teacher Education Qualifications (DHET 2011 revised in November 2014). In the policy, teaching is seen to be comprised of the acquisition, integration and application of different types of knowledge practices. The policy explicitly foregrounds knowledge, reflection, connection, synthesis and research, paying close attention to what is to be learned, and how (South Africa. DHET, 2015). This policy aims to address the issue of teacher subject content knowledge and pedagogical content knowledge and acts as a guide as to what should be included in teacher training or professional development programmes.

The policy specifies five knowledge practices that should underpin teacher professional programmes: *Disciplinary Learning, Pedagogical Learning, Practical Learning, Fundamental Learning, and Situational Learning*. Situational learning includes learning *in* context and *about* context. This involves understanding social complexity and diversity in South Africa and learning to work in nuanced ways with the diverse challenges faced by children in schools and the communities that they serve, for example, promoting inclusivity, and environmental sustainability. Therefore, in supporting teachers, socio-ecological issues should be engaged with in context to make learning meaningful (South Africa. DHET, 2015).

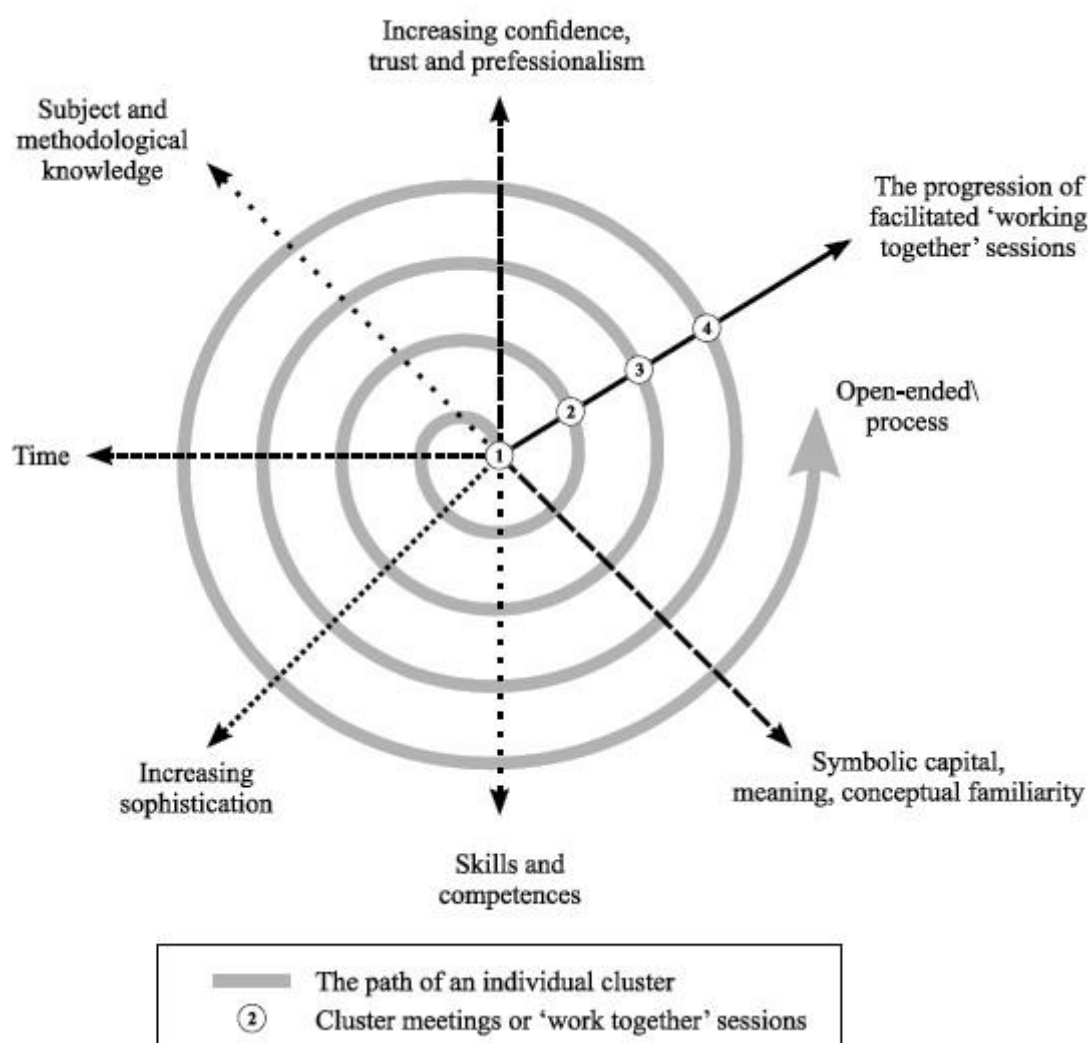
The focus on situational learning speaks to the interdisciplinary, integrated and active approach to learning that was suggested in the 1995 White Paper on Education and Training with the inclusion of environmental education in the education system (RSA, 1995). There have been challenges that have been identified in the implementations of environmental education. Some of these challenges include participants' negative perspectives of environmental learning, limited materials resources for environmental learning, timing of training, and lack of adequate support for environmental learning in schools at the end of project initiatives (Maila, 2003; Mokhele, 2007).

The 2015 Minimum Requirements for Teacher Education Qualifications policy was reviewed in 2018. The October 2018 draft stated that teacher education should take into account emerging priorities such as the 21st century skills and imperatives related to the 4th industrial revolution and the Sustainable Development Goals (SDG) (South Africa. DHET, 2018). This directive will strengthen the integration of education for sustainable development both in teacher education and in the schooling system.

In South Africa there have been initiatives, over the years established to build the capacity of teachers for environmental teaching and learning. Two of the initiatives were the *Learning for Sustainability* project established in 1997 and the *National Environmental Education Project for General Education and Training* (NEEP-GET) established in 2001. The Fundisa for Change programme is the most recent initiative building on the work of the previous two.

Learning for Sustainability was a donor-funded pilot project that introduced environmental sustainability to teachers in two provinces (Gauteng and Mpumalanga), most of whom had no background in environmental education. The pilot was introduced at a time when an outcomes-based education framework was introduced in South African schools. The project integrated environmental education in the curriculum through teacher development, curriculum development and resource materials development (Janse van Rensburg & Lotz Sisitka, 2000).

The pilot introduced a spiral model for professional development (see Figure 1.3). The spiral model is a long-term vision for professional development, characterised by a process-oriented, activity and cluster-based approach to professional development (Du Toit & Sguazzin, 2000).



The spiral model was the approach that was used in the professional development of teachers and subject education specialists in the NEEP-GET project. Towards the end of the project, some provinces (Free State, Eastern Cape and Mpumalanga) indicated that more attention needed to be given to continuous professional development (NEEP-GET, 2005).

International imperatives shaped and influences how South Africa integrated environment and sustainability education in the education sector. This study came at a time when the Millennium Development Goals (MDGs) were being replaced by the Sustainable Development Goals (SDGs), which were launched at the end of 2015. United Nations Member States are expected to use these universal goals to frame their agendas and political policies over the next 15 years. Goal Four of the SDGs focuses on quality education which seeks to ensure all learners acquire knowledge and skills needed to promote sustainable development. To achieve this, teachers need to be trained to use appropriate and relevant teaching and learning methods and relevant content that meet the needs of all learners (UNESCO, 2015a). One of the strategic approaches identified to ensure the achievement of SDG Goal Four and the education targets included under other SDGs is to mobilise efforts at national, regional and global levels. These efforts should be targeted at:

- achieving effective and inclusive partnerships;
- improving education policies and the way they work together;
- ensuring highly equitable, inclusive and quality education systems
- mobilising resources for adequate financing for education; and
- ensuring monitoring, follow-up and review and progress. (UNESCO, 2015a)

These efforts as outlined above are closely aligned with the Fundisa for Change approach to strengthening environment and sustainability education in South African schools. The programme adopts a collaborative approach in building the capacity of educators for environmental teaching and learning. One of its key objectives is to build a national system of engagement to expand network of partners with whom they can work in strengthening environmental learning. Another objective of the Fundisa for Change programme which aligns well with the strategic approaches mentioned above is the strengthening of the quality, progression and validity of the current national school curriculum and the representation of environmental content knowledge in teaching and learning support materials (Fundisa for Change, 2013b). Chapter Five provides a detailed description of the Fundisa for Change programme.

Target 4.7 of SDG Goal Four also speaks to the work of the Fundisa for Change programme and aims to ensure that by 2030:

all learners acquire knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development. (UNESCO, 2015a, p. 18)

This target necessitates that learners have teachers in their classroom who have the ability to engage with sustainable development and its associated concepts. Additionally, there is a correlation between some of the other sustainable development goals and the Fundisa for Change programme training materials (Appendix 2).

The Fundisa for Change programme seems to have heeded the 1998 call that was made to the United Nations Educational, Scientific and Cultural Organisation (UNESCO) to develop guidelines for reorienting teacher training to address sustainability in education (UNESCO, 2005a). That call is still relevant today as teacher education is still expected to reorient itself towards sustainability (UNESCO, 2017). UNESCO puts emphasis on content, its teaching and learning methods in approaching education for sustainable development (ibid.)

In 2013, the United Nations Economic Commission for Europe (UNECE) developed guidelines that support the empowerment of educators for a sustainable future. The guidelines describe three stages that need to be followed in an education change process; engagement with stakeholders, running workshops and follow up UNECE (2013). Additionally, the guidelines share principles that underpin an educational change process that reflects the ethos of competence in education for sustainable development. One of the principles resonates with the Fundisa for Change processes as it speaks about understanding and building on the context. This principle calls for the utilisation of existing structures and making use of ongoing processes and initiatives.

Subsequent to the UNECE guidelines, the Global Action Programme was launched with an emphasis on building the capacity of educators. The Global Action Programme is a post-2015 development agenda, a follow-up to the Decade of Education for Sustainable Development (DESD) that recognises that sustainable development cannot be achieved by political agreements, financial incentives or technological solutions alone.

Education still has a prominent role to play in sustainable development (UNESCO, 2014a).

GAP Priority Area Three calls for the integration of Education for Sustainable Development (ESD) into pre-service and in-service teacher education programmes, to increase the capacities of educators and trainers for the delivery of ESD (UNESCO, 2014a). For teachers to be able to achieve Target 4.7 of SDG Goal Four, they need not only to develop sustainability key competencies but also develop general sustainability competencies that will enable them to help learners develop sustainability key competencies through innovative teaching practices and learning experiences (UNESCO, 2017). Educators are viewed as change agents who can deliver the educational responses needed to achieve SDGs (ibid.) and as such it is imperative that teacher education programmes that aim to prepare educators to implement ESD be evaluated.

An interrogation of unexamined assumptions embedded in teacher education programmes through a theory-based approach to evaluation (used in this study) provides insights, firstly, into how programme objectives are operationalised to achieve desired programme outcomes. Secondly, it provides an explanation as to how and why and for whom programme outcomes were achieved or not. The Fundisa for Change Teacher Education programme is one of the initiatives that is trying to address the issue of Education for Sustainable Development at national level, hence it is the chosen case for this study (see Chapters Five and Six).

A re-thinking of the process of professional development and how programmes are evaluated may assist in addressing some of the challenges that indicate that teacher professional development programmes are inadequate in improving the quality of education in South African schools (Bertram, 2011; Opfer & Pedder, 2011; Mokhele & Jita, 2012). Results from a theory-based evaluation process can enable a critique of programmes with the aim of improving their conceptualisation and implementation.

According to Haji, Morin and Parker (2013), the acknowledgement of the minimal effect of professional development programmes on intended outcomes should lead to a conclusion that either little of what is done makes a difference, or current programme evaluation approaches are inadequate to capture what is of interest. It thus seems that questions asked are inadequate to give a full scope of what should be focused on to improve professional development programmes.

1.5 Programme evaluation

To extend our knowledge of teacher education programmes, Borko (2004) suggested that focus should be on four key elements that make up any professional development system, namely, the professional development programme, the teachers who are the beneficiaries of the programme, the programme facilitators, and the context in which the professional development occurs.

Fullan (2007) argued that professional development programmes sometimes fail to give teachers the support they need partly because of the assumptions of programme designers and implementers about how change in practice occurs. What needs to be changed often varies inversely with knowledge about how to work through a process of change. Programmes are conceptualised based on professional experience, insights and beliefs about interventions in a particular field (Birckmayer & Weiss, 2000). All programmes therefore have a theoretical basis, even when those assumptions are partially articulated.

It is through the surfacing of programme assumptions that we can possibly explain why certain professional development programmes and its variants, work in the ways they do to produce the desired results (Desimone, 2009). We also cannot lose sight of Borko's (2004) argument of looking into all the key aspects of professional development systems, to determine how each element works in relation to others.

Karachi, Abbott, Catalano, Haggerty and Fleming (1999) noted that:

A program evaluation enhances its utility by examining the theoretical basis of the program and the intervening and contextual factors that mediate the relationship between the program and the ultimate outcome. Thus, information generated from this type of evaluation can improve intervention conceptualization while it contributes to theory development and validation. (p. 713)

Arguably, without surfacing programme assumptions (which affect the delivery of a programme), even if they are sound, the programme cannot be fully understood. This study thus focuses on the use of a theory-based approach to programme evaluation, to surface the assumptions that underpin the Fundisa for Change Teacher Education programme. The word 'surface' in this research study refers to 'making explicit' assumptions that underpin programmes.

1.6 Theory-based approach to programme evaluation

Coryn, Noakes, Westine and Schröter (2011) defined a theory-based evaluation as:

...any evaluation strategy or approach that explicitly integrates and uses stakeholder, social science, some combination of, or other types of theories in conceptualizing, designing, conducting, interpreting, and applying an evaluation. (p. 201)

Theory or theories in theory-based evaluations refer to the assumptions and ideas of programme designers and implementers about why programme activities they plan will lead to expected programme outcomes.

Astbury and Leeuw (2010) stated that theory-based evaluations unpack programmatic ‘black boxes’ and explain how and why programmes work (or fail to work) in different contexts and for different programme stakeholders. A ‘black box’ evaluation refers to the practice or tendency of focusing only on the effects of a programme without attending to how the effects were produced. The black box, according to Weiss (2000), can have many theories (assumptions) for the same programme which do not get to be examined. Weiss argued that there are many ideas that implementers, stakeholders and concerned parties have about how a programme should work and these ‘theories’ need to be brought to light.

The Fundisa for Change programme is a national programme that conducts training across all nine provinces of South Africa. The programme also has multiple partners who deliver the short courses for teachers and subject education specialists. Fundisa is thus a programme that is designed and implemented by multi-sectoral partners in a variety of contexts (universities, nongovernmental organisations, government departments and parastatals), and as such multiple theories are at play during its implementation.

Environmental education programmes could benefit from using theory-based approaches to evaluation. Tao (2012) noted that evaluations of environmental education programmes have been challenged by a lack of clearly articulated programme objectives. This critical step is essential for identifying outcomes and structuring an appropriate evaluation plan. A related challenge identified is a misalignment between the programme's stated objectives and actual programme activities. Goals and objectives should be explicitly linked but what has been observed is that there are environmental education programmes that either have not identified their programme objectives, or have incorporated activities not aligned with programme objectives. There tends to be a mismatch between long-term outcomes of the programme and

actual programme activities. Tao (2012) suggested that evaluations of environmental education programmes can assist with identification of the underlying assumptions framing the programme, to provide clarity for programme stakeholders in aligning their short and long-term goals with programme activities. An articulated theory of change enables programme stakeholders to observe the synergy (or lack thereof) between the articulated assumptions and programme activities.

This research study worked with two examples of theory-based approaches to evaluation, theory of change and realist evaluation. Both approaches consider context to be important in understanding why a particular programme works or fails. Both approaches focus on understanding the theory that underpins a programme in order to focus the evaluation of the programme. The two approaches are used together in this study because they each bring a different aspect to understanding how a programme works. A programme's theory of change is the combination of a programme theory and an implementation theory. An implementation theory describes the steps to be taken in the implementation of a programme, in this case it would be the steps that need to be taken to implement the professional development component of the Fundisa for Change programme. Programme theory refers to the mechanisms that mediate between the delivery and receipt of the programme and the emergence of outcomes in a particular context (Weiss, 1998). Mechanisms in this study refer to resources (which could be material, cognitive, emotional and social) and reasons (of programme stakeholders).

Although the theory of change framework integrates both a programme and an implementation theory as defined by Weiss (1997), it predominantly engages with uncovering a programme's implementation theory (Blamey & Mackenzie, 2007). The uncovering of the initial programme theory necessitated an understanding of the professional development component of the Fundisa for Change programme's implementation plan, which in essence is the implementation theory (Blamey & Mackenzie, 2012). A realist evaluation approach enabled engagement with the programme's programme theory.

The realist evaluation approach was used to uncover the programme theory through focusing on the context, mechanisms and outcomes configurations embedded in the implemented programme theory of the professional development component of the Fundisa for Change programme in multiple sites. A realist evaluation starts by articulating the initial programme theory by identifying the mechanisms that are likely to operate, the contexts in which they might operate and the outcomes that will be observed if they operate as expected. According to

Dalkin, Greenhalgh, Jones, Cunningham and Lhussier (2015), mechanisms are what generate observed outcomes. Mechanisms in realist evaluation are a combination of resources offered by the programme and participants' reasoning and response to bring about intended programme outcomes.

Blamey and Mackenzie (2007) argued that programmes are not monoliths and that participants are not passive beneficiaries of professional development activities offered by programmes. They have the power to influence how programmes are implemented whether they exercise those powers or not. Programme stakeholders influence programme outcomes. Weiss (1998) stated that programme theory puts an emphasis on the response of people to programme activities. This is supported by Pawson and Tilley (1997), who argued that programmes do not work – it is the actions of programme participants who make them work. They argue that programmes provide a resource, or an opportunity that is intended to influence participants' decision-making. Westhorp (2014) argues that participants may attend the same programme but may respond differently to the programme because of their values and beliefs, norms, cultural roles, previous experiences, and current circumstances will shape their reasoning, their decisions and, therefore, programme outcomes.

If programme participants respond to what is provided by a programme, it can also be argued that programme stakeholders (conceptualisers and implementers) also make decisions that about what resources to bring that has the potential to influence participants. Ultimately, it is the target person's decision that determines whether the desired outcome is achieved. Therefore, programmes do not cause change, but rather that the target group in reaction to a programme, within a certain context, activates mechanisms that bring about change. It is more appropriate thus to say that programmes do not work – it is the actions of programme stakeholders who make them work. Stakeholders include conceptualisers, implementers and participants of the programme.

According to Westhorp (2014), a realist approach to evaluation is appropriate for programmes that seem to work but how they work and why they work is not yet understood. The approach is also appropriate for programmes that will be scaled up, to understand how they can be adapted to new contexts. This approach to evaluation is appropriate for the Fundisa for Change programme as it is a national programme that is implemented nationwide and would therefore need to be adapted to new contexts.

No programme works everywhere or for everyone as context influences programme outcomes. Programme stakeholders therefore need to understand how and why programmes work and don't work in different contexts, so that they are better equipped to make decisions about how to adapt programmes to local contexts (ibid.). Realist evaluation is about finding out for whom the programme is working, with what elements and under what conditions (Pawson & Tilley, 1997). This knowledge is useful for theorising what should be considered in a programme in order to achieve desired outcomes.

Realist evaluators also operate within a generative approach to causation (Pawson & Tilley, 1997). According to this perspective, causation is contingent. This perspective acknowledges that whether programme mechanisms are acted upon or not, depends on the programmes' stakeholders and the conditions existing during programme implementation. Generalisation is also tailored and focuses on the transferability of a theory of how a programme works for certain people under which conditions (Pawson, 2001a).

The aim of this study is not only to answer whether the Fundisa for Change professional development programme worked or not in terms of achieving programme objectives, but what it is about it which made it work (Sayer, 2000). Hence, a theory-based approach to evaluation was appropriate for evaluating the programme as theory-based evaluations clarify how programme activities are understood to contribute to outcomes.

1.7 Role of evaluator and positionality (identity) of researcher

At the time of the conceptualisation of the study and data generation, I was the national co-ordinator of the Fundisa for Change teacher education programme. As such, I attended most of the Fundisa training courses. As the co-ordinator of the programme I was responsible for the administration and operationalisation of programme activities as well as the monitoring and evaluation aspect of the programme. I facilitated some of the training sessions over the years but in choosing sites for the study, I purposefully chose cases where I was an observer to minimise personal bias. My co-ordination role meant that I had access to programme content, processes and had established relationships with programme stakeholders (designers, funders and implementers). At every site I was introduced to programme participants as the programme's national co-ordinator. At sites where I conducted my studies, I also introduced myself as a researcher.

Additionally, I was a high school teacher before I took the Fundisa for Change co-ordination role. My experience of teaching enabled me to identify with the participants in their role in the

professional development programme and their role in the classroom. Moreover, as the national co-ordinator of the Fundisa for Change programme I was invested in the future of the programme even though I was involved in the conceptualisation of the programme.

1.8 Research goal and questions

Research goals:

- Knowledge building of and for continuing professional development programme design as the study undertakes to generate explanations of how and why a programme works (or fails to) for classroom-based and office-based educators and under what specific circumstances.
- Contribute to accumulating theoretical knowledge on transferable lessons about programme theories, particularly for professional development programmes in teacher education.
- Broaden further knowledge of those contexts that condition the operation of programme theories in teacher education.

Research questions:

1. What theory of change shaped the Fundisa for Change professional development course⁴?
 - 1.1 What is the Fundisa for Change training programme's implementation theory?
 - 1.2 What is the Fundisa for Change training programme's programme theory?
 - For whom did the programme theory work and why?
 - In what contexts did the programme theory work and why?
 - What are mechanisms enabled the programme theory to work?
 - What outcomes were achieved?
2. What does the Fundisa for Change's training programme's theory of change and its articulation and implementation mean for environmental education teacher education programmes in South Africa?

The next section provides an outline of the thesis.

⁴ Professional development course and training programme are used interchangeably in the study.

1.9 Outline of the thesis

- This chapter sets the scene by providing context, background and rationale of the study. It introduces the cases and touches on the theoretical framework guiding the study. It concludes with the research questions and goals.

Chapter 1

- This chapter gives an overview of programme evaluation, briefly discusses evaluation of environmental programmes nationally and internationally concluding by expanding on Theory of Change and Realist Evaluation, the two theory-based evaluation examples used to frame the study.

Chapter 2

- The focus in this chapter is on teacher professional development. It discusses professional development in environmental education both nationally and internationally, concluding with two South African environmental education professional development cases that influenced the conceptualisation of Fundisa for Change programme.

Chapter 3

- This chapter discusses the research design. Justifications are made on choice of methodological approaches and data generation tools. It also discusses sites where data was generated. Data analysis process is described. The chapter concludes with researcher reflexivity, validity and ethics.

Chapter 4

- This is a data presentation chapter that describes the Fundisa for Change programme. The chapter traces the history of the programme and shares programme objectives and activities.

Chapter 5

- Chapter Six presents the implementation of the Fundisa for Change training programme in five sites. It starts with the Fundisa for Change professional development process and objectives and concludes with a description of how the course was implemented at the sites where data was generated.

Chapter 6

- Chapter Seven starts with sharing the initial theory of change of the Fundisa for Change professional development course using the CMO configuration. It also shares a theory for each of the sites. Concluding by presenting a refined programme theory of the Fundisa for Change professional development course.

Chapter 7

- The final chapter summarises study findings and discusses, limitations, implications and recommendations.

Chapter

CHAPTER 2: THEORY-BASED EVALUATION

2.1 Introduction

This chapter explores arguments for using a theory-based approach to programme evaluation. According to Huckle (2004), the world should be adequately interpreted in order to make rational changes. We cannot improve professional development programmes unless we have adequately surfaced (made explicit) assumptions that underpin those programmes, that is, we have a rationale for their conceptualisation and implementation. We need to know factors that enable or constrain professional development programmes from achieving desired outcomes in order to bring about change in how programmes are conceptualised and implemented.

The chapter also traces evaluation roots as depicted by Christie and Alkin (2013). Programme evaluation is defined and this is followed with a philosophical orientation to theory-based evaluations. The chapter makes reference to the Fundisa for Change programme that is evaluated in this study in order to contextualise debates on programme evaluation. It concludes with a presentation of two examples of a theory-based approach to evaluation, namely theory of change and realist evaluation which are the theoretical frameworks used in this study.

2.2 Evaluation roots

According to Christie and Alkin (2013), there are three foundations on which evaluation theory emerged. They called the three foundations ‘roots’ and these describe the purpose and development of evaluation theory. The ‘roots’ identified are: social accountability, systemic social inquiry and epistemology. Social accountability in evaluation is viewed as a way of improving programmes and society. The social accountability root in evaluation is a process for generating systemic information that can be used in decision making. Systemic social inquiry emerged as a response to concerns for determining accountability through methodical and justifiable means. Systemic social enquiry is guided by research methodology in pursuit of knowledge. The epistemology root focuses on the nature and validity of evaluation knowledge. Epistemology, currently and historically draws from positivism, pragmatism, constructivism and post positivism. These paradigms have had an influence on the work of evaluation theorists. These paradigms will be discussed later.

Christie and Alkin (2013) clustered evaluation theorists around three main branches: 1) use, 2) methodology and 3) valuing. These branches fundamentally characterise the work of

theorists in the evaluation field. Christie and Alkin (ibid) used the metaphor of a tree (Figure 2.1) to frame evaluation theories.

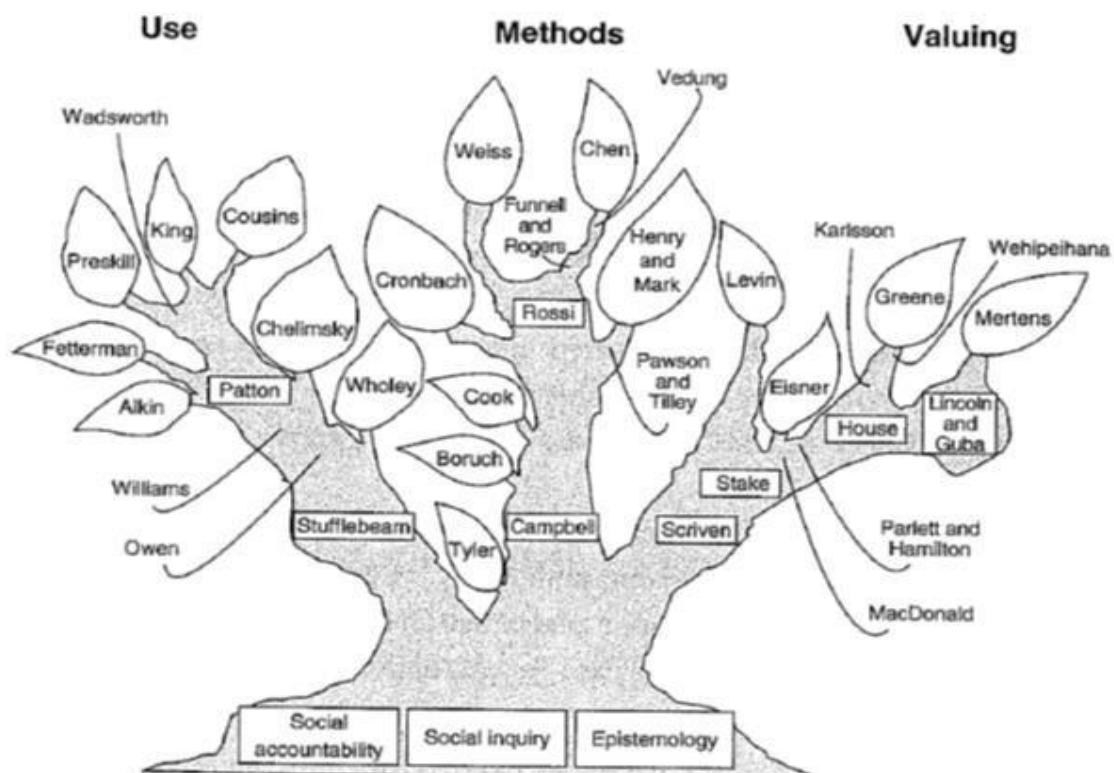


Figure 2.1 Evaluation theory tree: A wider perspective (Christie & Alkin, 2013, p. 388)

The table below summarises key ideas that serve as foundations for evaluation work.

Table 2.1 Evaluation branches

Roots	Social responsibility	Systemic social inquiry	Epistemology
Branches	Use	Methodology	Valuing
Key focus	Utilisation of evaluation information	Primarily guided by research methodology to support construction of knowledge	Emphasis is on valuing
Main idea	Evaluations are conducted to inform and impact decision-making	Focus for theory-based evaluations is on constructing a detailed programme theory that is used to guide the evaluation	Role of evaluation is to make value judgements
Some of the theorists (American & European)	Stufflebeam, Patton, Wholey, Chelimsky, Owen	Campbell, Tyler, Rossi, Weiss, Chen, Funnell & Rogers, Pawson & Tilley	Scriven, Levin, Stake, House, Guba & Lincoln, Karlsson

Adapted from Christie & Alkin (2013)

Christie and Alkin (2013) recognised that some of the authors do not exclusively belong to one branch but work across the three branches. The clustering of the theorists thus reflects the way in which authors' ideas relate to each other.

Evaluation research has changed over time, from early approaches that sought to capture behaviour using positivist approaches, to illuminative approaches which sought to shed light on issues, to constructivist or 'fourth generation' approaches that sought to involve participants in constructing the outcomes of the evaluation (Pawson & Tilley, 1997). Some evaluation theorists have also focused on utilisation approaches (Patton, 2002) and theory-based approaches to evaluation.

Pawson and Tilley (1997), in their seminal realist evaluation book, traced the history of evaluation research from the methodological change lens. The table below summarises their writing.

Table 2.2 Methodological changes in evaluation from experimental to realist

	Experimental	Pragmatic	Constructivist	Realist
Epistemology	Begins with a theory of causal explanation based on 'successionist' principles	Regards as valid that knowledge which is pragmatically acceptable since it falls into the prevailing framework in which the policy is set	Prone to relativism in its belief that truth is always attached to some standpoint rather than being external to the beliefs of any group	Begins with a theory of causal explanation based on generative principles
Method	Develop corresponding (quasi-) experimental research designs employing pre-test, post-test and control groups	Provides 'enlightenment' on the basis of information on the programme activity from a plurality of techniques based on the craft skills of the researcher	Gives research the task of examining stakeholders' meanings 'qualitatively' in an attempt to reconcile them through a process of negotiation which aims to produce consensual constructions	Tests theories of how program outcomes are generated by specific mechanisms and contexts, a task which involves making inter- and intra-programme comparisons in order to see which context-mechanism-outcome configurations are efficacious
Ontology	Copes with social complexity by adding a range of subsidiary control functions to ensure the validity of causal claims about the efficacy	Views social world as 'power-play', so investigations try to penetrate the chains of influence which can stunt or promote change	Begins with a theory of a social world constituted in the everyday meanings attached to it within the reasoning process present in all social interaction	Regularities in the patterning of social activities are brought about by the underlying mechanism constituted by people's reasoning and the resources they are able to summon in a particular context
Programming	Generic reform programmes which are seen as tackling major social problems by forwarding specific initiatives (causes) to bring about solutions	Views programmes as institutional realities such as 'services', livelihoods', 'targets', 'bargaining processes', 'clients', 'opponents', etc.	Regards programmes as loose amalgams of the constructions of a range of stakeholders (policy makers, providers, subjects etc.) involved in the initiative	An attempt to embody knowledge which has identified what works for whom in what circumstance

Progress	Process of experimental replication will identify those types of initiatives which can be shown to 'work' in providing consistent outcomes	Policy development is wrapped up in the issues of political feasibility, cost effectiveness and incrementalism	'Findings' or 'explanations', are themselves 'constructions' and so open to further negotiations in an ongoing process	Knowledge of which accumulates over successive trials of a programme and from other forms of empirical research, providing policy makers with families of theories specifying typologies of successful context-mechanism-outcome combinations
Utility	Informs the policy making process which is a matter of coming to rational choices amongst potential policy reforms on the basis of hard data from successful programmes	Begins with a theory of how policy is made which stresses the political dimension and the need for evaluation to be geared to the decision maker's objectives	Has open-ended goal of enlarging the collaborative process in a way which seeks to empower and educate all stakeholders	Knowledge is promulgated by a teaching and learning process in which stakeholders' fragmentary expertise is marshalled by the researcher

Adapted from Pawson and Tilley (1997)

Shadish and Luellen (2013) stated that experimental approaches to evaluation are inadequate in addressing social problems embedded in political, economic and social pressures. They argued that information from experimental methods is insufficient to solve social problems.

Chen (2013) also argued against a focus only on the experimental paradigm in evaluation. He believed that building theoretical models for programmes will provide accurate understandings of programmes in ways that will produce information on how desired programme outcomes can be achieved. Additionally, he called for the use of social science knowledge and theory related to the subject matter of the evaluation to identify programme effects that go beyond programme goals. This would enable an identification of secondary programme effects and unintended outcomes. Evaluators therefore need to explore pre-existing bodies of knowledge of possible programme mechanisms when evaluating programmes.

2.3 Programme evaluation

According to Rossie, Lipsey and Freeman (2004), evaluation research has its roots extending to the 17th century with systematic evaluation research having developed in the 20th century, and programme evaluation becoming common place in the late 1950s.

Evaluation research shapes our general understanding of how to bring about planned social change by testing the effects of certain broad forms of intervention. Evaluation research is intended to be both useful and used, either directly and immediately or as an incremental contribution to a cumulative body of practical knowledge (Rossie et al., 2004). Evaluation, according to Scriven (1991), has both social and intellectual importance; socially it directs efforts where it is needed most and endorses new and better ways of doing things and intellectually it refines thinking tools. An evaluation of a programme therefore should enable programme designers, implementers and policy makers to make changes in how programmes are conceptualised, implemented and evaluated.

The systematic evaluation of social programmes first became common in education and public health with the emergence of the transfer of responsibility for a country's welfare from donors and non-government organisations to government (Rossi et al., 2004). Evaluations served as an accountability mechanism. Evaluation results are of significance to those whose lives are affected, directly or indirectly, by the programme being evaluated. Additionally, findings from programme evaluation can make significant input in policy decisions and policy design (ibid.).

Worthen, Sanders and Fitzpatrick (1997) believed that the major task of programme evaluation is to provide answers about the effectiveness of programmes. To make choices on which programme models to use, programme designers and policy makers need good information about the relative effectiveness of programmes in achieving its intended outcomes. Programme evaluation is viewed as a strategic analysis to inform practice and assess impact which enables judgements to be made on whether a programme should be modified, expanded or discontinued (Rossi et al., 2004).

Liddy (2010) argued that programme evaluation is a deeper level of analysis as results of evaluation report on programme goals, exploring the value that programmes add thus informing future programme work. Evaluation reports provide a written record of practice and as such should focus on long-term impact and social change. She believed that evaluation can potentially reveal the hidden and taken-for-granted practices that add value to educational programmes.

Evaluation findings can generate support for effective programmes, identify innovative programmes that are making a positive impact, and expose the failings of existing programmes along with indications of the kinds of change that would make them work (Weiss, 1998). Citing Cronbach (1982), Greene (2013) stated that a comprehensive and in-depth programme evaluation should lead to identification of programme components e.g. activities, materials or combinations that lead to desired outcomes. She acknowledged that the same programme will look different in each different context but the evaluation of the programme should still be able to provide a rich understanding of the challenges and potentialities of the programme in each of the contexts where it is implemented. The aim of this study was to identify mechanisms that operate in the diverse contexts where the Fundisa for Change professional development course was implemented. Findings from this study will inform future design and evaluation of teacher professional development programmes. The results will reveal what mechanisms make programmes work (or not) as well as what needs to be considered to make them work.

Evaluators should also be open to identifying unintended outcomes as programme outcomes in evaluation may result from influences other than those attributed to a particular training programme (Storrs, 2010).

Even though a programme may be implemented in different sites by different people, there would be aspects that are common within the programme, i.e. that form the ‘DNA’ of the programme. Preskill (2013) identified the following infrastructure that characterises programmes;

- Culture: trust among members, attitudes, practices regarding collaboration and problem-solving, extent to which participatory decision making is supported.
- Systems and structures: extent to which there is open and accessible work environment, rewards and recognition system and practices; and relationship of one’s work to programme goals.
- Communication system: availability of information and its dissemination.
- Leadership vision, mission, support of learning, inquiry and change.

The aspects above may be core to holding a programme together irrespective of who implements it and where. It is valuable to determine how these programme characteristics influence how a programme like Fundisa for Change, that has different stakeholders, affect its implementation.

A focus on the context where a programme is evaluated has emerged as an important factor in the evaluation field. According to Liddy (2010), evaluation is an applied and strategic form of research that uses social sciences methods to examine the impact of educational and training programmes. The effectiveness of programmes is investigated within political and organisational contexts so as to inform social action and to improve social conditions in a particular context. As programmes are implemented in context, taking context into account is necessary as context may have an influence on programme outcomes (Rossi et al., 2004).

It was suggested by Haji et al. (2013) that evaluations involve multiple stakeholders, make use of multiple research methods and should occur throughout the life of a programme, from its conceptualisation, to its implementation and revision. This practice will not only generate a holistic understanding of the programme and its effects but also how the context where the programme is implemented is changed by its presence. This suggests that a researcher would need to identify key programme stakeholders when generating data in order to explore the different perspectives of stakeholders about a programme. Additionally, multiple data generation methods will assist in triangulating data that has been generated, thus increasing its validity.

Social programmes are by nature dynamic and frequently change with shifts in political contexts (policies) and social trends. A certain level of flexibility is essential in programme evaluation as modification to programme implementation may be necessary due to changing contexts. This is particularly essential when a programme is implemented over a long period of time and in different contexts (Rossi et al., 2004).

Alkin (2013) argued that evaluation information needs to be produced with a clear understanding of the programme being evaluated and the context in which it operates, e.g. understand stakeholders, social and political contexts, exact characteristics of the programme, rationale for programme activities and sequence, questions of interest and concern for programme stakeholders. In the case of the Fundisa for Change programme, stakeholders include partners from the environmental sector, Department of Basic Education, parastatals in the environmental sector and institutions of higher education. Additionally, a specified purpose of a programme and its organisational arrangements and complexities differ from one situation to the next as political settings vary. An evaluator needs to make these visible and reflect on them. The evaluation needs to be adapted based on the particular context to ensure actions taken by stakeholders from the evaluation results enhance evaluation validity (Alkin, 2013).

Weiss (2013) proposed that programme evaluation is affected by and affects the political context. Her argument was that political spheres are constituted of vested interests, negotiations, constituencies, critics at different levels, some of which are at higher echelons of government. Weiss (ibid.) viewed evaluation as a political activity in the following three ways:

- 1) A programme that is evaluated would have been brought into being through political processes (hence its acceptance would also be political). Programme champions might have had to struggle against opponents to get it established. Therefore, entities that researchers study are embroiled in political processes. The Fundisa for Change programme is no different; a proposal was submitted to the Department of Basic Education for buy-in before the programme could be rolled out nationally.
- 2) Evaluation reports enter a political space and can be used as ammunition for one point of view or another in decision making. The reports can set off a cascade of future events. In the case of the Fundisa for Change programme, programme progress reports given to funders were used as leverage to source more funding for the programme and to unlock new funding streams.

- 3) Undertaking the study in the first place is a political stance, it sends a message that the programme is important enough to give attention, i.e. it gets legitimated through the evaluation process. The Fundisa for Change programme is primarily implemented with funding from partners but the ultimate aim is to have the programme institutionalised in Higher Education Institutions (HEIs) and within the teacher professional development directorate in the Department of Basic Education.

Approaches used in programme evaluation depend on the purpose of the evaluation as well as on the level of the intended change. A combination of approaches can also be used to evaluate a single programme. Different evaluation models and approaches that can be utilised are tabulated below.

Table 2.2 Evaluation models and approaches

Evaluation model and approach	Questions asked
<i>Behavioural Objectives Approach:</i> focuses on the degree to which objectives of a programme, product, or process have been achieved	“Is the programme, product, or process achieving its objectives?”
<i>The Four-Level Model:</i> most often used to evaluate training and development programmes	“What impact did the training have on participants in terms of their reactions, learning, behaviour, and organisational results?”
<i>Responsive Evaluation:</i> calls for evaluators to be responsive to the information needs of various audiences or stakeholders	“What does the programme look like to different people?”
<i>Goal-Free Evaluation:</i> focuses on the actual outcomes rather than the intended outcomes of a programme	“What are all the effects of the programme, including any side effects?”
<i>Adversary/Judicial Approaches:</i> adapt the legal paradigm to programme evaluation	“What are the arguments for and against the programme?”
<i>Consumer-Oriented Approaches:</i> help consumers choose among competing programmes or products	“Would an educated consumer choose this programme or product?”
<i>Expertise/Accreditation Approaches:</i> relies on expert opinion to determine the quality of programmes.	“How would professionals rate this programme?”
<i>Utilisation-Focused Evaluation:</i> done for and with specific, intended primary users for specific, intended uses.	“What are the information needs of stakeholders, and how will they use the findings?”
<i>Participatory/Collaborative Evaluation:</i> emphasis is on engaging stakeholders in the evaluation process.	“What are the information needs of those closest to the programme?”

<i>Empowerment Evaluation</i> : use of evaluation concepts, techniques, and findings to foster improvement and self-determination.	“What are the information needs to foster improvement and self-determination?”
<i>Organisational Learning</i> : use of evaluation as a catalyst for learning in the workplace.	“What are the information and learning needs of individuals, teams, and the organization in general?”
<i>Success Case Method</i> : focuses on the practicalities of defining successful outcomes and success cases.	“What is really happening?”
<i>Theory-Driven Evaluation</i> : focuses on theoretical rather than methodological issues. [some also refer to it as a theory-based evaluation]	“How is the programme supposed to work? What are the assumptions underlying the programme’s development and implementation?”

Adapted from Preskill & Russ-Eft (2005)

According to Haji et al. (2013), programme evaluation should not only be about judging the worth of a programme but should also provide programme designers with information on how programmes can be adapted in diverse contexts. This highlights the significant role that context plays in programme delivery.

Programme evaluation has evolved from asking whether the programme has worked or not but strives to establish how and why it worked or did not and to surface what else emerged during programme implementation. Knowing simply that a programme worked is not the same as knowing how and why it worked. Programme evaluation should be able to generate knowledge that will inform the work of others. The evaluation process should enable a generation of insights into the relationship between the programme, the contexts in which it is implemented and its outcomes.

Educational or training programmes are generally based on certain assumptions which guide their design and implementation. These assumptions need to be made explicit to all the stakeholders so that when the programmes are evaluated, insights generated can be used to improve them. The surfacing of these assumptions in evaluation allows for the interrogation of the validity of these assumptions (Haji et al., 2013). A focus on the outcomes of a programme which excludes contexts and assumptions (beliefs, theories) held by all the stakeholders is inadequate to account for complexities that exist in educational programmes. It also fails to generate meaningful understanding of factors that lead to programme success or failure and also the interaction of these factors in open systems (ibid.).

Hutchinson (1999) argued that the success of educational programmes can be influenced by many factors, e.g. personal (participants' prior experience and motivation), external (concerns and stresses), programme components (materials used during interactions, content covered during the training etc.) and confounding factors (concurrent influences). As a result, in an open system, it is not easy to attribute casual mechanisms to one factor but the best plausible factors can be surfaced in theory-based evaluations. Sayer (2010) argued that a change process involves multiple causal mechanisms and the operation of the same mechanism can produce different results because of the context where it is introduced, additionally different mechanisms can produce the same outcome.

A theory-based approach to evaluation emerged from a critique of how programme evaluation in the past focused primarily on the outcomes of a programme without considering what gave rise to the outcomes. Programme evaluations in the past consisted of 'black box' evaluations, which put an emphasis on programme inputs and outputs without considering what goes on inside the programme (Pawson & Tilley, 1997). A theory-based approach to evaluation intentionally sets to make explicit the hidden and taken-for granted beliefs and practices embodied in a programme (Astbury & Leeuw, 2010). The identification and articulation of assumptions underlying a programme provides programme stakeholders with clarity on how they can align their short- and long-term goals with programme activities (Tao, 2012). In some cases, programmes do not have a clearly articulated theory but instead have broad objectives that do not specify what change is expected, how it will be achieved and when it will be achieved (Riché, n.d).

The next section explores how environmental education programmes have been evaluated as the focus of this study is on evaluating an environmental education programme.

2.4 Evaluation of environmental education programmes

Chen (2013) argued that black box evaluations have limited usefulness, as they do not provide enough information about the context of the programme and its strength and weaknesses. As a result, programme stakeholders will not have sufficient information to improve it. His argument is that a conceptualisation of a programme theory can overcome the limitations. A theory-based approach to evaluation articulates the basis of a programme (Monroe, Fleming, Bowman, Zimmer, Marcinkowski, Washburn & Mitchell, 2005).

Chen (2013) believed that conceptualisation of a programme theory makes explicit a programme implementation process and the underlying mechanisms that influence the programme. A theory-based approach to evaluation explains how and why a programme achieves particular results through examining the structure of a programme, its implementation and causal mechanisms that are operating.

The next section shares a review of environmental education programme evaluation and discusses international and Southern African perspective on evaluation.

2.4.1 An international perspective

According to Scott and Gough (2003), evaluations of environmental educational programmes tend to focus on measuring the effectiveness or quality of a programme and programme participants' knowledge is assessed after attending a programme.

It has been noted that there are two constraints under which environmental education programmes operate: limited financial resources and criticisms that environmental education is ineffective (McDuff, 2002). How should environmental educators evaluate their programmes to give concrete evidence of their impact and effectiveness? McDuff (ibid.) suggested that a needs analysis be conducted prior to designing both training and programme evaluations. This would enable programme designers to design programmes that respond to the needs of the participants, and the evaluation would therefore focus on how those needs were met or not.

Another suggestion from Rovira (2000) is that social differences be taken into account when evaluating an environmental education programme. She argued that the social context determines the potential for environmental education programmes to effect actual change of attitudes and behaviour in participants.

Zint, Dowd and Covitt (2011) stated that "Evaluations are critical to the success of individual environmental education (EE) programs and can contribute to advancing the field of EE" (p. 471). They argued that when evaluation results are analysed and synthesised they can add to the body of knowledge about the benefits of environmental education and effective environmental education practices. I was prompted by the argument above to conduct a systematic literature review of peer-reviewed research studies published between 2000 and 2016 that empirically evaluated environmental education programmes. The aim of the review was to identify the focus of the evaluation and the methodology used in evaluating the

programmes. I wanted to determine to what extent the evaluation studies have given insights into why the programmes evaluated were successful or not.

Data generated in the literature review was from 16 journal articles in six journals:

Environmental Education Research (7), *Journal of Environmental Education* (2), *Applied Environmental Education and Communication* (3), *Teacher development* (1), *International Journal of Science Education* (1), *International Research in Geographical and Environmental Education* (2). This is not a comprehensive literature of evaluation environmental education programmes, but reflects some of the key dimensions of the field.

An examination of the articles shows that the focus of the evaluation is mainly on the impact of the intervention programme on participants, that is, the effect of the programme on knowledge, behaviour, attitudes of participants (see Table 2.3 below). What is worth noting is that 14 of the 16 programmes analysed are programmes designed for youths and school children and only two are for evaluating teacher development programmes. Some of the studies show positive outcomes from intervention programmes in terms of programme aims but there were also inconclusive outcomes and lack of evidence to attribute outcomes to programme intervention. Most of the evaluations are what are referred to as ‘black-box’ evaluations due to the fact that they do not clearly indicate why the results or outcomes obtained were obtained. Only one (Rickinson, Hall & Reid, 2015) of the 16 programmes has used a theory-based approach to programme evaluation. Another study that could potentially be referred to as a theory-based evaluation study was conducted by Powers (2004). The study used a utilisation approach to programme evaluation with the aim of developing a programme theory for the programme that was evaluated. The study engaged in the first step of a theory-based evaluation by generating a programme theory. This shows the need for development of evaluation theory and practice in environmental education.

Table 2.3 Focus of environmental education programme evaluation

Journal	Focus	Evaluation approach	Articles	Year
<i>Environmental Education Research</i>	Impact of the programme in terms of producing changes in the attitudes and habits held by participants about local environmental issues	Mixed methods, quasi-experimentation (pilot & control group)	Evaluating environmental education programmes: some issues and problems Marta Rovira	2000
	Assessing students' ecological knowledge, environmental awareness and learning experiences	Mixed methods	Evaluating the impact of an environmental education programme: an empirical study in Mexico Isabel Ruiz-Mallena*, Laura Barraza, Barbara Bodenhorn and Victoria Reyes-García	2009
	Influence of participation in an EE programme on students' connectedness to nature	Quantitative (pretest–posttest nonequivalent comparison group design), treatments and control group	Evaluating the effects of environmental education programming on connectedness to nature Julie Ernst & Stefan Theimer	2011
	Relationships between the environmental attitudes and environmental knowledge of schoolchildren	Qualitative, pre and post-test, quasi-experimental	Educational impact on the relationship of environmental knowledge and attitudes A. K. Lieflander and F. X. Bogner	2016
	Experiences that remained salient in the memories of former participants, five to forty years after involvement	Narrative enquiry, qualitative	Environmental identity formation in nonformal environmental education programmes Corrie Colvin Williams & Louise Chawla	2016
	Development of a theory-informed assessment instrument for use in evaluating environmental education programmes to evaluate quality of students' engagement	Mixed methods	Theory-based assessment in environmental education: a tool for formative evaluation Dafna Granit-Dgani, Avi Kaplan & Hanoch Flum	2016

	Conceptualising, investigating and generating evidence about the programme's impacts and influence in participating schools, and efforts to understand what it is about a programme that is influential in bringing about those impacts	Programme theory and realist synthesis	Sustainable schools programmes: what influence on schools and how do we know? Mark Rickinson*, Matthew Hall and Alan Reid	2015
<i>Journal of Environmental Education</i>	Analysing the effects of place-based education programmes on participants in order to develop a programme's theory of change and more accurately link programme intentions with their outcomes	Mixed-method, Theory of Change using logic models	An evaluation of four place-based education programmes Amy L. Powers	2004
	Assess the effects of the programmes offered on the affective, cognitive, or conative domain variables of the participants	Mixed methods of inquiry, comparing pretest and posttest mean scores`	Evaluation of the environmental education programme at the New Jersey School of Conservation N. J. Smith-Sebasto & Heidi J. Semrau	2004
<i>Applied Environmental Education and Communication</i>	Examined the outcome and impact to preservice teachers' Environmental Education (EE) self-efficacy beliefs and their use of inquiry-based instruction.	Mixed-methods approach	Examining the durability of environmental education self-efficacy beliefs in preservice teaching Greer M. Richardson, Ling L. Liang & Donna G. Wake	2014
	Programme impact	Mixed-methods research design	Residential environmental education center program evaluation: an ongoing challenge Nicholas Bourke, Connie Buskist & Julie Herron	2014
	Effect of the programme on the attractiveness of the natural area	Mixed approach combining pretesting/post-testing	Evaluation of a place-based environmental education programme: from there to here Jan Cincera, Bruce Johnson & Silvia Kovacikova	2015

<i>International Research in Geographical and Environmental Education</i>	Evaluate impact of programme	Participatory evaluation	Participatory evaluation of environmental education: stakeholder assessment of the Wildlife clubs of Kenya Mallory D. McDuff & Susan K. Jacobson	2001
	Impact on participants' environmental knowledge, attitudes and behaviour	Pre- and post-questionnaires, mixed methods	Evaluating the impact of a school waste education programme upon students', parents' and teachers' environmental knowledge, attitudes and behaviour Malgorzata Grodzinska-Jurczak , Agata Bartosiewicz, Agata Twardowska & Roy Ballantyne	2003
<i>International Journal of Science Education</i>	Effectiveness of a programme, outcome of student's participation in the programme (in terms of short-term increase and the persistence of knowledge).	Pre-, post-, retention test design	Evaluating environmental knowledge dimension convergence to assess educational programme effectiveness Anne K. Liefländer, Franz X. Bogner, Alexandra Kibbe & Florian G. Kaiser	2015
<i>Teacher Development</i>	Impact of the Summer Institute on participating teachers' beliefs and their students' perceptions about environmental education	Mixed methods	Evaluating teachers' self-perceptions of their knowledge and practice after participating in an environmental education professional development programme Toni A. Sondergeld, Andrea R. Milner & Charles Rop	2014

While various studies have contributed empirical evidence to numerous youth-based non-formal environmental engagement programmes, the environmental education literature lacks a discussion on a systematic approach to the development and evaluation of these programmes (Riemer, Lynes & Hickman, 2014). Both programme development and evaluation benefit from the presence of a clearly formulated programme theory (Riemer & Bickman 2011 cited in Riemer et al., 2014).

O'Donoghue (1986) argued that the way environmental education is viewed will determine how environmental education programmes are evaluated. He stated that if environmental education is considered as a sensitising construct that initiates, sustains critical processes of change and facilitates social change then evaluation should be seen as the critical part of these processes of change.

According to O'Donoghue (1986), evaluation in environmental education, when viewed as an emergent process of facilitating change, should have the following characteristics:

1. Context-specific and grounded in action.
2. Participatory and collaborative without necessarily being directed by an outside researcher or evaluator.
3. Emergent as a continuous process wherein new constructs illuminate and stimulate further inquiry.
4. Simple evolving towards increased sophistication.
5. 'Theory-driven' seeking to illuminate and understand rather than merely to provide evidence of worth and success (pp. 20-21)

O'Donoghue called for a rejection of a limited conception of evaluation as a means of measuring outcomes and instead called for an integrated critical approach to evaluation within a process of social change (ibid.).

O'Donoghue's (1986) idea of a theory-based approach to evaluating environmental education programmes was endorsed by Monroe (2010) who stated that articulations of theories that underlie programmes provide models for environmental educators to understand how theories and research can be used to develop programmes and explain programme success.

2.4.2 A Southern African perspective

Global imperatives on the state of the environment and its implication for humans led to countries coming together to deliberate on how environmental issues and risks can be addressed (see Chapter Three). South Africa has been part of the deliberations and this led to the integration of environmental education into the education sector. Integration of environmental education into the education system meant that the national school curriculum should respond to environmental issues and risks.

New developments in the world find their way into government constitutions, policies, legislations, agendas, mandates and development plans. These policies in turn find expression in the education system. Implementation of new policies requires adaptation and new practices in response to the new requirements brought on by a new policy. The actualisation of policies requires people with capacity to operationalise them. When the capacity is lacking, it needs to be developed.

Any curriculum needs to be mediated and teachers are the ones who deliver a curriculum. Changes in a curriculum require that teachers consider new and different ways of working with a new curriculum. The quality of any education system is dependent on the quality of the teachers who implement it. Additionally, the quality of teachers is dependent on the quality of teacher professional development they receive (discussed in Chapter Three).

An evaluation of how environmental education professional development programmes are conceptualised and implemented is therefore critical to determining how programmes support teachers to engage with a school curriculum expected to respond to the increasingly diverse environmental challenges and risks in the twenty first century.

What has characterised evaluation of environmental programmes in Southern Africa in the past two decades? The table that follows looks at the focus and approaches that have been used in Southern Africa to evaluate environmental education programmes.

Table 2.4. Environmental education programme evaluation in Southern Africa

Projects	Aim of evaluation	Data generation methods	Method and Approach	Paradigm	Evaluation Branch
<i>Gold fields (1998)</i>	Comprehensive review of the course & its contribution to environmental education	Document analysis, interviews, focus group discussions & questionnaires	Qualitative	Constructivist	Value
<i>Learning for Sustainability (1999)</i>	Formative evaluation of project and its role in the professional development of curriculum advisers	Document analysis, interviews, observation and contextual profiling	Participatory Qualitative Empowerment	Constructivist with contextual reflexivity	Use
<i>NEEP-GET (2005)</i>	Project review across the following themes: participation, effectiveness, relevance & sustainability	Contextual profiling and provincial storylines (participant narratives)	Utilization, Participatory Empowerment Qualitative	Constructivist with contextual reflexivity	Value & use
<i>SADC (2005)</i>	Review of programme processes to inform future decision-making	Document analysis, interviews and events observation	Qualitative Success case Participatory	Constructivist with contextual reflexivity	Use
<i>SADC (2008 - 2012)</i>	Project impact, relevance, efficiency, effectiveness and sustainability (continuity) in supporting environmental education and education for sustainable development in the SADC region	Document analysis, contextualisation, individual and group interviews	Qualitative Success case Participatory	Constructivist with contextual reflexivity	Use
<i>Enviro champs</i>	Review of factors that enable or constrain effectiveness, efficiency, relevance and sustainability of the enviro champs project	Document analysis, interviews, site observation	Theory-based Realist evaluation, Context - Mechanism- Outcome configuration	Realist	Method

Things to note from the analysis of the evaluation of the environmental education programmes above is that they all considered the context where the projects and programmes were implemented. Consideration of context is a key feature of theory-based evaluations. Some of them used participatory and collaborative approaches to evaluation. The *Learning for Sustainability* and the *NEEP-GET* projects did contextual profiling as foundations for evaluations but without the terminology of theory-based evaluations. The SADC 2005 evaluation also had characteristics of being a theory-based evaluation as it asked questions about what worked well, what didn't and why. Only the Enviro Champs explicitly used a theory-based approach to evaluation. The short history of six EE programme evaluations show that there is a need to more EXPLICITLY develop realist evaluation theory and practice in EE, especially in environmental education professional development programmes, another gap which this thesis aimed to fill.

2.5 Theory-based evaluation

If a programme is successful, an evaluation of the programme should identify which elements are critical for widespread replication in other contexts. Even if a programme it fails to achieve its intended outcomes, an evaluation should be able to determine whether non-achievement is due to inadequate implementation, or whether the context is unsuited to operate the mechanisms by which outcomes are expected to occur, or whether failure can be attributed to programme theory itself (Coryn et al., 2011).

In evaluating programmes, it is important to be able to differentiate which outcomes are expected in the short- and long-term. In some cases, it may be important to determine time frames for the outcomes to be observed. It is also critical to analyse how the short-term outcomes link with the long-term outcomes. According to Coryn et al., (2011) initial outcomes are usually expressed as changes in knowledge, skills, abilities, and other characteristics (e.g. increased knowledge of certain content and/or practices). Intermediate outcomes are often classified as behavioural changes (e.g. increased use of certain pedagogical methods) that are believed to eventually produce changes in long-term outcomes, such as building a just society or meeting the needs of a programme's target group (e.g. improve quality teaching and learning). In a theory-based evaluation it is important to determine which mechanisms and contexts will enable the short-term outcomes to develop into long-term outcomes.

Weiss (2013) stated that theory-based evaluation should go beyond a single case and contribute to a development of a better programme theory. It is therefore imperative that programme

assumptions and operating mechanisms that are taken for granted are identified. She argued that it is also important to describe the nature of the people who participated, the content of the programme and the circumstances under which it ran. This knowledge will make programme evaluation more effective as results will be responsive to a particular kind of programming, to specific kinds of participants and contexts.

Leeuw (2012) stated that theory-based evaluations have a conceptual and an empirical component. Conceptually, theory-based evaluations surface a programme's theory and empirically, they investigate observed outcomes of programmes. I analysed the Fundisa for Change course implementation in order to surface and refine the implicit initial programme theory. The initial programme theory that was constructed from the Fundisa for Change programme documents and from data generated from key partner interviews. A theory-based approach to evaluation also reveals programme outcomes that are not readily observable due to the fact that they may not be easily measurable or it is too soon for them to have occurred (Carvalho & White, 2004). Hence a programme that has a long implementation period needs to consider how programme mechanisms necessary at each level of the outcomes (initial, intermediate and long-term) may lead to the next, as well as the context that may change during the life of the programme.

Proponents of a theory-based approach to evaluation agree that it is an approach that involves the surfacing of assumptions that inform programmes and the evaluation of these assumptions as they are operationalised in context. This is an important consideration as conditions and people cannot be assumed to be the same in all contexts. As mentioned above (see section 2.3.), the Fundisa for Change programme that is evaluated in this study was implemented in multiple sites for a diverse group of participants (see also Chapter Six). It was therefore important to generate data that would determine what works for who and under what conditions. Programme stakeholders tend to believe that a programme has 'worked' if programme outcomes have been achieved and has 'failed' if outcomes were not achieved. Knowledge about programmes is constructed through understanding why they fail or succeed. To generate cumulative knowledge on programme evaluation, the conceptual framework should enable an interpretation of evaluation results that goes beyond operations of a particular programme but rather extends to similar programme for generalisation and replication (Lipsey & Pollard, 1989).

A theory-based evaluation unpacks the 'black box' by identifying the mechanisms that mediate between a programme's intended outcomes and its processes. Knowledge generated can be

generalised to similar programmes in similar situations. To be able to generate an understanding of how and why programmes operate the way they do, an articulation of the conceptual framework is needed as it serves as a hypothesis that underlies programme conceptualisation and implementation. The starting point therefore of any theory-based evaluation is to construct a programme's theory, i.e. surfacing the assumptions behind the programme (Monroe et al., 2005). Programme theory in this context refers to programme stakeholders' knowledge and intuition of what would result in the programme achieving its desired goals. Stakeholders' theories come from observations and experiences of having worked with beneficiaries and partners in communities (Chen, 2013).

McMeeking, Basile and Cobb (2012) asserted that a theory-based evaluation uses detailed descriptions to surface assumptions upon which a programme is based to show how a programme will work under certain conditions. Theory-based evaluations provide information about mechanisms that mediate between programme activities and outcomes. Knowledge about the mechanisms benefits not only specific programmes but also other change-oriented programmes in a variety of contexts (Birckmayer & Weiss, 2000). Since the Fundisa for Change programme has been implemented in multiple sites since its roll-out, mechanisms specific to each study site had to be identified although some mechanisms were common across the five study sites (see Chapter Seven).

Differences and similarities amongst proponents of theory-based evaluations have been identified over the years. Stame (2004) shared the following similarities:

- Evaluation is based on what might happen as understood by programme stakeholders and as interpreted by evaluators;
- Programmes are considered in their contexts;
- Use is made of a variety of methods to generate data; and
- There is a commitment to internal validity, a focus on causality without negating comparisons across different situations. (p. 63)

An evaluator will therefore have to engage with key programme stakeholders to identify their assumptions about the programme. Stakeholders are integral in programme evaluation (Stake, 2013). Moreover, there are multiple realities based on interpretations and perceptions of individuals (Lincoln & Guba, 2013) and an evaluation can surface and legitimise the different views of programme stakeholders (Greene, 2013).

Additionally, the evaluator will have to take into account the context where the programme is implemented as this will affect what is observed. As discussed in detail in Chapter Four, I interviewed key stakeholders of the Fundisa for Change programme. I reviewed literature on theory-based programme evaluation to understand the assumptions that may have influenced programme stakeholders during the design and implementation of the Fundisa for Change programme. Moreover, I reviewed Fundisa for Change programme documents to determine the context under which the programme was conceptualised. All advocates of theory-based evaluations agree that all programmes are underpinned by a theory, whether it is explicitly articulated or not.

Contextualising a programme brings complexity, as adapting a programme into a local setting has implications for both programme theory and design (Sridharan & Nakaima, 2012). The Fundisa for Change programme was adapted in different contexts (provincially) and for different participants (teachers and subject education specialists) by the facilitators who implemented the programme. The complexity had to be monitored during site evaluation of the programme (see Chapter Six).

Riché (n.d) believed that evaluations should in fact be contextualised as programme outcomes are influenced by social, institutional, cultural, economic, geographical and political factors embedded in local environments. Understanding a programme's theory within a specific context and how it interacts with factors external to the programme is important in capturing the 'how' and 'why' of programme outcomes. Contextual factors can either help a programme achieve its objectives or act against the programme working as shown in the *Learning for Sustainability*, SADC and *NEEP-GET* evaluations referred to above (see section 2.4.2). Moreover, other programmes external to the programme being implemented may contribute to a programme's observed outcomes (Canadian Secretariat, 2012). It becomes important therefore to identify the contextual factors that interact in an event to explain observed outcomes. Identified contextual or process conditions that influence programme outcomes should be used to improve future programmes with similar intended outcomes. The identified contextual and process factors are critical for successful implementation of programmes and should inform a definition of specific conditions for specific programmes. The identification of conditions for training programmes should inform implementation of similar programmes in other contexts (Nakrosis, 2014).

The next section explores theory of change as one of the examples of a theory-based approach to evaluation which has been used in this study.

2.6 Theory of Change

Serrat (2013) defined a theory of change approach that applies critical thinking to the design, implementation, and evaluation of a programme designed to foster emergent, projectable, or transformative change. He further identified types of changes that a programme may intend to foster:

- Discursive – a change in the narrative(s) that stakeholders hold about a concern, problem, or issue, e.g. The SADC environmental programme developed a research/learner-based response to environmental issues and for enabling sustainable ways of living (see Table 2.4).
- Procedural – a change in the way the processes that manage a concern are carried out (implementation), e.g. The *Learning for Sustainability* responded to teacher professional development process with a spiral model that was continuous and of extended duration responding to the critiques of cascade, once-off approaches to professional development (see section 3.4.3.1).
- Content-based – a change in the nature of a concern, e.g. the *NEEP-GET* project with its objective of building capacity for environmental learning emphasised the relationship between human rights, social justice, inclusivity and a healthy environment. This enabled the programme participants to have a holistic understanding of environment (see section 3.4.3.2).
- Attitudinal – a change in the way stakeholders think about a concern, e.g. in the *Learning for Sustainability* Project and the *NEEP-GET* project, professional development on the integration of environmental education in the curriculum was not seen as an add-on to teachers' work but aimed to bring relevance through contextualising environmental issues thus enhancing quality in the curriculum (see section 3.4.3)
- Behavioural – a change in the way stakeholders behave in relation to a concern, i.e. in communication, action or relation with others, due to changes in discourse, procedure, content, or attitude, e.g. the *Enviro Champs* programme developed a framework that can be used by environmental champions in other communities to address water related environmental challenges (see Table 2.4).

Connell and Kubisch (1998) defined a theory of change approach to evaluation as a systemic and cumulative investigation of the connections between programme activities, outcomes and context. They claimed that programmes without an articulated theory are difficult to evaluate, adding that to commence with an evaluation, the theory underlying a programme needs to be specified. The theory-based approach to evaluation makes it possible to determine the programme's intended outcomes, the activities that will be implemented to achieve those outcomes and the contextual factors that may influence the implementation of the activities and thus programme outcomes. A programme's theory of change may have multiple strands (economic, political, and social) that may operate at many levels (community, institutional, personal network, family, and individual).

A programme's theory of change may evolve over the course of the programme (Connell & Kubisch, 1998). An initial programme theory is likely to be incomplete as programme theories get refined as the programme is being implemented. The evolutionary nature of a programme theory has implications for programme implementation and evaluation. An initial theory of change rarely defines contingencies needed for achievement of long-term programme outcomes like behaviour change or improvement of practice (Sridharan & Nakaima, 2012). Mason and Barnes (2007) argued that programme theories are refined while they are being explored. What was intended to happen, what does actually happen in implementation and delivery, and the identification of the factors which lead to outcomes, are only visible through research that seeks to understand *how* the programme works in context. The *Learning for Sustainability* project (see section 3.4.3.1) introduced contextual profiling into the evaluation of the project. The profiling included environmental and developmental issues in South Africa, the education context, environmental education development and teacher professional development. The profiling enabled the development of a teacher professional development programme that would respond to the issues profiled (Lotz-Sisitka & Janse van Rensburg, 2000), seeking out contextual reflexivity in evaluation designs as was also the case in the *NEEP-GET* and *SADC* evaluations (see Table 2.4).

According to Astbury and Leeuw (2010), a programme theory can be developed before a programme is implemented or during the course of programme implementation. Programme theory development during programme design increases stakeholders' chances of specifying intended programme outcomes, activities to be implemented and contextual factors likely to affect them. A careful consideration of context enables programme conceptualisers and

evaluators to identify factors that may influence achievement of a programme's intended outcomes that the programme may lack. A programme theory prior to programme implementation ensures a strategic implementation of programme activities. It may also reveal that multiple theories of change are operating simultaneously within a single programme and that various stakeholders may be working under different, and possibly even competing, theories of change as was found in the *NEEP-GET* project (see section 3.4.3.2). Thus, theories need to be articulated at both strategic and operational levels and links between the two made explicit (Connell & Kubisch, 1998). This is important as different stakeholders may be operating at different levels in a programme, e.g. some are only involved at the strategic level while others are focused on operations, although in some cases stakeholders operate at both levels.

A theory of change approach is a systematic and cumulative study of links between programme activities and their expected outcomes, from the strategic to the operational. A case for programme impact will result from causal inferences made during the life span of a programme. Programme process and implementation are represented by activities and outcomes which include learning generated during the entire course of the programme at multiple levels (Connell & Kubisch, 1998).

A theory of change is an articulation of the underlying beliefs and assumptions that guide a programme that aims to bring change and improvement. Theories of change represent beliefs that programme designers and implementers have about what is needed by programme beneficiaries and the strategies that will enable those needs to be met (International Network on Strategic Philanthropy [INSP], 2005). In the case of the Fundisa for Change programme, it was conceptualised that participants' content knowledge can be enhanced by developing knowledge resource materials that extend the knowledge that is specified in curriculum documents (see Chapter Five). It is in the surfacing of these assumptions that evaluators can make judgments about the appropriateness of programme activities in achieving stated outcomes of the programme.

Weiss (1997) argued that it is important for theory of change evaluators to distinguish between the two components of a theory of change, an implementation theory (implementation activities) and a programme theory. She stated that an implementation theory provides operational details about how the programme is carried out. A programme theory deals with the mechanisms that intervene between the implementation of a programme and the observed outcomes. A

programme theory focuses on participants' responses to the programme. She states that 'The mechanism of change is not the programme service per se but the response that the activities generate' (p. 46). In the Fundisa for Change professional development course, the implementation theory involves the action and activities that occurred during the training of teachers and subject specialists. The programme theory includes the mechanisms that were activated during its implementation and the role they played to achieve programme outcomes observed at each site (see Chapter Seven). According to Weiss (1997), the operative mechanism (cognitive, affective, social, cultural responses) of change is not the programme activities per se but the response that programme activities generate from participants.

Programme theory puts emphasis on the response of people to programme activities, i.e. programme theory is not only actions programmes take but also the response of participants (Weiss, 1998). For example, the Fundisa for Change participants in some of the sites were taken to a water purification plant. Participant reflections from this experience showed that the participants gained a conceptual understanding of the water purification process and gained pedagogical skills on how they would teach this process in the classroom (see Chapter Six). Implementation theory looks at what is required to translate programme objectives into programme operation. One of the objectives of the Fundisa for Change programme is to enable participants to design and develop a lesson plan. During the training session, participants in groups had to design a lesson plan which they had to share with the group for feedback (see Chapter Six). Weiss (1988) argued that theory-based evaluation should make programme mechanisms clear, break down a programme in its subsequent mechanisms, and use data of different kinds to test them. In that way, theory-based evaluation helps generate new theories.

According to Chen (2013), in theory-based evaluations, programme stakeholders want to know whether the programme can activate causal mechanisms for attaining its prescribed outcomes. Stakeholders are also concerned with a programme being integrated into existing systems and compatible with other components of the system e.g. capacity, implementers' capabilities, relationships with partners, beneficiaries' acceptance, delivery structure, and social norms. Success of a programme is contingent on contextual factors like implementing organisations, type of implementers, participants etc. Chen argued that if the context of a programme is changed, the effectuality of the programme is likely to change (ibid.).

Generating a narrative of a programmes' theory of change is the starting point for the evaluation of a programme (see Chapter Seven where I have done this for the Fundisa for Change

programme). The surfacing of a programme's theory of change assists in making explicit the assumptions embedded in the programme, thereby 'unpacking' the programme. The programme is therefore evaluated against these theories (see Chapter Seven). Assumptions about programmes are influenced by people's perceptions of the problem the programme is trying to address and the mechanisms that are believed will bring the desired change (Lipsey & Cordray, 2000). At the core of this approach to evaluation is an unearthing and an understanding of underlying mechanisms that operate explicitly and implicitly in social intervention programmes to determine why programmes work or fail to do so.

2.7 Realist evaluation

All evaluation approaches have philosophical assumptions. Realist evaluation is underpinned by what Pawson and Tilley (1997) call 'scientific realism'. There are other schools of realism besides scientific realism. Realism, according to Westhorp (2014), has five ideas that have implications for evaluation;

- Both the material and the social worlds are 'real' therefore programmes are also 'real' and can have real effects – positive and negative, intended and unintended. Secondly, social institutions and constructs (culture, class, gender, religion, political and economic systems etc.) will have real effects on whether and how programmes work.
- All enquiry and observation are shaped and filtered through the human brain therefore there is no such thing as final truth or knowledge because reality itself constrains the interpretations that can reasonably be made of it. Therefore, although evaluators can work towards better understanding of whether, how and why programmes work, they can never reach final certainty or provide definitive proof.
- All social systems are open systems. Programmes are therefore open social systems. It is thus necessary to choose the boundaries of the system(s) that will be included in the evaluation but to be cognisant of the fact that those systems will not be static, but will change over time regardless of whether a programme is introduced or not. Any outcome that is observed will be a result of interactions within and across systems – not simply an outcome of the programme.
- Evaluation offers a particular understanding of how causation works. Things that we experience or can observe are caused by deeper, usually non-observable processes. For example, we can experience a training programme and observe that participants use different language at the end of it than they did at the beginning, but we cannot 'see' the new content being stored in memory or the new connections being made in the brain

that enables them to do so. It is the interaction between what the programme provides and the reasoning of its intended target population that causes the outcomes. This interaction, therefore, constitutes a programme mechanism. An evaluation needs to identify what resources and opportunities were provided by a programme and to whom; and what ‘reasoning’ was prompted in response, generating what changes which in turn generate what outcomes. Mechanisms cannot be directly observed simply by observing what programmes do. It is necessary to know what occurred because this provides information about the resources that were provided and determines how participants responded.

- Evaluation provides a specific way of thinking about context. Whether mechanisms operate at a particular moment depends on the context. With context, what matters is what influences whether mechanisms operate, and which mechanisms operate. The context within which the organisation implementing a programme can influence the way in which, or the extent to which, a programme is implemented, who it targets and who it reaches. It can also influence the ways in which intended beneficiaries respond. Variations within the target population (gender, class, caste, culture etc.) can influence which mechanisms operate (pp. 4-6).

Critical realists investigate at one level events and outcomes, for example, in a professional development programme; these are the external and visible actions of people. But the primary focus is on discovering the mechanisms that produce programme events and outcomes (Easton, 2010). Existing decision making in programme conceptualisation and delivery can be improved if causal mechanisms that are at play in teacher professional development programmes are understood. For example, facilitators draw on tacit knowledge and their experience in knowing how certain actions have good outcomes. This knowledge is not necessarily explicit when one observes facilitators at work. This knowledge has to be surfaced, and this was done through interviews.

People have ‘powers’ and powers can be unexercised or exercised and not realised or realised but not perceived, for example, participants have the power to learn in a training programme but may not exercise those powers and thus not learn. Or they may exercise those powers and learn but not do anything with the learning they have received, thus the power is exercised but not realised (Collier, 1994). Pawson and Tilley’s (1997) core argument is that programmes have certain ideas which will work for some participants in certain conditions. It is these ideas and conditions that need to be understood and surfaced through evaluation. Programmes offer

chances of change which may (or may not) be triggered into action through participants' capacity to make choices. Participant's choices frame the extent and nature of change. It is therefore not only the moment when participants attend training that matters but the entire learning process during and post training (Pawson & Tilley, 1997). Both programme facilitators and participants are capable of intentional action. They are reflexive and therefore have reasons for the choices they make. According to Bhaskar (1998), agents are defined in terms of their tendencies and powers which are their reasons for acting. Although agents may feel constrained in a system, social structures shape how people interact but they do not fully determine how people act. Agents tend to be influenced by previous experiences. Sayer (2011) argued that agents have the capacity for reflexivity and becoming, that is, to develop through acquiring new knowledge, skills and values.

According to Archer (2010), people's reflexive internal conversations are the means through which agents deliberate about what course of action to take. It is therefore important that participants' reasons for action or non-action be understood so that these can be interrogated during professional development programmes to assess to what extent (if at all) reflection on practice can cause change. One can make a judgement about how much participants know and how this knowledge impacts on the decisions they make (Scott, 2010).

According to Sayer (2010), changes in meanings and practices go hand in hand. He stated that often individuals are critiqued instead of the structures within which they operate. He suggested that possibilities or some individuals in the same structure might not be possible for others. It has been argued that people are able to change themselves and are able to transform current structures, ways of acting, relating and thinking (Sayer, 2005). Agents should realise that social change does not happen to people; rather people make the social changes happen although these may not necessarily be in people's chosen conditions and preferred resources (Sayer 2010).

The realist Context-Mechanisms-Outcomes (CMO) configuration framework was used in the study to unpack the programme theory of the professional development course of the Fundisa for Change programme. Table below shows an elaborated CMO configuration adapted from Pawson and Tilley (1997) and de Souza (2013). De Souza drew on Bhaskar and Archer to define the concepts on contexts.

Table 2.5 Elaborated CMO configuration adapted from de Souza (2013)

Context	Mechanisms		Outcomes
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: internally related objectives and practices	Roles, positions, practices, processes, resources	Preferences, beliefs, norms, values	Transformation or invariance or reproduction
Culture: ideas that influence action of individuals, thus determining certain outcomes	Ideas, propositions, theories, arguments about structure, culture, agency and relations	Preferences, beliefs, norms, values	Transformation or invariance or reproduction
Agency: intentional engagement in action or non-action influenced by cultural or structural conditions	Motivation	Preferences, beliefs, norms, values for action or non-action	Transformation or invariance or reproduction
Relations: interaction between related entities	Duties, responsibilities, powers and rights	Preferences, beliefs, norms, values	Transformation or invariance or reproduction

The focus of a realist evaluation is on finding out for whom a programme is working and under what conditions (Pawson & Tilley, 1997). This knowledge is useful for theorising what should be considered in a programme in order to achieve desired outcomes. According to Pawson and Tilley, realist evaluation enables a penetration beneath the observable programme inputs and outputs in order to accumulate information that will be useful for strengthening programmes. Programmes are generally designed to provide resources or opportunities to influence people's reasoning and ultimately their actions.

Mechanisms in realist evaluation, according to Pawson and Tilley, are a combination of resources offered by a programme and participants' reasoning in response to the resources offered (ibid.). Programme resources, i.e. mechanisms, may be material, cognitive, social, and emotional. Programmes work when these resources resonate with programme participants (Pawson, 2003). According to Westhorp (2012), participant reasoning includes preferences, norms and beliefs and these underpin decisions that lead to particular actions, which in turn enable or constrain outcomes. Partly, the success or failure of programmes is due to the reasoning and personal choices of different participants (Pawson, Greenhalgh, Harvey & Walshe, 2005). It is essential to determine "which individuals, subgroups and locations might benefit most readily from the program, and which social and cultural resources are necessary

to sustain the changes” (Pawson & Tilley 1997, p.85). Programme outcomes thus depend critically on the choices made by participants and programme resources offered by programme implementers (Pawson & Tilley, 1997).

Mechanisms are identified in order to determine potential causal powers e.g. what the intervention does that can produce the expected outcome in the conditions in which it is introduced. In other words, how do programmes trigger mechanisms which change existing social processes, and how are these mechanisms of change dependent on the context? (Pedersen & Rieper, 2008).

Westhorp (2014) stated that there are two things we need to note about mechanisms:

The first is that they exist as part of a whole system. A trainer only has the power to ‘cause’ change because he or she operates in relation to a student (or group of students), in a training programme, using the spaces, equipment and materials provided, and drawing on the social rules that guide teaching and learning. If any of these elements of the system are removed or changed, the causal process changes too. The second is that mechanisms exist whether or not they are operating at a particular moment. The trainer has the power to teach, and the learner has the power to learn, whether or not they are currently doing so. The mechanism is already there, but it will only operate when the circumstances are right. (p. 5)

Mechanisms exist whether or not they are activated; the particular combination of mechanisms that will fire in a given situation is determined by the context (Westhorp, 2012). According to Cheyne, Abhyankar and McCourt (2013), the realist approach makes explicit the principle that it is the opportunities or ideas programmes offer people to make them work that make them work. A programme introduces ideas and/or opportunities for change into existing social systems. The process of how people interpret, that is reason, and act upon these opportunities or ideas is what is known as the programme's mechanisms. Change and new ways of acting can emerge as a result of new ideas awakening capacities that have been dormant in individuals (Pawson, 2001b). A programme may work by *enabling existing* reasoning (“I’d like to do this but I can’t because I don’t have the resources to do so – this programme provides the resources to do so”) or by *changing* reasoning (“I have a new understanding of the value or importance of ‘x’ so I will now do ‘y’”) (Westhorp, 2014, p. 6).

An evaluator could ask, how do resources on offer permeate into the reasoning of the subjects?

What cultures within the education department and peoples' aspirations are crucial in sustaining the learning process? What programmatic arrangements are better at delivering the programme (Tilley, 2004)? There will always be many mechanisms operating in a programme that trigger different reactions among participants and these also need to be considered (Pawson & Manzano-Santaella, 2012). Programme mechanisms in turn are influenced by the context in which the programme is implemented (Robert, Ridde, Marchal & Fournier, 2012).

Programmes implemented over a considerable period and across many contexts have a tendency of self-transformation. They evolve due to differences in local conditions (Manzano-Santaella, 2011). To avoid overlooking barriers to change, power relations and uneven capacities also need to be taken into account (*ibid.*). Programmes involve the actions of people, whether during the conceptualisation or implementation stages. Therefore, understanding human intentions and motivations, what stakeholders know and how they reason, is essential to understanding the programme (Pawson, Greenhalgh, Harvey & Walshe, 2004.)

For a national programme like the Fundisa for Change programme, with the professional development course implemented in nine provinces with a diverse group of participants and contexts, a broad training programme theory as a general theory of change needed to be explicitly articulated. The broad programme theory was an initial programme theory (see Chapter Seven) that could be refined subsequent to the implementation of the training programme in different contexts. During implementation a programme theory is refined, reinvented and adapted to local conditions (Pawson et al., 2005), as was the case in the Fundisa for Change training programme (see Chapter Six). What works in one setting may not work in another (Porter & O'Halloran, 2012). The Fundisa for Change training strategies or guidelines designed nationally during Training of Trainers workshops (see Chapter Five) are suggestions that may or may not be followed when the programme is implemented in different sites. A realist approach to evaluation was used in this study because it promised an explanatory depth that the Fundisa for Change training programme, a multi-partner collaborative initiative designed nationally and implemented locally, required (Manzano-Santaella, 2011).

Cheyne et al. (2013) stated that the context in which a programme is implemented shapes the mechanisms and the outcomes. Hence a programme evolves when introduced into different contexts as context tends to influence what people do and how they will act. When a programme is implemented in another context, there are inevitably differences in infrastructure, institutions, stakeholders and participants. Consequently, some critical causal configurations on which

programme success depends might be broken by the shift. A programme can still obtain the same objectives in different sites but by different means Pawson (2001a). Pawson and Manzano-Santaella (2012) stated that there will always be multiple contexts e.g. individual, institutional and infrastructural features that condition the action of the mechanisms. There will also be many outcomes associated with the underlying causal mechanisms.

Pawson and Tilley (1997) argued that all programmes are conceptualised and implemented into pre-existing social contexts. Context has an influence on the success or failure of a programme. They listed four contextual components that might determine whether the new ideas will lead to participants making the programme work or not: i) the individual capacities of facilitators and participants, ii) the interpersonal relationships created between them, iii) the institutional balance, iv) and the wider infra-structural systems. The table below elaborates on these components.

Table 2. 6. Components that influence success of a programme

Component	Questions to ask
<i>Individual capacities</i> of the key actors and stakeholders	Do the stakeholders have the interest, attitudes, capability and credibility to play an effective part in the programme?
<i>Interpersonal relationships</i> required to support the programme	Are lines of communication, management and administrative support and professional contracts supportive or constraining to the delivery of the programme?
<i>Institutional setting</i>	Is there clear and supportive leadership from top management about the programme?
<i>Structural systems</i>	Are there global, regional or national policies or structures that support the objectives of the programme?

Adapted from Pawson, Greenhalgh, Harvey and Walshe (2004)

The four contextual factors that shape the implementation of social programmes were further elaborated on by Macfarlane, Greenhalgh, Humphrey, Hughes, Butler and Pawson (2011);

- Individual capabilities are defined as values, roles, knowledge and purposes of programme stakeholders to take the programme forward.
- Interpersonal relationships supporting the programme include communication, collaboration, network, influences and influences stakeholders have in the social systems where the programme is embedded.
- Institutional settings in this case would be the informal rules of engagement (Fundisa for Change partnership protocol), culture within the programme, leadership, resource allocation and local priorities. Leadership was enabled by a central co-ordination office that provided strategic guidance and management of the programme at national level with the assistance of the Fundisa for Change core team, which is composed of the pioneers of the programme. The co-ordination office also provides the maintenance of communication and networking infrastructure (Fundisa for Change, 2013b).
- The infra-structural system is the political support a programme receives.

Decisions made by participants are heavily influenced by pre-existing political outcomes and social structures which have an influence on the mechanisms by which individuals make (or do not make) the decision to change practice. If the agent or individual can be directly introduced to the specific possibilities provided by the programme and the potential for doing things in a new way, they can be encouraged towards changing practice (Dobson, Jackson & Gengatharen, n.d). It is therefore important to identify the programme processes and contexts

in which programmes are implemented and the influence of these factors on what programme stakeholders do.

Pawson and Tilley (1997) suggested that people are often aware of what shapes their lives and of the choices which influence their activities as well as of the broader social systems that limit their opportunities. This awareness may lead to some people wanting to change the influences that change their lives but may not be able to make the change due to not having the resources to bring change about, or their efforts may be hindered by others with more resources (Dobson et al., n.d). Therefore, only certain participants, in certain circumstances will act upon the ideas and opportunities provided by a programme (Pawson & Manzano-Santaella, 2012).

Additionally, Pawson and Tilley (1997) argued that programme stakeholders' capacity for choice is always conditioned (i.e., constrained and enabled) by the power and resources of their 'stakeholding.' As much as programmes might work by offering resources designed to influence programme participants, whether or not a change happens depends on the participants' characteristics and their circumstances (Pawson et al., 2004, p. 2). For an example, teachers are decision makers to whether or not the environment-related subjects are included in their teaching activities. Even if a curriculum policy emphasises the need of environmental learning, teachers may not be able to offer applicable teaching activities due to lack of capacity to teach to environmental topics (Liu, Yeh, Liang, Fang & Tsai, 2015).

2.8 Conclusion

This chapter explored the history, purpose and the value of programme evaluation. The chapter also discussed theory-based evaluations with a particular focus on theory of change and realist evaluation. Literature on programme evaluation as discussed in this chapter shows that programme evaluation has evolved from only asking whether a programme has worked or not, but rather asks how and why a programme works or does not. Answers to these questions give insights on what needs to be considered when programmes are conceptualised and implemented. It should be noted that no one programme can work exactly the same way everywhere for everyone. Programme stakeholders need to understand what needs to be available in different contexts to make a programme work. Insights on how and why programmes work provides information on how the same programme, for example the professional development component of the Fundisa for Change programme can be adapted in different contexts.

What is evident is that the type of questions asked in evaluations is dependent on the purpose of the evaluation as well as theoretical and methodological developments in the field of evaluation itself. The chapter discussed the gap in the field of environmental education with regard to evaluation of professional programme which showed that the theory of change and realistic evaluation methodology were implicitly developing that explicitly used.

The next chapter provides literature on the conceptualisation of teacher professional development with a particular focus on professional development in environmental education.

CHAPTER 3: TEACHER PROFESSIONAL DEVELOPMENT

3.1 Introduction

This chapter gives a broad discussion on professional development, touching on some of the international and national debates on what this concept involves. The chapter also focuses on professional development in the field of environmental education, drawing on global imperatives that have influenced the integration of environmental education in teacher education.

The focus of this chapter is also on the relationship between professional development and teacher learning and the factors that enable or constrain professionals' learning in professional development programmes. Learning is at the heart of all professional development programmes and as such, research in professional development should be aimed at determining who learns, what is learned and how learning occurs. Professional development programmes therefore should focus on how professionals learn in a knowledge society, and give professionals time to reflect and interact with colleagues within professional learning communities (Harwell, 2003).

According to Sanyal (2013), no education policy, no matter how well designed can succeed without a teacher. It has also been argued that a change in policy alone is not sufficient to improve an education system (Livingstone, 2012). "Policy intentions, no matter how well meaning, are not enough to enable a thriving practice of teaching, therefore, frameworks of thinking that enable, or impede, sound policy and practice need to be examined" (Shalem & Pendlebury, 2010, p. xi). Quality, systematic life-long professional development programmes should enable teachers to professionally and effectively manage the teaching and learning process. Different authors have defined professional development differently; the next section discusses the conceptualisation of professional development.

3.2 What is professional development?

Teachers are essential drivers of a good quality education system. Internationally, it is recognised that for professional education and for development to succeed, teachers need to be integrally involved in it, through reflecting on their own practice. Professional development for teachers should have a strong school-based component with activities that are well co-ordinated (South Africa. DoE, 2006). According to Villegas-Reimers (2003), teachers are not merely one of the variables that need to be changed to improve education systems, rather they are the most

significant change agents. Professional development for teachers is a lifelong process that begins with initial teacher training and continues until they retire (ibid.).

Teaching (and therefore teachers) are at the centre of any schooling system. The quality of teachers' professional practices determines to some extent the quality of teaching and learning in the schooling sector. Teacher quality and not only teacher supply is important for learning; hence teacher professional development should be a priority in all education and development strategies (UNESCO, 2015b). Wolhuter (2006) believed that any education system stands or falls based on the quality of its teaching profession, and by implication on the quality of its teacher training programmes. Teachers, like all professionals, need to grow their knowledge and skills throughout their careers (South Africa. South African Council for Educators [SACE] & DBE, 2010).

The initial preparation of teachers is only the foundation of their professional education. Continuing professional teacher development is essential for upgrading and updating teachers because the rate of social and educational change makes initial teacher training an inadequate basis for long-term professional competence (Luneta, 2012). Initial teacher education cannot cover all the knowledge that a teacher will need throughout their teaching career (UNESCO, 2015b). The development of professional practices is a continuing process that lasts for the duration of one's career (South Africa. DBE & SACE, 2008). Continuing professional teacher development is therefore an essential component of any education system that aims to improve the quality of teaching and learning.

It is important to note that quality education should be responsive to societal changes and the changing context of learners. Teachers therefore need to constantly update their knowledge and skills to be relevant to changing contexts. Teachers should be able to reflect on practice, and adapt to new challenges by adopting new pedagogies (UNESCO, 2015b).

Additionally, no pre-service training programme can effectively prepare teachers for a lifetime in their profession. Although Steyn and van Niekerk (2005) argue that teachers' skills and knowledge can decline over time, it can also be argued that as teachers get more experience in teaching, their skills are heightened. Teachers who keep up-to-date with what is happening in their profession will have an increase in knowledge as opposed to a decline in knowledge and skills. Teachers thus need regular and continuous development through quality programmes to improve their practice. The continual deepening of professional competence is an integral part

of the development of any professional working in any profession. Teaching is no exception (Boyle, While & Boyle, 2004). Le Roux and Ferreira (2005) proposed that continuing professional development should be an ongoing and continuous occurrence in a teacher's career, and should not be viewed as a chance event or a tool to manage crises during curriculum reform. According to Bell and Gilbert (1994), teachers should regard the professional development process as one of empowerment for continuous development, rather than one of continued dependency on a facilitator. This suggests that professional development programmes should empower teachers in ways that enable them to take ownership of their own professional development. Some researchers in the field of teacher professional development go as far as stipulating the knowledge required in teacher professional development programmes.

Bertram (2011) believed that when teachers have deep conceptual disciplinary knowledge, then they should be able to access new knowledge on their own through reading books, journals, textbooks or websites. The new knowledge introduced into an official curriculum should not pose an insurmountable challenge as it is brought into already existing disciplinary schema. Continuous professional development programmes should therefore not focus only on how to implement a particular curriculum which will ultimately change. The focus should rather be on general knowledge for the profession, for an example, disciplinary knowledge, pedagogical knowledge and pedagogical content knowledge. Teachers should be supported to succeed in delivering the curriculum in the present times but also to grow over time (Harwell, 2003). Professional development programmes with a strong focus on disciplinary knowledge can assist teachers to develop the competence necessary to access new knowledge (Borko, 2004). The extent to which this is realised in professional development programmes needs to be explored.

For Guskey (2002), there is no single form of continuous professional development programme that is appropriate for all teachers. What is required is an optimal mix of activities that suit particular teachers at different stages in their individual development. A 'one size fits all' approach to professional development does not work. Teachers are at different stages of their development at different times in their careers, and these stages need to be considered as teachers' needs and dispositions may vary during the different stages (Villegas-Reimers, 2003). The challenge is providing professional development activities that enable each individual participant to acquire what they need from a professional development programme.

Guskey (2002) argued that professional development programmes change teachers' classroom practices, attitudes and beliefs to improve learner achievement. Teachers generally attend professional development programmes with an assumption that the programme will enhance their knowledge and skills to improve learner performance. Most of the professional development programmes do not achieve that goal because neither do they consider what motivates teachers to participate in professional development activities, nor the process of change that occurs in teachers (*ibid.*). Additionally, teachers who volunteer to attend professional development activities may differ with motivation, prior knowledge, teaching and assessment practices (Wayne, Yoon, Zhu, Cronen & Garet, 2008). Teacher professional development programmes should be able to address those different expectations, also taking into consideration that different people learn differently (Darling-Hammond, 2006).

Villegas-Reimers (2003) stated that workshops, seminars, conferences and courses are professional development models that have been criticised for being once-off activities that do not cater to teachers' needs and do not provide follow-up. She acknowledged that there have been cases where these models have been successful when accompanied with other professional development opportunities. The Fundisa for Change teacher education programme combines five-day contact sessions with on-site support from local partners as well as establishes and strengthens district professional learning communities (Lotz-Sisitka, 2011; Tshiningayamwe, 2016). Irrespective of which model is chosen, Villegas-Reimers (2003) suggested that the context where professional development models are implemented be considered, as well as other factors that may support these models.

Ball and Cohen (1999) proposed that professional development permeate through to teachers' practices as teachers cannot change how they teach simply by being told to do so. Moreover, it should provide teachers with opportunities to make choices about their own learning (Dunne, 2002). The challenge, according to Simmie (2007) is finding approaches that will win teachers' active involvement whilst offering them support and spaces for them to challenge their current practice. Professionals should reflect critically on current practice to either maintain or improve it in future (Winch, Oancea & Orchard, 2015). It is when teachers challenge and question their own taken-for-granted practices that they can learn in ways that could lead to changes in practice (Webster-Wright, 2009). Reflecting and reflective practice is an integral component of teachers' work, and this process can provide the impetus for changing practice (Herbert & Rainford, 2013). Professional development programmes should thus not only provide teachers with more professional knowledge but also assist them to inquire into their work (Darling-

Hammond, 2006).

The notion that professional development activities should enable professionals to engage in reflective processes is also supported by Webster-Wright (2009) who stated:

No one can make another person learn, professionals can be supported to continue to learn in their own authentic way while taking into account the expectations of their working contexts ... If the agentic role of professionals in shaping their learning is to be taken seriously, then a framework of support needs to account for this while working within contextual constraints ... Such a framework needs to not only support professionals as they learn but also find ways to encourage a spirit of critical inquiry where professionals can gain insight into their own learning and the assumptions they hold about their practice. (p. 727)

Teacher professional development programme activities should not only focus on what teachers learn and how they learn but also on how they can critique their current practice. This suggests that change in practice will occur when professionals are supported to develop a disposition to challenge and interrogate implicit assumptions about their practices, which they may be taking for granted.

Additionally, Steyn and van Niekerk (2005) argued that professional development is not ‘done to’ people; no one can be developed. Rather professional development should make professional reflect on current practice in order to identify their needs. They argued that many teachers are unable to reflect critically on their own practice and/or to try out new solutions to problems they encounter, hence a need for continuing professional development that encourages reflexivity.

It is also important that teacher professional development programme conceptualisers be aware of teachers’ experiences and what teachers think of those practices. Insights gained can be used by programme conceptualisers to better support teachers (Webster-Wright, 2009). Professional development often fails to produce its intended results when what it presents contradicts with participants’ current beliefs (Harwell, 2003) and expectations.

Moreover, teachers find relevance in professional development when the focus of the activities is linked to their classroom work (Dunne, 2002). This gives teachers an opportunity to develop the knowledge they need for teaching (Marrongelle, Sztajn & Smith, 2013). Intensive, sustained, job-embedded professional development that is focused on the content of the subject

that teachers teach is more likely to improve teacher subject content knowledge, teaching pedagogy, assessment practice and learner performance (Wayne et al., 2008; Hunzicker, 2011). A programme therefore needs to provide teachers with new knowledge, teaching and assessment strategies that they can reflect on and might enact in their work contexts (Clarke & Hollingsworth, 2002). Professional development cannot succeed without strong subject content knowledge and an inquiry into professional questions that are relevant to the setting in which the professional development is delivered (Harwell, 2003).

In some contexts, professional development activities are examined in relation to their impact in changing teachers' attitudes, beliefs, and perceptions for learners' achievement; in other contexts, they are an end in themselves irrespective of whether or not the activities will lead to improvement in student learning (Evans, 2014). Evans (2014) critiqued what she called a narrow view of professional development which defines professional development as what professionals do. She argued against the view that professional development is only a physical action that can be observed and which impacts student learning. She rather viewed professional development as something relating predominantly to a professional. She did not deny that professional development may have secondary benefits, such as to improve learner performance, but these should not be integral to a definition of professional development. Evans explained that new ways of thinking that may be planted in teachers' reasoning during professional development activities may take time to be assimilated into practice. Her argument is that we cannot assume that professional learning will be evident immediately (ibid.). Should we only conceive of teachers to have learned through professional development, only when we can see immediate change in their practice? Evans (2014) questioned the assumption that the impact of professional development will be immediately visible claiming that kind of reasoning fails to consider complexities in professional development.

Wayne et al., (2008) asked pertinent questions: how long do teachers need to think about what they have learned in order to put it effectively into practice? Once practices are put in place, are they sustained over time? How long do improved teaching practices take for there to be detectable increases in learner performance? Does professional development have an impact during the year in which it is delivered, or is there a delay in impact? These questions suggest that there might be a time lapse between when professionals participate in capacity development to when desired results are evident. Evans (2014) argued that ideas that may have been planted within professionals' mindsets may be diluted by interacting with other influences that may not be readily recognisable or identified.

Some researchers believe that change requires time. Teacher professional development is not an event but a process (Harwell, 2003). The process of learning and transformation in teaching practice resulting from professional development is time-consuming (Villegas-Reimers, 2003). Teachers and other professionals do not change overnight. Any form of professional development will require a long-term gradual progression to change. We should therefore be asking what exactly it is that is being developed and how and when professional development programmes are designed and delivered. What capacity does the professional development programme have to support professional autonomy? To what extent do professional development initiatives facilitate transformative practice? What conditions enable professionals to practice from learning and to learn from practice?

Evans (2014) argued that professional development should involve behavioural, attitudinal and intellectual development, that is, modification of professional performance, work-related attitudes and work-related knowledge and competence. She posited that professional development is not only about behavioural change, it is also about changes to attitudes, intellectual capacity and mindsets. Yet professional development initiatives often tend to focus primarily on behavioural change. Teachers will seldom fully engage with and commit to ‘new’ or ‘different’ forms of practice unless they perceive them as potential improvements (even if only partially) to existing practice (Evans, 2014). Moreover, Johnson, Hodges and Monk (2000) argued that less time has been spent on asking why teachers behave the way they do. Their argument is that the focus is more on how teacher behaviour can be changed. They posited that we need to understand teachers’ untransformed behaviour in light of professional development received. Additionally, they questioned the assumption that teachers act from knowledge acquired. They stated that most teachers know more teaching strategies than they use. Their stance was that professionalism is not differentially distributed because of the inadequacies of individuals within the system; rather it is differentially distributed because of the variations in the systems within which individuals work. Their argument highlights the importance of context.

There are contextual factors that may hinder an implementation of what teachers may have gained in a professional development programme. It is therefore important to identify contextual factors that may constrain what a teacher can and wants to do with knowledge gained from a professional development programme. Conceptualisers of teacher professional development programmes need to consider contextual factors that may constrain teachers’

implementation of what they learn from professional development activities so that these can be absented where possible. Some of these factors may be the learners they teach, the knowledge and experiences teachers bring, teachers' current practices, the curriculum, teaching methods, assessment, the learning environment, government and education policies, available resources and school cultures and structures (Dunne, 2002). Context might also include the community where a teacher works. Contexts that support professional development are conducive to the changes that the professional development is designed to bring about (Harwell, 2003). Professional development alone will not change teachers' practices unless the environment in which they work allows this (Johnson et al., 2000). It has been argued that teachers in South Africa in the past were unable to play a professional role because the education system precluded it (ibid.). The next section discusses professional development in South Africa.

3.3 Professional development in South Africa

The South African Council for Educators (SACE) defined professional development as:

activities undertaken individually or collectively by educators throughout their careers to enhance their professional knowledge, understanding, competence and leadership capacity; in particular to increase their mastery of the curriculum and their teaching areas, their skill in teaching and facilitating learning, their understanding of children and young people and their developmental needs, and their commitment to the best interests of their learners and their schools, the wellbeing of their communities and the ethics of the education profession. (South Africa. DBE & SACE, 2008, p. 3)

This definition encompasses the needs of teachers, their learners' needs and societal needs. Professional development is therefore more than developing teachers but also about impacting the communities where schools are situated. This definition is in close alignment with the aim of the Fundisa for Change Teacher Education programme. Teachers are developed professionally so that they can contribute to building environmentally sustainable societies through engaging with environmental knowledge and skills in the curriculum (Fundisa for Change, 2013a).

Mestry, Hendricks and Bisschoff (2009) stated that the culture of professional development in South Africa was adversely affected by the legacy of apartheid education. The education landscape in South Africa was shaped by powerful political and economic forces which often

overshadow pedagogical forces (Wilmot, 2004). Kachelhoffer (1995) stated that South African politicians were not showing respect for quality teacher education even though the quality of a country's work force depends on well qualified teachers. He argued that if a government does not realise the worth of quality teacher training and prioritises education, a country will sink into poverty.

Since the dawn of democracy, teacher development in South Africa has been hampered both by the frequency of the curriculum reform as well as inappropriate models of teacher development (Bertram, 2011). Teacher development in South Africa has been impeded by the numerous changes in curriculum since democracy and the inadequate models used to orientate teachers into a new curriculum. After democracy, teacher development initiatives were introduced on a scale that was unprecedented in the history of South Africa. The initiatives were implemented in a form that was called a cascade model of teacher training to assist teachers in the implementation new curricula (Jansen, 2004). This model has been critiqued for being inadequate (Du Toit & Sguazzin, 2000).

In a 2009 review of the South African National Curriculum Statement, it was highlighted that teacher training and good quality, content rich textbooks were critical to successful curriculum delivery. The type of training that teachers received to implement the National Curriculum Statement is reported to have been too superficial and too generic and of poor quality, thus inadequate to provide teachers with support for curriculum implementation. It is also reported that the training was decontextualized and unsupported. There was therefore a strong call for subject content training and for subject-specific training and classroom-based mentoring and support (Dada, Dipholo, Hoadley, Khembo, Muller & Volmink, 2009). The Fundisa for Change training programme is subject and phase specific, it draws on environmental content knowledge that is specified in a subject and in a phase but also extends that knowledge (see also section 5.6.1.1).

The history of training in South Africa has been a 'one-size-fits' all approach which has not been effective. One of the challenges with prior training initiatives was that many of the departmental officials (who were mandated to train teachers) had a relatively poor understanding of the curriculum (that was to be implemented) and provided teachers with superficial information. Additionally, the departmental officials were not sure of their roles in relation to implementing the curriculum (Dada et al., 2009).

Some of the recommendations from the report were:

- In-service teacher training should be targeted to where it is most needed. Training needs to be subject-specific.
- Principals, Heads of Departments, district and provincial support staff need in-depth training on roles, curriculum content and assessment requirements to be able to support teachers effectively.
- Subject advisors should be trained to work as supportive, training and development-oriented advisors, who offer in-class support as well as training and development to teachers.
- Higher Education Institutions should align their teacher training programmes with national curriculum policies to enable better alignment between the current (largely generic) teacher education programmes and focused training required for successful curriculum implementation. (Dada et al., 2009, p. 57)

The South African Action Plan 2014 released by the Department of Basic Education in 2011 (see section 1.4.2) stated that, although emphasis within teacher development needs to shift towards subject knowledge, it is still necessary to provide training in the structure and implementation of the curriculum and assessment guidelines. This is because teachers' development needs to go beyond giving teachers skills but also needs to convey to teachers the concept of professional identity and pride in the profession (South Africa. DBE, 2011).

Professional development is mandatory for all South African teachers as stated by SACE, "... all state-employed teachers and many privately-employed teachers are required to undertake professional development as part of their conditions of service" (South Africa. SACE & DBE, 2010, p. 16). This means that South African teachers are expected to maintain their professional standing through continuing professional development (South Africa. DoE, 2006). This also extends to education department officials (senior education specialists - SESs) as recommended in the 2009 curriculum review report.

Additionally, in South Africa continuing professional development for teachers is considered important. Some professional development activities are compulsory and paid for by the Department of Education (South Africa. DoE, 2006). The 1995 White Paper on Education and Training views teachers as one of the key pillars of the national human resource strategy (RSA, 1995).

Although relevant stakeholders (as mentioned in the recommendations of the 2009 review above) must share the responsibility for improved schooling, school reform efforts seem to weigh heavily on teachers. Teachers take sole responsibility for curriculum implementation (and often get the blame for poor curriculum implementation). District departmental officials and NGOs complain that the support they give to teachers is rarely translated into practice because of teachers' poor attitudes, culture and lack of commitment to improve. Teachers blame the education district for its lack of capacity and the lack of capacity of some its district officials (Mestry et al., 2009).

According to Borko (2004), meaningful learning is slow and some teachers change more than others through professional development. Hence, it may seem that nothing is changing in the school sector in South Africa and that challenges remain unchanged. The Department of Basic Education's Action Plan 2019 states that changes have occurred, some obvious while others have been subtle. There is a recognition that change needs to be accelerated, and that certain changes in education systems are slower than others (South Africa. DBE, 2015b). Importantly, professional development has to resonate with a teacher's desire to change current practice (Steyn & van Niekerk, 2005).

One of the recommendations from the Southern African regional conference on teachers held in Mozambique in 2015 was that continuing professional development should be co-ordinated amongst all service providers (UNESCO, 2015b). In the South African context, the South African Council for Educators (SACE) is better positioned to take up the role of co-ordinating service providers. The Continuing Professional Teacher Development (CPTD) system in South Africa is currently under the South African Council for Educators (SACE). The system aims to:

1. Improve schooling and the quality of learner achievements.
2. Coordinate professional development activities with a view to achieving sharper focus and effectiveness.
3. Revitalise the teaching profession and foster renewed commitment to the profession's seminal role in the development of our country.
4. Contribute to the responsible autonomy and confidence of the teaching profession.
5. Enable the profession to re-establish its professional standing and role in advancing the ideals of social justice.

6. Acknowledge the effective participation of teachers in professional development activities which are priorities for the education system and the teaching profession (South Africa. DBE & SACE, 2008, p. 3).

The CPTD system consists of professional development (PD) activities, endorsed by SACE on the grounds of their fitness of purpose and quality, for which teachers earn 150 professional development points over a three-year cycle. University qualifications and short courses that are not SACE endorsed, even if they carry credits will not lead to teachers accumulating professional development points even if they get those qualifications. All the Fundisa for Change short courses have been endorsed by SACE from 2016 – 2019.

A call was made in the Southern African regional conference on teachers held in Mozambique in 2015 that the conceptualisation of teacher development programmes should be based on a systemic identification of teachers' needs (UNESCO, 2015b). South Africa introduced an Integrated Quality Management System (IQMS) to identify teachers' professional development needs through a developmental appraisal and a performance measurement. The development appraisal aims to determine individual educators' competences, their areas of strength and weaknesses in order to draw up programmes to provide support and create opportunities for individual development for continued growth (RSA, 2003). This monitoring process entails teachers being observed by their immediate supervisor (a Head of Department) and a peer (preferably someone who teaches the same subject) as they teach a lesson. A performance measurement tool is used to generate insights from the lesson observation. Teachers are then required to draw up a personal growth plan (PGP) after they have been appraised so that their weaknesses can be addressed. These plans are submitted to provincial district offices so that professional development programmes can be organised for teachers. Data from this process can be fed into the SACE system so that SACE can collate all the developmental needs teachers have indicated. This information can be made available to service providers in the education system so that these needs can be incorporated into teacher professional development programmes.

Provincial Education Departments in South Africa were expected to establish and develop Provincial Teacher Development Institutes (PTDIs) in all nine provinces by 2017. Currently there are 147 teacher centres spread across all provinces (South Africa. DBE, 2018). These are physical sites at provincial level from where provinces are expected to coordinate and deliver all national and provincial continuing professional development programmes for teachers

(South Africa. DHET & DBE, 2011). Some of these institutes are already in existence in some provinces, some having been initiated by teacher unions but the process is as yet incomplete.

In 2013, the National Education Collaboration Trust (NECT) was established as a response to the call by the National Development Plan (NDP) to increase collaboration among stakeholders and improve educational outcomes. One of the themes of NECT is the professionalising of the teaching service. It aims to achieve this through a standardised, routinised year-long programme which involves quarterly training, in-school support and provision of resources such as teacher support toolkits (<http://nect.org.za/>). According to NECT 2016 annual report (National Education Collaboration Trust [NECT], 2017), the programme has achieved the following tangible successes:

- Over 2.6 million pieces of materials distributed in classrooms
- Over 11 000 hours of coaching and mentoring hours provided to teachers and school managers
- Since its launch, NECT programmes have reached:
 - Over 50 districts (of 86 districts)
 - 631 district officials (of 2663 officials)
 - 6 817 schools (of 25 574 schools)
 - 26 000 teachers (418 611)
 - Over 2 million (12 932 565) learners

The National Education Collaboration Trust (NECT) works closely with the Department of Basic Education. Ensuring that every learner receives quality schooling is an urgent need in South Africa, as stated in the Department of Basic Education *Action Plan 2019: Towards the Realisation of Schooling 2030* (South Africa. DBE, 2015). By 2030, South African schools want to have:

- Teachers who receive the training they require and are continuously improving their capabilities and are confident in their profession.
- Teachers who understand the importance of their profession for the development of the nation and do their utmost to give their learners a good educational start in life.
- Teachers who are satisfied with their jobs because they feel their employer is sensitive to their personal and professional needs and that their pay and conditions of service are decent and similar to what one would find in other professions. (South Africa. DBE, 2015).

It is estimated that on average, educators in South Africa spend 39 hours per annum on professional development, but around half of educators spend 12 or fewer hours a year on professional development. What needs strengthening are the levels of effort from educators and the quality of training received. It is envisaged that the average hours that will be spent on teacher professional development from 2017 to 2029 will increase from 62 to 80 hours per annum (South Africa. DBE, 2015).

The 2019 Action Plan also indicates that there is still a need for externally provided in-service training, given the low overall amount of time spent on professional development. The Action Plan posits that in recent years the focus of the external training has been on orienting teachers to new curriculum documents. The call now is on shifting the focus to subject knowledge and teaching methodology as roll-out of CAPS was completed in all the grades in 2014 (South Africa. DBE, 2015).

Notwithstanding debates on what professional development is and what it is for, professional programmes in teacher education should reflect the needs of a changing society. The type of education that a country wants and the society it needs to a large extent determine the teacher education programme that is implemented (South Africa. DHET 2015, Abudu & Donkor, 2014). The task of aligning programmes with changing societal needs and challenges requires an interrogation of the context where teaching and learning takes place. Some of these societal demands are discussed in the following section.

3.4 Professional development in the context of environmental challenges

3.4.1 Environmental issues and risks

Environmental issues and risks are global concerns experienced worldwide (le Roux & Ferreira, 2005). The 2016 Global Education Monitoring (GEM) Report (UNESCO, 2016) states that the planet is in a dire state due to overexploitation of natural resources, loss of biodiversity and a rise in carbon levels leading to climate change. Such degradation of the planet has trapped families are trapped in poverty with being displaced. Moreover, disparities with regard to access to quality education are widening. There have been various responses at global, regional and country level to environmental challenges faced. Policy, legislation, agreements, treaties and conventions have been established to address environmental degradation in attempts to mitigate, combat and reverse some of the environmental threats. Education programmes have also been developed in formal and informal sectors to address

these issues and risks. There is an urgent need for all sectors of society to work together to address environmental challenges and to create a sustainable world (McKeown & Hopkins, 2014).

3.4.2 Global responses to environment and sustainability challenges

In 1998, a call was made by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) to develop guidelines for reorienting teacher training to address sustainability in education. Educating for a sustainable future is perceived to involve improving quality basic education and reorienting education to address sustainability (UNESCO, 2005). Some of UNESCO's proposed guidelines and recommendations for reorienting teacher education to address sustainability are:

- Revision of teacher education and certification requirements to include Education for Sustainable Development (ESD).
- Creation of professional development programmes related to ESD for teacher educators.
- Development of strong national coordination teams for ESD that includes professional organisations and issue-related educational organisations.
- Working with national publishers and textbook committees to infuse sustainability into textbooks at all levels.
- Development of strong regional consortium teams that allow educators from a range of sustainability-sector groups to come together to support teacher-education initiatives.
- Documentation of successful ESD programmes that have reoriented teacher education to address sustainability. (UNESCO, 2005)

Reorienting education to integrate ESD is a multi-layered process that involves changes in policy and practice. It also speaks to an acceptance of the sustainability paradigm and taking into cognisance knowledge, skills and values for a sustainable future. The reorienting process will take time in teacher education to get desired changes and teacher educators and teacher education institutions are lead agents to advance ESD (McKeown & Hopkins, 2014).

Teacher education institutions have the potential to bring changes within education systems that will shape the knowledge and skills of future generations for a sustainable future. Teacher educators are therefore key change agents in transforming education and society (UNESCO, 2005). Teacher educators therefore need to be sensitised to national and international perspectives on environment and development so they can be responsive to sustainable

development. The training of teacher educators on ESD is thus critical as these are the lead agents who will empower teachers to think critically and make informed decisions in bringing out the environmental and sustainability content knowledge embedded in the subjects they teach and to choose appropriate teaching strategies for a sound orientation to environmental issues and risks and support them with assessment methods (Ravindranath, 2007; UNESCO, 2015b). Teacher training is thus critical in making education more responsive to sustainability challenges. Programmes for teacher training appear to hold significant benefits for teachers' understanding and confidence in delivering ESD (UNESCO, 2016). Teachers are the most important education resource in any country according to the 2010 EFA Global Monitoring Report (UNESCO, 2010).

The United Nations Conference on Sustainable Development held in Rio de Janeiro in 2015, launched 17 Sustainable Development Goals (SDGs). The Sustainable Development Goals provide new orientation for development and replace the Millennium Development Goals. United Nation member states are expected to use these universal goals to frame country agendas and political policies over the next 15 years. The achievement of the Sustainable Development Goals is reliant on regional and national policies and programmes. Each of the 17 goals has at least one target that addresses learning, training, educating or raising awareness on the sustainable development issues. The educational intent of the SDGs recognises that education is a critical factor in addressing environmental and sustainability issues and in ensuring human well-being (UNESCO, 2016).

Goal 4 of the SDGs focuses on quality education that is inclusive and equitable and promotes lifelong learning opportunities for everyone. This goal seeks to ensure all learners acquire knowledge and skills needed to promote sustainable development and to increase the percentage of qualified teachers by 2030. This goal is expanded in the 2015 Incheon Declaration for Education 2030, which sets out a universal education agenda for the next fifteen years (UNESCO, 2015a).

The Incheon Declaration for Education 2030 (hereafter referred to as Education 2030) aims to provide quality education and improve learning outcomes to achieve the SDGs and to transform lives. Quality education is defined as an education that develops creativity and knowledge, acquisition of analytical, problem-solving, higher-level cognitive, interpersonal and social skills as well as values and attitudes that will enable citizens to make informed decisions for sustainable development. In addressing issues of sustainability, Wals and Lenglet (2016)

suggested that methods and approaches used should enable citizens to move beyond engaging only with the known facts on sustainability, but to move into issues of societal concern so as to engineer collaborative learning and collective action. Additionally, Tan and Pedretti (2010) argued that ESD cannot only be about including topical environmental issues into a lesson. They posit that socio-political nuances and value judgements that often accompany environmental issues need to be taken into consideration. The argument above was also highlighted by Hattingh as evidenced in the following quote,

... part of the task of education in general, and thus of environmental education in particular, is to acknowledge, foreground, explore and discuss the intricate ways in which social issues and the difficult feelings that they create, are embedded at a specific time and a particular place, not only in concrete cultural, political and social structures, but also in wider environmental, bio-physical contexts. To think through the links and relationships between all of these structures and contexts, I believe, is the proper task of environmental education, environmental ethics and environmental philosophy. (2004, pp. 162-163)

ESD in teacher education needs to develop in teachers and educators an understanding of earth systems and ecosystems and how people interact with nature and the impacts of those interactions. This has to be linked to the subjects they teach to support and maintain relevance and appropriateness. This will foster and support sustainable actions in the learners they teach. This kind of training needs to be supported with quality resource materials that will support teaching and learning (Ravindranath, 2007, Tan & Pedretti, 2010).

The International Education 2030 vision acknowledges that quality education cannot be achieved without ensuring that teachers are empowered, properly trained and supported with resources and efficient government systems (UNESCO, 2015a). The GEM Report has a mandate affirmed by the Incheon Declaration to be a mechanism for monitoring and reporting on the quality education and on the education targets of the other Sustainable Development Goals (UNESCO, 2016). This is a step forward as the issue of monitoring and evaluation was highlighted as a challenge at the end of the UN Decade for Sustainable Development (2005 - 2014). The final report and summary of the DESD indicated that there was a “need for more research, innovation, monitoring and evaluation to develop and prove the effectiveness of ESD good practices” (UNESCO, 2014b, p. 8).

Education quality in schools is to some extent dependent on the quality of teachers in the schooling system. The quality of teachers depends to some extent on the quality of teacher education and development they receive. The Fundisa for Change Teacher Education programme runs training of trainers for teacher educators and teacher supporters who then support teachers to implement ESD in their classrooms (see section 5.6.1.2). Capacity building for both educators and trainers is a component that is recognised as a priority action in the Global Action Programme (GAP) (UNESCO, 2014a). The GAP principles on ESD provide guidelines to teachers and teacher educators on the focus of professional development for ESD.

Priority action area 3 of GAP speaks directly to building the capacity of educators and trainers. For educators and teachers to be able to teach sustainability issues, they need to acquire knowledge, skills attitudes and values that will enable them to deliver the educational response to sustainable development. This priority action area requires that ESD be integrated into pre-service and in-service teacher education programmes, to increase the capacities of educators and trainers to deliver ESD more effectively (UNESCO, 2014a).

GAP is a follow-up to the Decade of Education for Sustainable Development (DESD) and a contribution to the post-2015 development agenda. It is responding to the provision of meaningful and relevant education, recognizing that sustainable development cannot be achieved by political agreements, financial incentives or technological solutions alone. The important role of education in sustainable development has long been recognised back in 1992 when it became one of the goals of Agenda 21³ adopted in Rio de Janeiro. Chapter 36 of Agenda 21 focused on the improvement and reorientation of education for sustainable development. In 2005 UNESCO recognised that the United Nations Decade of Education for Sustainable Development (UNDESD) provided an opportunity to implement universal quality education for a more sustainable future. UNESCO ten key aspects that support quality education for learners and for education systems (UNESCO, 2005b). ESD is linked to quality education (McKeown & Hopkins, 2014; Lotz-Sisitka & Lupele, 2017).

Education for Sustainable Development (ESD) is recognised as an integral element of quality education and a key enabler for sustainable development. ESD is a holistic and

³ Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organisations of the United Nations System, Governments, and Major Groups in every area in which humans impact on the environment. It was adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, in 1992.

transformational approach to education that focuses on learning content and outcomes, pedagogy and the learning environment in transforming society. The overall goal of the Global Action Programme is “to generate and scale-up action in all levels and areas of education and learning in order to accelerate progress towards sustainable development” (UNESCO, 2014a, p. 14).

This goal is further broken down into two objectives:

- (a) to reorient education and learning so that everyone has the opportunity to acquire the knowledge, skills, values and attitudes that empower them to contribute to sustainable development; and
- (b) to strengthen education and learning in all agendas, programmes and activities that promote sustainable development. (UNESCO, 2014, p. 14)

The Global Action Programme focuses on five priority action areas: (1) advancing policy; (2) transforming learning and training environments; (3) building capacity of educators and trainers; (4) empowering and mobilising youth; and (5) accelerating sustainable solutions at local level.

ESD in the context of GAP focuses on the following principles:

- Allows acquisition of knowledge, skills, values and attitudes that empower people to contribute to sustainable development and take informed decisions and responsible actions for present and future generations;
- Includes key sustainable development issues into teaching and learning;
- Requires innovative, participatory teaching and learning methods that empower and motivate learners to take action for sustainable development, critical thinking skills, understanding of complex systems, imagining of future scenarios; and
- Provides quality education and learning that is relevant today. (UNESCO, 2014a)

It is evident from the narrative above that there needs to be a change in how we educate in order to see the transformation that GAP calls for. This entails changing how educators are capacitated to implement a transformative education system. GAP with the five priority action areas is responding to the challenges that were identified during the UN Decade of Education for Sustainable Development (2005 - 2014). Some of the reported obstacles to ESD implementation in schools were due to absence of articulated ESD strategies and policies and lack of competence of educators to deliver ESD. Other challenges included lack of alignment

between education and sustainable sectors and lack of institutionalisation of ESD due to minimal political support of ESD at systemic level (UNESCO, 2014b). Some of the positive findings in the 10-year period were: education systems were starting to address sustainability issues, stakeholders in sustainable development were taking up education to advance sustainable development, national legislation and policies were addressing sustainability and partnerships and collaboration amongst stakeholders were shaping how countries are taking up sustainability (ibid.).

The focus on education goes beyond providing access to all but to ensure that learners are learning and acquiring relevant skills. To achieve this, teachers need to be trained to use appropriate and relevant teaching and learning methods and relevant content that meets the needs of all learners. National, regional and global efforts need to be mobilised to achieve effective and inclusive partnerships to achieve SDG 4 on quality education. The international Education 2030 agenda calls for a clear definition of learning outcomes in both cognitive and non-cognitive domains, which should be continually assessed formatively, as an integral part of the teaching and learning process. These need to have a direct link to pedagogy (UNESCO, 2015a). It is not enough to engage with environmental and sustainability content knowledge and assessment of that knowledge, without considering how the knowledge will be delivered. Additionally, engaging with ESD is not only in the cognitive domain but also includes the psychomotor and affective domains. Current international education discourses on learning tend to focus on the results of the learning process at the expense of the process of learning. The trend is a focus on the knowledge and skills that can be easily measured rather than on the skills, values and attitudes that are not easily measured, although these are also important for societal development and transformation (UNESCO, 2015b).

According to Education 2030 (UNESCO, 2015a), one of the indicative strategies of progress towards a more sustainable world will be the development of policies and programmes that promote ESD in mainstream formal, non-formal and informal education systems, teacher training, curricular change, learner assessment and pedagogical support. This includes implementing the Global Action Programme on ESD, and the ESD 2030 Agenda. Teachers continue to be viewed as key agents to achieving the Education 2030 Agenda.

The low quality of learning outcomes in schooling is attributed to the absence and/or inadequacy of continuous professional development and support for teachers. Governments are called upon to “review, analyse and improve the quality of teacher pre- and in-service training

and provide all teachers with quality pre-service education and continuous professional development and support” (UNESCO, 2015a, p. 22). This should be accompanied with the development of qualifications framework for teachers, teacher trainers (teacher educators), teacher supervisors and inspectors (subject advisors and district officials). Additionally, effective feedback systems, to support good teaching and teachers’ professional development need to be developed and implemented to ensure that training has a positive impact on teachers’ work. Tools for assessing the content and duration of the training will need to be developed (UNESCO, 2015a).

Education 2030 (UNESCO, 2015a) proposes that teachers and educators, and their organisations, be engaged with at all the stages of policy-making, planning, implementation and monitoring as they provide a bridge between policy and practice. This will give them an opportunity to contribute their experiences as practitioners and their collective insights and expertise to overall policies and strategies. The private sector organisations and foundations should be invited to use their experience and financial resources to strengthen public education.

A research and evaluation process of all components of the education system is necessary for sharing lessons, opening debate on what works and providing constructive feedback. The evaluation can focus on, among other things, the centrality of teaching and learning quality, partner participation at all levels to contribute to the accomplishment of both accountability and development objectives. Member countries governments (like South Africa) are expected to engage with the Education 2030 agenda in ways that take into account their national contexts to ensure the agenda corresponds to their education systems, plans and policies (UNESCO, 2015a).

The issue of capacity building is a global, regional and national issue and critical to social transformation for a just and sustainable world. Teaching and learning is at the centre of transformation. It is critical that teachers gain confidence in teaching basic scientific facts relating to ESD topics in the subjects they teach. They need to know enough to understand when they need to ask for assistance. Teachers also need resources that will enable them to understand ESD principles, values and pedagogies to implement these in their classrooms. ESD frameworks are currently ill-understood and poorly implemented by both teachers and teacher educators in the continent (UNESCO, 2015b).

Countries have policies, strategies and frameworks to address quality education and sustainable development but the implementation of these still remains a challenge. Responding to the challenges requires multiple world views and alternative knowledge systems that will introduce educators and learners to diverse perspectives and a variety of lived experiences. A humanistic approach to education is seen as key to societal transformation as it is inclusive as it does not exclude nor marginalise. The role of teachers in this approach to education is seen as central to facilitating learning for sustainable development. Teachers are expected to foster critical thinking and independent judgement instead of unreflective conformity (UNESCO, 2015c).

The humanistic approach to education requires that teachers:

- Facilitate learning, understand diversity, be inclusive, and develop competencies for living together and for protecting and improving the environment;
- Foster classroom environments that are respectful and secure, encourage self-esteem and autonomy, and use a wide range of pedagogical and didactical strategies;
- Relate productively to parents and communities;
- Work in teams with other teachers for the benefit of the school as a whole;
- Know their students and their families, and be able to relate teaching to their specific contexts;
- Choose relevant content matter and use it productively in the development of competencies;
- Use technology together with other materials as instruments for learning; and
- Continue to learn and develop professionally. (UNESCO, 2015c)

These expectations have implications for teacher education in terms of what should be included in teacher education and training programmes to meet these expectations. It would be unrealistic to expect teachers to achieve the objectives of ESD stated in the various policies and agendas without appropriate education or training (Stanišić & Maksić, 2014).

Ravindranath (2007) argued that ESD in teacher education involves deliberation about content knowledge, learning and teaching strategies, teaching and learning materials and capacity building for effective delivery. Are national education authorities able to account for the significant share of current public expenditure on basic education and teacher education? Does the expenditure lead to effective and relevant learning for teachers and learners? Are threats and opportunities to realising quality education through teacher education easily identifiable?

The starting point to answering these questions would be to look into current teacher education programmes, but also taking into consideration the contexts where they occur.

3.4.3 Regional responses to environmental challenges

The African continent is not left behind in the sustainability transformative agenda. Africa as a continent is also facing economic, social, cultural and environmental challenges. Relevant and quality education is needed to address some of these issues (UNESCO, 2015b). In 2014 the African Union (AU) released a draft of Agenda 2063, which is a plan for Africa's structural transformation. Agenda 2063 has eight priority areas which define the continental agenda. The agenda is set to be integrated into regional and national development plans. The AU vision is to ***“build an integrated, prosperous and peaceful Africa, an Africa driven and managed by its own citizens and representing a dynamic force in the international arena”*** (AU, 2015, p. 10) [emphasis in original].

A common set of seven aspirations has emerged from the converging voices of Africans of different backgrounds that paint a picture of what they desire for themselves and the African continent in the future. The first of these aspirations is a prosperous Africa based on inclusive growth and sustainable development. This aspiration recognises that a key driver of Africa's prosperity is human capital developed through quality education; accessible universally at all levels (African Union [AU], 2015).

One of the challenges that has been identified in the continent (which is a threat to quality education) is the significant shortage of qualified teachers, particularly in science, technology and mathematics, coupled with poor school facilities and lack of relevant curriculum. One of the eight priorities of Agenda 2063 is to have African citizens who are literate, creative and are able to adapt in knowledge driven communities and societies. One of the indicative strategies for progress against the above priority is to “increase the supply of qualified teachers at all levels by improving training capacity and teacher incentives to ensure that they possess the relevant knowledge, skills and attitudes and motivation to teach effectively” (AU, 2015, p. 56). It is evident that Agenda 2063 values the role of education in building sustainable societies in Africa, hence a call for a curriculum that is relevant to the needs of society and teachers who have the capacity to engage with that curriculum.

According to Lotz-Sisitka and Lupele (2017), there are intersecting social (cultural change, social justice and health risks), economic (inequality and poverty), environmental (natural

resource depletion, biodiversity loss and climate change), and political (governance, democracy and peace) issues faced by most African societies. These issues affect development on the African continent. Education for Sustainable development has the potential to address some of the challenges that are faced by the African continent. In Southern Africa, environment and sustainability education has a strong focus on political ecological perspective to address politics and social justice (ibid.). Studies done on the relationship between ESD and quality education in Southern Africa show that:

- In addition to acquiring knowledge in ESD, the strengthening of critical and reflexive engagement with concepts, knowledge and values requires participation in ESD learning processes (Lotz-Sisitka & Lupele, 2017).
- ESD can contribute in meeting both personal and societal needs while developing learners' capabilities and opportunities to engage with sustainability issues. Teachers therefore need knowledge of sustainability issues and ESD pedagogies to integrate ESD in their teaching (Shumba & Kampamba, 2017).
- To enhance educational quality and meaning to education, both sociocultural and structural dimensions need to be included in teacher education as they enable teachers to engage with regional aspects such as customs, lifestyles and values that characterise the society where ESD is taking place (Kalumba, 2017).

The South African teacher education programme, Fundisa for Change states that “we can use our imagination and problem-solving skills to creatively develop diverse solutions to our problems, and to change how we live for the better” (Fundisa for Change, 2013, p. 3). ESD creates opportunities for societies to be empowered to address societal environment and sustainability issues. The next section discusses how South Africa has responded to environment and sustainability issues.

3.4.4 South African responses to environmental challenges

Poverty, unemployment and ill health and environmental threats are some of the challenges that South Africans face. Schools are expected to respond directly to such issues and risks by providing learners with knowledge, skills and values to understand these challenges and contribute to addressing them (South Africa. DoE, 2006, p. 7). Teachers have a responsibility to foster in learners the transformation needed for a sustainable future (Bopape, 2009). Teacher education, which comprises pre- and in-service training, therefore has a critical role to play in equipping teachers to undertake this task (South Africa. DoE, 2006, p. 7).

In her Deputy Presidential speech at the 4th World Environmental Education Congress (WEEC) in Durban in 2007, Ms Mlambo-Ngcuka stated that current patterns of consumption and production were unsustainable, and indicated that humans were living beyond their means. She suggested that environmental protection is everyone's responsibility and for people across all sectors in communities to adopt new ways of living. She highlighted that education was the most fundamental and important strategy to combat environmental problems but also noted that there was a tendency to make environmental education more abstract and detached from people's reality (Mlangeni, 2007).

At the National Environmental Education Project (NEEP-GET) colloquium that was held at the Mamelodi Environmental Centre in Pretoria in 2005, the then Minister of Education, Naledi Pandor, stated that environmental education should not be viewed to be only about trees, soil, and water but that it focuses on the impact of the lifestyle choices people make and the decisions they take that affect the air we breathe and the food we eat. She added that programmes in environmental education must illustrate the direct link between human security and sustainable development. She asserted that issues of human rights should be at the core of developing such programmes. She also posited that learners and educators should understand that the expectation of engaging with environmental programmes is to change the relationship between human beings and the environment. She believed that if educators viewed environmental and social issues as curriculum opportunities, it would enable learners to develop knowledge, skills, values, and attitudes that enable learners to make different lifestyle choices (Pandor, 2005).

According to the South African National Development Plan, natural resources are degraded faster than they can regenerate. The challenge is developing policies and regulations that will sustain threatened natural resources to protect people's livelihoods (RSA, 2011a). The vision of South Africa's National Development Plan is to have an environmentally sustainable country and nation by 2030 (ibid.). The National Development Plan has a mid-term strategic framework to monitor progress towards the vision. The medium-term strategic framework recognises that South Africa is rich in natural and environmental resources and that these need to be protected to ensure sustained development and preservation of environmental diversity (RSA, 2013). South Africa has a sound environmental governance regime that is based on good science. Some of the challenges that the country faces are inadequate information systems and capacity constraints in compliance monitoring and enforcement (ibid.). This is disappointing considering that the country has emphasised environmental concerns in policy documents such

as the Reconstruction and Development Programme (RSA, 1994), the South African Constitution (RSA, 1996), The 1998 Environmental Management Act (RSA, 1998), the National Development Plan mentioned above (RSA, 2011a) and the National Climate Change Response White Paper (RSA, 2011b).

The Reconstruction and Development Programme policy emerged as a response to the realisation that South Africa was confronted by serious economic, social, political, moral, cultural and environmental problems (RSA, 1994). The policy placed ‘environment’ as one of the basic needs. The 1998 Environmental Management Act (known as NEMA) emerged from a realisation that democracy and good governance can only be achieved through a sound socio-economic framework that is environmentally sustainable. One of the goals of the policy is to promote the education and empowerment of South Africans people by increasing their awareness of, and concern for, environmental issues, and assisting in developing the knowledge, skills, values, and commitment necessary to achieve sustainable development (RSA, 1998). It is believed that only when citizens are aware of environmental issues and how to address them that they can protect the right to an environment that is not harmful to their health and well-being as envisaged in the 1996 South African Constitution (RSA, 1996).

In South Africa, the policies mentioned above have influenced the integration of environmental education in education and training programmes. The 1995 White Paper called for the integration of environmental education in formal education at all levels (see also section 1.4.1). The Reconstruction and Development Programme (RSA, 1994) proposed that the reconstruction of education and training required a body of teachers, educators and trainers who are committed to sustainable development.

The UNESCO call to reorient (see section 3.4.1.) teacher training was particularly important for South Africa as the country had already integrated environmental education in the national school curriculum. As a signatory to international conventions on Environment for Sustainable Development, South Africa is committed to addressing environmental concerns through education. This is evident in the 1995 White Paper on Education and Training and the 1998 Environmental Management Act. The 1998 Environmental Management Act expects the education and training sector to:

- Integrate environmental education in all programmes, levels, curricula and disciplines of formal and non-formal education and in the National Qualification Framework;

- Integrate environmental education into all training and unemployment relief programmes;
- Enhance environmental literacy through the use of all forms of media;
- Ensure that environmental education programmes and projects foster a clear understanding of the inter-relationship between economic, social, cultural, environmental and political issues in local, national and global spheres. (RSA, 1998, p. 36).

The South African national school curriculum has integrated environmental and sustainability concepts and these are specified in the subject specific curriculum documents, are assessed and evident in school textbooks (see section 1.4.1). The school curriculum should thus influence the nature, content and pedagogy of teacher education if it aims to support and prepare teachers for the schooling system. The integration of ESD into school curricula will not be sustained and implemented unless it is coupled with appropriate changes in teacher education curricula (Ravindranath, 2007). It has been noted that both nationally and internationally governments tend to neglect teacher educators in professional development initiatives oriented towards educational improvement: this also extends to ESD. This results in teacher educators continuing to work with poor understandings of how to improve educational quality in schools; and consequently has a negative knock-on effect on schooling (Lotz-Sisitka, 2012/2013). Furthermore, it has been argued that commitments to free, accessible and compulsory education for all are silent on the provision of quality teacher education to ensure quality basic education (Sanyal, 2013). Educational quality is one of the 17 Sustainable Development Goals.

It is quite encouraging to note that the Minister of Basic Education in South Africa, Motshekga, mentioned in her speech delivered at the release of National Senior Certificate examination results on 4 January 2017, that as a country we need to be cognisant of the global education agenda, the UNESCO Education Agenda 2030, which is part of the 17 UNESCO Sustainable Development Goals. She further stated that the National Senior Certificate examination results are one of the barometers that can evaluate progress made by the South African government in relation to the UNESCO Sustainable Development Goal 4, the Continental Education Strategy for Africa on the African Agenda 2063, the National Development Plan Vision 2030, and the DBE's *Action Plan 2019: Towards Schooling 2030* (Motshekga, 2017).

Education for Sustainable Development (ESD) in South Africa is used interchangeably with environmental education (EE) because the society-economy-environment-politics nexus that

underpins ESD has always shaped how South Africa engaged with EE (Lotz-Sisitka, 2011). An emerging concept in Southern Africa is Environment and Sustainability Education (ESE) which denotes a focus on the interrelated nature of environmental, societal, political, and economic concerns for the common good (Mandikonga & Lotz-Sisitka, 2016).

Over the years, South Africa has shown its commitment to developing environmentally literate citizens by integrating environmental content knowledge and sustainability concepts into the national school curriculum. Additionally, there have been initiatives over the years that have been supported by the Department of Basic Education. The initiatives were to assist teachers and subject education specialists in interpreting and implementing environmental education in schools. Two of these initiatives came at a time when there were education reforms in South Africa. The *Learning for Sustainability* project was piloted during the implementation of Curriculum 2005 and the National Environmental Education Programme in the General Education and Training (NEEP-GET) band (grades R – 9) was introduced when the Revised National Curriculum Statement was being implemented. The section below gives an overview of the two programmes. The conceptualisation of the Fundisa for Change programme was influenced by insights that were gained from the *Learning for Sustainability* project and the NEEP-GET project. It is important to note also that some of the partners who were involved in the two initiatives are active partners of the Fundisa for Change programme.

3.4.4.1 Learning for Sustainability project

The Learning for Sustainability was a teacher professional development pilot project that was implemented in Mpumalanga and Gauteng province from 1997 – 2000. The project was funded by the Danish Ministry in partnership with the South African Ministry of Education. The conceptualisation of the project was informed by ideas of learner-centredness, constructivism, critical pedagogy and reflective practitioners (Janse van Rensburg, 2000). The project was also conceptualised to be environmentally oriented and contextually relevant at local level within an outcomes-based framework (Lotz-Sisitka & Olivier, 2000). Most of the participants in the pilot had no background in environmental education when issues of environmental sustainability were introduced to them (Janse van Rensburg, 2000).

The aim of the project was to integrate environmental education and the notion of sustainability in the national school curriculum through an integrated approach to teacher professional development, curriculum development and resource material development. The project staff worked in close collaboration with subject education specialists in Mpumalanga and Gauteng.

Project activities consisted of regular meeting between project staff members, subject education specialists and teachers, creating district clusters. The meetings took place over a period of three years. During these meeting teachers explored environmental issues in a range of teaching and learning activities using related resource materials. Teachers were expected to design lesson plans they would use in their classes to introduce learners to local issues affecting environmental sustainability. Teachers implemented the lessons in their classes and discussed their lesson reflections in their clusters. They also used reflective journals to reflect on their learning journey during the project implementation (Janse van Rensburg, 2000).

According to Janse van Rensburg and Mhoney (2000), the professional development process was participatory with a focus on moving teachers from a content-centred approach to teaching to an outcomes-based approach which was the framework for Curriculum 2005. It also supported teachers in processes of action reflections and action research. A spiral model (see Figure 1.3) was used to develop teachers professionally. This approach to professional development was a response to critiques on the inadequacy of a once-off, cascade model of transferring curriculum reform in preparing teachers to implement a new curriculum (Du Toit & Sguazzin, 2000). The spiral model emphasised open-endedness, continuity and process in professional development (see Figure 1.3). The spiral model is based on extended cluster-based training and close interaction between classroom practice and reflection-on-practice in regular professional development sessions (Janse van Rensburg & Mhoney, 2000).

Professional development within the spiral model was viewed as a process that enabled teachers to gain a better understanding of their professional practice and to reflect on it in light of curriculum policy, over extended periods of time. The spiral model also allowed for continuity within a peer-support network (Du Toit & Sguazzin, 2000).

The following are key features of the spiral model:

- Contextualisation: Taking into account social, educational and environmental contexts in which professional development occurs;
- Active participation by teachers in clusters (during session) and individual activities (in the classroom);
- Constant dialogue amongst participants to understand concepts and to grapple with new knowledge, professional issues and classroom practice;
- Participant reflexivity, reflecting critically on previous actions to do better;

- Integration of theory and practice to refine and build competences in the context in which they will be used through discussion and practical implementation;
- Flexibility to respond to needs as they arise (cluster and individual needs);
- Democracy that enables teachers to take responsibility for their own learning processes;
- Socially constructive orientation for a critical orientation to learning processes in a particular context;
- Development of meaning that is appropriate, relevant and contextually situated; and
- Mediation of continuous, life-long learning. (Du Toit & Sguazzin, 2000, pp. 24-25)

Despite all the effort in the project to enable teachers to integrate environmental education in teaching and learning, teachers' exploration of environmental issues in class was superficial (Lotz-Sisitka, 2002; Ramsarup, 2005). This indicated that although teachers engaged with a holistic view of environment (social, economic, political and the biophysical), there was a lack of clarity on how to explore environmental issues within the subjects they taught (Janse van Rensburg & Lotz, 1999; Lotz-Sisitka & Olivier, 2000; Ramsarup, 2005).

It was therefore recommended that professional development in environmental education should enable:

- An understanding of environment and context and related key concepts;
- Capacity to critically reflect on and apply environmental education processes integral in various subjects in response to environmental issues;
- Pedagogical interpretation of critical outcomes as environmental education processes in subjects;
- Knowledge of content, pedagogy and competence to relate subject knowledge and pedagogy to environmental issues and risks in local settings;
- Sourcing, accessing and use of appropriate resource materials in curriculum development activities at local level;
- Capacity to interpret curriculum policy documents and draw on these to develop lesson plans and materials;
- Capacity to develop and implement assessment processes to determine learning arising from environmental processes; and
- Develop lesson plans that enable learners to use knowledge gained to undertake investigation and take action to respond to local environmental issues and risks. (Lotz-Sisitka and Olivier, 2000, p. 99)

Lesson learned from piloting the *Learning for Sustainability* project in the two provinces, Mpumalanga and Gauteng, informed the national scaling up of professional development in environmental education in the National Environmental Education Programme in the General Education and Training band (NEEP-GET) project that was launched in 2001 by the then Minister of Education, Professor Kader Asmal.

3.4.4.2 National Environmental Education Programme for General Education and Training (NEEP-GET)

In preparation for the national rollout of the NEEP-GET in 2001, a pilot project was run between August and December 2000 in six provinces. Data generated prior to the pilot from school profiles showed that there was an uneven incorporation of environmental education activities in different schools (Lotz-Sisitka & Raven, 2001).

Some of the recommendations from the pilot were:

- The NEEP-GET should find ways of enabling provincial subject education specialists to make partnerships with environmental education practitioners to further the aims of environmental learning.
- The programme should enable teachers to integrate environmental curriculum activities in the subjects to avoid NEEP-GET activities being viewed as an ‘add-on’.
- Learning support materials developed should provide opportunities for teachers to select and adapt them in context.
- Materials should interpret curriculum policy framework, provide pedagogical guidance, provide conceptual and content knowledge as well as support learning in the classroom.
- A collaborative and partnership approach in working with subject education specialists should be adopted to provide the needed support and lessen the pressure of work overload.
- Professional development activities should be aligned with curriculum policies and provincial policies to avoid ‘mixed messages’.
- National initiatives should work with the support of and/or in partnership with provincial departments for easy access and orientation.

The findings and recommendations from the NEEP-GET pilot provided insights for national rollout of the NEEP-GET project.

The NEEP-GET project was established to support the integration of environmental learning in the South African curriculum (NEEP-GET, 2004). The NEEP-GET was a curriculum project that was located within the Schooling Directorate (Lotz-Sisitka, 2004). The NEEP-GET project built on previous initiatives;

- Environmental Education Policy Initiative (EEPI) which was active in advocating for the integration of environmental education in policy in the 1995 White Paper on Education and Training;
- Environmental Education Curriculum Initiative (EECI) which contributed to the inclusion of environmental into the national school curriculum as a phase organiser in Curriculum 2005);
- Learning for Sustainability (see section 3.4.4.1); and
- NEEP-GET pilot (Lotz-Sisitka, 2004).

One of the objectives of the project was to support the professional development of teachers in planning for and implementing environment lessons in the classroom as well as support subject education specialists in their work of supporting teachers with curriculum implementation for a period of four years. A cluster and process-based approach within a spiral model was used in the professional development process (NEEP-GET, 2004). One of the features of the project was the creating of a learning space for teachers and subject education specialists (NEEP-GET, 2005). The clusters met regularly to share ideas, perspectives and experiences related to curriculum implementation and professional development. There were teacher clusters, subject education specialists' clusters and a cluster of the mix of these two groups (NEEP-GET, 2004). The spiral model provided a balance for structure and flexibility to respond to local contexts.

The project contributed to the implementation of environmental education in curriculum policy development, materials development, professional development and school-based implementation. The project was also instrumental in facilitating co-operation amongst different school-based environmental education initiatives in South Africa (Lotz-Sisitka & Raven, 2001).

The approach and strategy used by the project was an active learning framework in OBE, resource-based learning, contextual learning and working with learning theories. The project was implemented in eight of the nine South African provinces; logistical issues resulted in Limpopo missing out on implementation of the project (NEEP-GET, 2005). The project played out differently in the eight provinces due to contextual factors (Lotz-Sisitka, 2004).

The table below summarises some of the NEEP-GET project outputs, main achievements, challenges and recommendations.

Table 3.1 NEEP-GET project outputs, achievements, challenges and recommendation (NEEP-GET, 2005)

Outputs	Main achievements	Main challenges	Recommendations
Undertaking initiatives to integrate environmental learning in the GET band curriculum	Contributed to inclusion of environmental education as an underpinning principle of the curriculum that emphasised the relationship between human rights, social justice, inclusivity and a healthy environment.	There was little evidence that indicated that educators involved in the project gained a good understanding of the environmental focus in each subject.	Effort should be on strengthening interpretation and understanding of environmental focus in the different subjects.
Implementation of professional development to enable integration of environmental learning	An in-depth knowledge of curriculum issues and processes and of environmental learning (knowledge of environmental issues and issues-based approaches to teaching and learning).	Sustainability of the provincial co-ordination functions for environmental learning within the provincial education department.	A need for a sustainability strategy plan to be developed to ensure sustainability once an initiative has been established.
Development of production of guideline documents and resource materials to support integration of environmental learning	A number of documents were produced to strengthen interpretations of environmental in the curriculum, support professional development, strengthen and support partnerships.	Vigilance on quality assurance, editorial changes and production timing of materials.	Curriculum interpretation guideline documents to be pro-actively and strategically used to strengthen a more in-depth understanding of the environmental focus in the subjects in subject committee contexts and in teacher development programmes and initiatives.
Influence pre-service teacher education regarding environmental learning	The four main universities (Rhodes, UNISA, Stellenbosch and University of Venda) that were involved in the provision of environmental education in teacher education were involved in the formative monitoring and evaluation of the project and this process led to a transfer of learning into the institutions.	This output was neglected in the project and the strategy of involving universities mainly in the formative monitoring and evaluation of the project was not adequate to influence pre-service teacher education.	The project guideline documents and the outputs of the project should be shared with all Higher Education Institutions (HEIs) so they can be integrated into HEI programmes where possible.

At the National Environmental Education Project (NEEP-GET) colloquium that was held at the Mamelodi Environmental Centre in Pretoria in 2005, Pandor commended the NEEP-GET project for creating a learning space for the empowerment of officials who would provide professional confidence in teachers to be key agents in improving teaching and learning in the country. She also noted that no amount of quality school facilities and excellent learning materials would achieve the kind of learning the country desires without empowered teachers (Pandor, 2005).

Findings from the NEEP-GET project highlighted the inadequate attention that was given to institutions of higher education offering teacher education in the NEEP-GET programme. This finding and recommendations shaped the emergence of the Fundisa for Change programme theory and structure.

3.5. Conclusion

This chapter has explored global and national perspectives on professional development. It also discussed international imperatives that have influenced South Africa's professional development approaches to environmental education through a brief summary of some of the national initiatives that have been implemented in the country to strengthen environmental learning in the schooling system.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter discusses the research design decisions that were made to guide a theory-based evaluation of a national professional development programme. It also gives an explanation and justification of the process used to generate the data to answer the research questions and to address the goals of the study. The chapter further provides a discussion on the analysis of the data and concludes with a discussion about ethical issues, validity and trustworthiness of the findings.

4.2 Research design

According to Maxwell (2012), research design is a real phenomenon due to the natural setting and actual interactions that may alter the enactment of research from the proposed design. The presence of a researcher in an actual setting may have unintended consequences for what participants do, thus affecting what is generated. A researcher is affected by and affects a setting, thus changing its nature (Merriam, 2009). As noted in Chapter One (see section 1.7), during the generation of the data, I was the national co-ordinator of the Fundisa for Change Programme. Due to this position, I already had a relationship with most of the Fundisa for Change facilitators prior to my observation of the implementation of the programme and they were aware of my dual purpose for attending the training sessions. My presence at the training venues was two- fold: firstly, as a national co-ordinator of the programme, I attended training sessions for monitoring and evaluation purposes; secondly as a researcher I was generating data for this study, which forms part of the broader body of evaluation research in the Fundisa for Change programme.

The study was designed as a qualitative case study inquiry, the case being the Fundisa for Change programme. A qualitative study, according to Patton (2002), is conducted in a context-specific setting. The researcher studies the phenomenon of interest in context. Context in this study was multi-faceted as I had to consider the context of the Fundisa for Change programme within an educational and political and socio-ecological landscape as well as the context of the facilitators and programme beneficiaries. Qualitative research takes into consideration a range

of contextual factors (social, institutional, and environmental conditions) that may influence human experiences (Yin, 2011).

In qualitative research, people tend to act in their everyday roles and express themselves through action and speech. What emerges from what people say and do can represent the meanings they give to real-life events as they experience them (Yin, 2011). Danermark, Ekstrom, Jakobsen and Karlsson (2002) posited that society is composed of thinking and reflecting people who are continually changing their social reality, and as social science researchers we engage in what is called double hermeneutics when we interpret people's interpretations of their social world.

This study followed an explanatory design; explanatory because it is primarily concerned with surfacing and testing a theory of change for a programme (Robson, 2011). The aim is to identify what mechanisms are triggered in a particular context to produce professional development course outcomes observed. It is to identify the conditions that are necessary to activate mechanisms that lead to achievement of programme outcomes. In evaluating the Fundisa for Change professional development course, the first phase was to surface the professional development course's initial theory of change (see section 7.2), comprised of the implementation theory and the programme theory (see Figure 7.1). The initial theory of change for the Fundisa for Change professional development course was constructed from content analysis of the Fundisa for Change documents which were developed prior to this study being conducted. Additional data was generated from interviewing key stakeholders that were involved in the conceptualisation of the Fundisa for Change programme. The interviews were conducted to determine stakeholders' perceptions of the theory of change that underpinned the Fundisa for Change professional development component of the programme. A CMO configuration was used to surface the initial programme theory for the Fundisa for Change professional development course (see Table 7.1). Observations were also conducted to observe and test the initial programme theory against how the programme was implemented in five sites. The actions of programme facilitators and programme beneficiaries during the implementation of the professional development provided insights into their interpretation of the professional development course's programme theory.

As described in detail in Chapter Two, programme-based qualitative evaluation research seeks explanations of what the programme is doing, why it follows the course that it does, how

recipients respond, and why they act in the ways that they do. A qualitative evaluation inquiry allows the researcher to be close to the setting to see what is going on and allows for identification of discrepancies between the articulated programme theories of change and the actions and programme mechanisms that are visible in programme implementation (Weiss, 1998). As argued in Chapter Two, there is therefore a need to transcend common sense to get a deeper understanding and explanation of the meaning of actions and events for people (Danermark et al., 2002).

Sayer (2000) argued that “realists reject cookbook prescriptions of method which allow one to imagine that one can do research by simply applying them without having a scholarly knowledge of the object of study in question” (p. 19). All the choices made for data generation were informed by the research questions and the kind of data I needed to answer research questions. The table below shows the type of data generated.

Table 4.1 Type of data generated

Type of data	Form of data	Data generated for Fundisa for Change Monitoring and Evaluation	Additional data generated for research study	Data incorporated into research study
Qualitative	Demographic data of participants	yes	no	yes
	Demographic data of facilitators	no	yes	yes
	Record of attendance	yes	no	yes
	Focus group interview with key partners	no	yes	yes
	Individual interview with key partners	no	yes	yes
	Participants' interview	no	yes	yes
	Analysis of Fundisa for Change documents	no	yes	yes
	Analysis of observation data from implementation of training programme	yes	no	yes
	Analysis of participant's work	yes	yes	yes
	Analysis of participant questionnaires	yes	no	yes

(Adapted from Raymond, 2016)

4.3 A realist case study

In realist case study research, an event or phenomenon is described before it is explained. Emphasis is on the description of what is happening in a programme before explaining the mechanisms that have led to its occurrence. It also rests on the assumption that there are underlying mechanisms to what is observed and this consequently demands an in-depth enquiry into the empirical (Chadderton & Torrance, 2011) to surface underlying mechanisms. Gummesson (2000) stated that the case study can be used to access complex realities under the surface. He also believed that a case study is an appropriate approach for generating a programme theory to initiate change. Stake (1995) believed that all evaluation studies are case studies, while Robson (2011) claimed all programmes are case studies because they occur at a particular time, place and with particular people. Simons (2015) believed that the strength of case study is on its ability to get insights into the particular.

Patton (2002, p. 55) noted that:

Case studies are particularly valuable in programme evaluation when the programme is individualised, so that the evaluation needs to be attentive to and capture individual differences among participants, diverse experiences of the programme, or unique variations from one programme setting to another. Regardless of the unit of analysis, a qualitative case study seeks to describe that unit in depth and detail, holistically, and in context.

The Fundisa for Change professional development course is a single unit that is implemented in diverse contexts with diverse stakeholders. Yin (2013) argued that a case should not be studied in isolation from its context. Yin stated that a major challenge in case study is when an evaluation is required to play an explanatory role (*ibid.*). In evaluating the Fundisa for Change professional development course, the focus was on what works for whom and under what circumstances. Yin (2013) explained that when a case study evaluation takes on an explanatory role, outcomes need to be documented and interpreted and an explanation of how the outcomes came about need to be given. This requires an in-depth enquiry into the context of implementation, what was brought into the context and what was observed.

I used a variety of sources of evidence to provide a thick description of the Fundisa for Change programme: documents, observation, questionnaires and interviews to provide context for the programme.

Flyvbjerg (2011) argued that when a researcher chooses to do a case study, the choice is not methodological but rather a choice about what to study. He stated that a unit of study becomes a case when boundaries have been demarcated. He further argued that a case study inquiry is an intensive approach that is characterised by depth, detail, richness, completeness and variance. Additionally, case studies evolve in time and focus on context. The researcher sets the boundary by choosing what will count as a case and what will be the context of the case. For this study, the broad Fundisa for Change programme is the context and the case is the professional development component of the Fundisa for Change programme.

As noted in Chapter One, the focus of this study was to understand training programme activities within specific contexts and sites, as the programme was implemented in different provinces with different participants. The study thus details the interaction of a programme with its contexts (Yin, 2013). Moreover, Born (2015) argued that a case study approach enables a researcher to understand the interplay between contextual factors and complex initiatives. Yin (2009) added that a case study is an appropriate methodological choice when the boundaries between phenomenon and context are not clearly defined.

The evaluation of the Fundisa for Change professional development course is an instrumental, intrinsic and bounded case study (Merriam, 2009; Stake 1995). The multiple-case study is instrumental in understanding the CMO configurations influencing the impact of the Fundisa for Change professional development course but also intrinsic for the understanding of the Fundisa for Change professional development course itself (Edwards, 2011).

Multiple, embedded cases (see Figure 4.1) were selected to widen the potential scope and significance of the findings, and to generate more CMO configurations for the refinement of the initial CMO configuration.

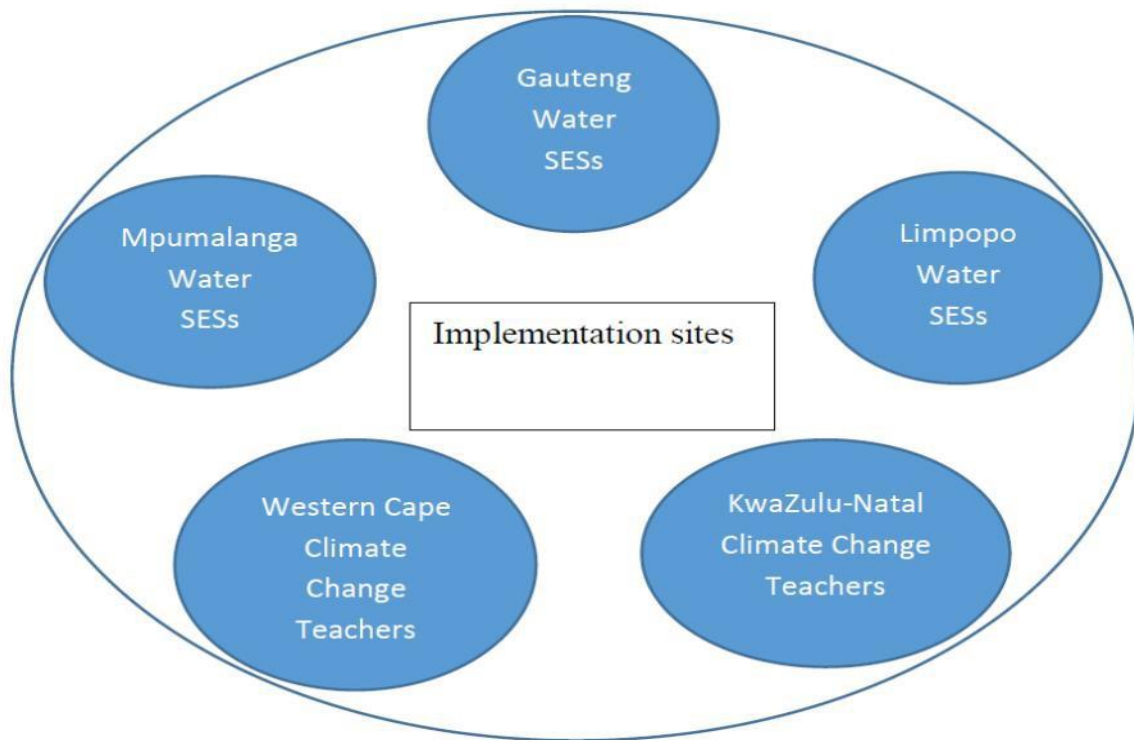


Figure 4.1 Provincial training sites

The unit of analysis is the Fundisa for Change professional development course and its implementation in multiple sites. It is instrumental as insights gained will inform the design and evaluation of other professional development programmes. Additionally, a theory of what works for whom and under what conditions may be transferrable to other programmes and contexts.

Conclusions drawn from each case produced cumulative knowledge that was used to generate a general programme theory for the Fundisa for Change professional development course. Cumulative knowledge about what works for who under what conditions is what can potentially be transferred to other teacher professional development programmes.

Flyvbjerg (2001) discussed five misunderstandings of the case-based method. These five misunderstandings are discussed below in relation to a realist evaluation approach to case study research (adapted from Edwards, 2011).

- *Misunderstanding 1.* General, theoretical (context-independent) knowledge is more valuable than concrete, practical (context-dependent) knowledge.

In realist evaluation, context is valuable as data without a description of the context would not explain why certain generative mechanisms work or not in a programme to produce experienced outcomes. The CMO configurations are based on the principle that outcomes are generated when underlying causal mechanisms operate in a specific context.

- *Misunderstanding 2.* One cannot generalise on the basis of an individual case; therefore, the case study cannot contribute to scientific development.

According to Pawson and Tilley (1997),

In order to generalize, in order to create transferable lessons about programs, we need to get away from such day-to-day specifics. Generalization is not a matter of understanding the *typicality* of a program in terms of its routine conduct. Rather the process of generalization is essentially one of *abstraction*. We move from one case to another, not because *they* are descriptively similar, but because we have ideas that can encompass them both. (p. 119)

The focus is therefore not on ‘descriptive particulars’ of any individual programme but rather on transferring lessons about programmes (Pawson & Tilley, 1997).

- *Misunderstanding 3.* The case study is most useful for generating hypotheses; that is, in the first stage of a total research process, while other methods are more suitable for hypotheses testing and theory building.

In realist evaluation, the evaluation cycle starts with abstracting a theory from literature then hypothesising on what might work for whom in what circumstances. This is followed by testing the hypothesis through data generation. Data is generated to see if the theory is accepted or rejected. This leads to theory modification and refinement. Theories are built from previous findings to inform future evaluations.

- *Misunderstanding 4.* The case study contains a bias toward verification, that is, a tendency to confirm the researcher’s preconceived notions.

Theory-based evaluations engage in surfacing underlying mechanisms and this demands that researchers engage in in-depth enquiry of the empirical in order to surface the underlying mechanisms (Chadderton & Torrance, 2011). In a realist evaluation, outcomes are dependent on the context and mechanisms that are triggered. It would be difficult for a researcher to predict what would happen before they understood the context. They would not be able to know what would work for who in which conditions without engaging with the circumstances of a case.

- *Misunderstanding 5.* It is often difficult to develop general propositions and theories on the basis of specific case studies.

Realist evaluators accumulate knowledge through abstraction, which;

is a process in which we move from one specific empirical case to a general theory and back to another case and so on. What are transferable between cases are not lumps of data but sets of ideas. The process works through the development of a body of theory which provides an *organizing framework* which ‘abstracts’ from a program a set of essential conditions which make sense of one case after another. (Pawson & Tilley, 1997, p. 120)

The focus is therefore on transferring general theories that may be of relevance to other programmes.

4.4 Study site

Maxwell (2012) believed that the goal of most qualitative studies “is to understand the process, meanings, and local contextual influences involved in the phenomena of interest” (p. 94). Qualitative data generation methods were used in each site. Each site in the Fundisa for Change programme was a ‘complete’ study’ in that a CMO configuration was developed for each site to inform the development of the Fundisa for Change CMO configuration (Yin, 2009) (see Chapter Seven).

Maxwell (2012) stated that in making a selection, a researcher identifies settings and participants that firstly exhibit the phenomena of interest. Secondly, the setting and participants should be accessible and conducive to providing insights on what a researcher seeks to understand.

Relevant participants for interviews were purposefully selected (see section 4.5.5). In selecting participants, I identified all the stakeholders involved in the Fundisa for Change programme that would be able shed light into the what, how and why of the programme. This included identifying those who were involved when the programme was conceptualised and developed in order to understand the origins and development of programme activities. Key stakeholders included those who had a broader overview of the strategic and operational components of the programme, as well as those in the forefront of implementation, e.g. programme facilitators and programme training material developers. Cohen, Manion and Morrison (2011) stated that this kind of sampling is used to access people who have experience, expertise and in-depth knowledge about particular issues. Programme participants were also interviewed (see section 4.6.5).

Convenience sampling was used to select study sites (Cohen et al., 2011). The sites were readily accessible for data generating as Fundisa for Change training in these sites occurred during the data generation phase. As the Fundisa for Change programme co-ordinator at the time of data generation, I visited most of the sites. For data generation, I chose sites where I was a non-participant observer. At other Fundisa for Change implementing sites, I facilitated some of the sessions. Data for the study was therefore generated in five provinces. The aim of generating data in different contexts was to understand what was working in each site within pre-existing systems and what was brought into the sites.

The implementation of the training was observed in five diverse case study sites. The diversity of cases is defined based on the diversity of the Fundisa for Change implementing partners; diverse institutional contexts; diverse subject topic interests and levels; diverse geo-physical and socio-cultural/ social-ecological contexts. In choosing diverse contexts, I wanted to determine the influence of context on programme outcomes.

The table below provides brief details of the sites.

Table 4.2 Data generation sites

Site	Date of training	Module	Number of participants
Gauteng	22 – 26 September & 22 October 2014 (5 days)	Water – Intermediate and senior phase Social Sciences	14 Social Sciences senior education specialists (SES)
Limpopo	9 – 11 February 2015 9 – 10 March 2015 (5 days)	Water – Intermediate and senior phase Social Sciences	27 senior education specialists (SES)
Mpumalanga	16 – 19 February 2015 6 May 2015 (5 days)	Water – Intermediate and senior phase	15 Social Sciences senior education specialists (SES)
Western Cape	8 – 10 July 2015 (3 days) and one day follow-up cluster district visit	Climate Change Further Education and training phase (FET)	24 Geography teachers
KwaZulu-Natal	18 – 20 July 2015 (3 days) and one day follow-up site visit	Climate Change Senior phase Natural Sciences	19 Natural Sciences teachers

The thematic training focus in three of the five sites was on teaching water in Social Sciences. Participants in the three sites were subject education specialists in the intermediate and senior phase. Senior education specialists (SEs) are office-based educators who support the implementation of the curriculum in schools. At these three sites, participants did the same work of supporting Social Sciences teachers. They had varying work experience (discussed in Chapter Six). The lead facilitator in the three sites was a Fundisa for Change partner from the environmental sector with colleagues in the environmental education sector and partners in institutions of higher education.). Observing three sites could show what the necessary conditions were that enabled programme outcomes to be achieved and also what contingent conditions were required per site based on context (discussed in Chapter Seven).

The two other sites focused on climate change in Geography and Natural Sciences. Lead facilitators in both sites were Fundisa for Change partners in institutions of higher education. Participants were Geography teachers in one site and Natural Sciences teachers in the other site. The last two sites had classroom Geography teachers at the FET phase (grades 10 - 12) in one site and at senior phase Natural Sciences teachers (grades 7 - 9) in the other site. It was discovered during data generation that some of the participants at the KwaZulu-Natal site were foundation and intermediate teachers who did not teach Natural Sciences. Each site is described in detail in Chapter Six.

It was not up to the Fundisa for Change partners to decide the focus of the training or which participants were to be trained. This was negotiated with the provincial Department of Basic Education. Provinces made official request to the Fundisa for Change programme based on their needs. Other requests came from the Fundisa for Change partners who supported schools and teachers with environmental learning curriculum support (see Chapter Six).

4.5 Data generation and management

According to Patton (2002), a qualitative inquiry is best answered through in-depth, open-ended interviews, direct field observation and document analysis. He argued that these methods capture and provide insight into what happened and report the experiences of the participants. Patton (1990) noted that the use of multiple sources of information increases validity of conclusion drawn in a study as the strengths of one approach can complement the weaknesses of another.

The choice of data generation tools used in this study was informed by the study's research goals and research questions.

4.5.1 Document analysis

Some of the documents that were analysed existed before data on the Fundisa for Change programme was generated for the study, while others were produced during programme implementation (see Table 4.3). Documents that were used to generate data included official programme documents produced during the conceptualisation of the Fundisa for Change programme, for example, meeting minutes, proposals and business plans. Some of the documents were produced as outcomes of strategic programme activities, for example, implementation plan, action plans, while the rest were produced during programme implementation, for example, evaluation questionnaires and participants' work.

Documents not produced for research purposes can also provide insights that are relevant to a study (Merriam, 2009). This was the case in this study as these kinds of documents were used to surface a theory of change for the Fundisa for Change professional development course. There was no difficulty in accessing the documents mentioned above but I had to request permission to include them in the study. Most of the other documents were external documents that were shared with the Fundisa for Change partners, programme funders and programme beneficiaries. Some of them (generic training modules) are in the public domain on the Fundisa for Change website while subject specific modules are only shared with Fundisa for Change partners and training participants.

Documents are primary sources that are useful in qualitative research because of the nature of the data they contain (Yin, 2011). Some of the strengths of using documents are that they are unobtrusive and can be used repeatedly; they can corroborate and augment evidence from other sources. But they may also reflect authors' bias (Yin, 2014). I did not detect any bias in the documents I analysed.

Researchers use documents to get insights into the history of a programme, programme activities, systems, processes and activities. Programme documents are therefore important sources of information that give researchers information about a programme that could be used during interviews and programme activity observation. Programme documents provide "the trail of paper that the evaluator can follow and use to increase knowledge and understanding" about a programme being evaluated (Patton, 2002, p. 233). Additionally, document review provides access to information about a programme that is not directly observable or readily available. Data generated from documents can be used to triangulate data from interviews and observation (ibid.). Documents that were included in the study were chosen because they would provide a picture of the programme and would be used to surface the theory that underpins Fundisa for Change training programme systems and processes. The table below (Table 4.3) shows the Fundisa for Change documents that were analysed.

Table 4.3 Fundisa for Change documents that were analysed

Documents analysed	Purpose of the analysis
<i>Programme planning materials</i> • Programme meeting minutes (meeting held in 2010) • Business plan • Implementation plan • Partnership protocol • Conference concept note	• To get a sense of the thoughts and ideas that led to the development of the Fundisa for Change training programme • To understand the systems and processes that occurred during the development of the Fundisa for Change training programme • To understand what the Fundisa for Change training programme wants to achieve and how they plan to achieve training programme objectives • To get insights into how the partners in the training programme work together • To surface the Fundisa for Change training programme's theory of change

<i>Programme training materials</i> • Fundisa approach to accreditation • Introductory core text • Methods and processes • Active teaching and learning • Water training module • Climate Change water module • Other resources brought by facilitators	• To understand what the training component of the Fundisa for Change programme wants to achieve in the professional development of educators • To understand the framework of the training programme • To get a sense of what the programme prioritises in developing educators • To see what facilitators view as important in professional development
<i>Facilitator training reports and reflections</i>	• To see what facilitators say about how participants engage with the Fundisa for Change programme
<i>Participants' work</i> • Portfolio of Evidence • Individual and group work tasks	• To get insights into the training session outcomes and what participants achieved

4.5.2 Questionnaires

The Fundisa for Change programme ran a ‘Training of Trainers’ workshop in May 2014 for Fundisa for Change partners. The questionnaires (Appendix 3) were given to the partners after three days of training. A total of 19 questionnaires were received from trainers and analysed.

Additionally, at the end of every Fundisa for Change training session, participants completed a questionnaire to evaluate the training session. The questionnaires were semi-structured, with a clear structure, focus and sequence with spaces to allow participants to add comments and respond to open-ended questions in a way they think best (Appendices 3 and 4). Although the questionnaires set the agenda, they did not presuppose the nature of the response (Cohen et al., 2011). Questionnaires were analysed to generate data on programme participants’ experiences of the training session and to determine outcomes for participants.

At each site, time was set aside on the last day of the training for participants to complete the questionnaire. This ensured that there would be a higher rate of return of the questionnaires. This seemed to work in most of the sites. The table below show the statistics on the return of the questionnaires.

Table 4.4 Number of questionnaires given, returned and analysed

Site	Questionnaires issued	Questionnaires returned and analysed	Percentage return
Gauteng	14	8	57%
Limpopo	27	24	89%
Mpumalanga	15	15	100%
Western Cape	24	18	75%
KwaZulu-Natal	19	19	100%

In all the sites, the questionnaire was not ‘talked through’ with the participants but in all the sites it was given to participants on the first day of training. Participants were asked to read the questionnaire to familiarise themselves with what they would be asked to reflect on at the end of the training session. This provided participants with an opportunity to ask questions of clarification about the questionnaire during the course of the training session.

Although each participant completed the questionnaire individually, the participants completed the questionnaire within the group setting. I observed that some participants spoke amongst themselves as they completed the questionnaire. I also noticed that some of the responses were identical and this could be because of the influence of others from the discussions they were

having during the completion of the questionnaire.

Another aspect is that participants were at different points in their lives in terms of work experience; therefore, their responses would reflect where they were in their careers and what they prioritised.

The questionnaires were quite lengthy. Teachers' questionnaires were six pages (appendix 4) and the subject education specialist questionnaire was four pages (appendix 3). Completing it as a last activity on the last day of training may have been off-putting for some of the participants although time was set aside for this. They all seemed to be in a rush to get going and this was common in all the sites. It is possible that participants rushed to complete the questionnaire without fully considering their responses.

The questionnaire had three parts. This was preceded by a statement that informs participants that the data generated would be used to improve the programme and that the reporting of the data would be aggregated and anonymous. Participant confidentiality was assured although they were requested to fill in their personal details (name and contact number). Part 1 of the questionnaire focused on participant personal profiles, that is, demographic background and work experience. Part 2 focused on participants' responses to the training and the last and third part focused on the applicability of the training to participants' work contexts. Most of the questions were multiple choice questions; some required participants to rate statements about the training. There were a few questions that required participants to elaborate on their responses or to reflect on their experiences, for example, reasons for attending the training, what more they would like to see in the training, what stood out for them and how the programme could be improved. Data generated was limited in terms of richness as there were only a few open-ended questions.

The questionnaires were not developed for this study but to provide data for the programme for their monitoring and evaluation systems. Items on the questionnaires were crafted to meet the needs of the programme and not to respond to the study's research questions. Despite this, data was elicited from the rating scales in the questionnaire to see what different programme mechanisms were useful in supporting programme outcomes.

The last page of the questionnaire invited participants to comment on any aspect of the training. This would allow participants to comment on things that may not have been captured in the questionnaire. At the end of the questionnaire, participants were thanked for their input.

Due to the limited data generated from the questionnaire, other data generating tools were required for more depth in response to the research questions and to develop the CMO configurations. Hence interviews and observations were also used to generate data.

I used indexing codes to represent questionnaire data sources. The following index codes were used:

- **UPQ**
 - U - university
 - P - partner
 - Q - questionnaire
- **EPQ**
 - E - environment sector
 - P - partner
 - Q - questionnaire

4.5.3 Observation

According to Robson (2011), the action and behaviour of people is central to research, therefore a natural and obvious approach to making sense of what is seen is to record, describe, analyse and interpret what was observed.

Observations entail being present in a situation and recording impressions of what takes place, then interpreting the meaning of the observed behaviour (Somekh, 2011). Observations take place in the setting where the phenomenon of interest naturally occurs. Data from observations represent a first-hand encounter with the phenomenon of interest. Observation makes it possible to record behaviour as it is happening. This was quite important in this study as it was likely that facilitators' theory of change would be displayed in their practice.

Training programme implementation was observed in order to describe a narrative of the programme as it was implemented so that a reflection of what was achieved and how, in relation to training programme theory would be recorded (see table 4.5). Observations were also done to capture specific incidents and behaviour that could be used as reference points for subsequent interviews (Merriam, 2009).

As mentioned in section 4.4 observation of training was done in five sites. Three of the sites focused on waters a topic and the other two focused on climate change. Figure 4.2. provides a visual presentation of the number of participants trained per province according to the topics

covered.

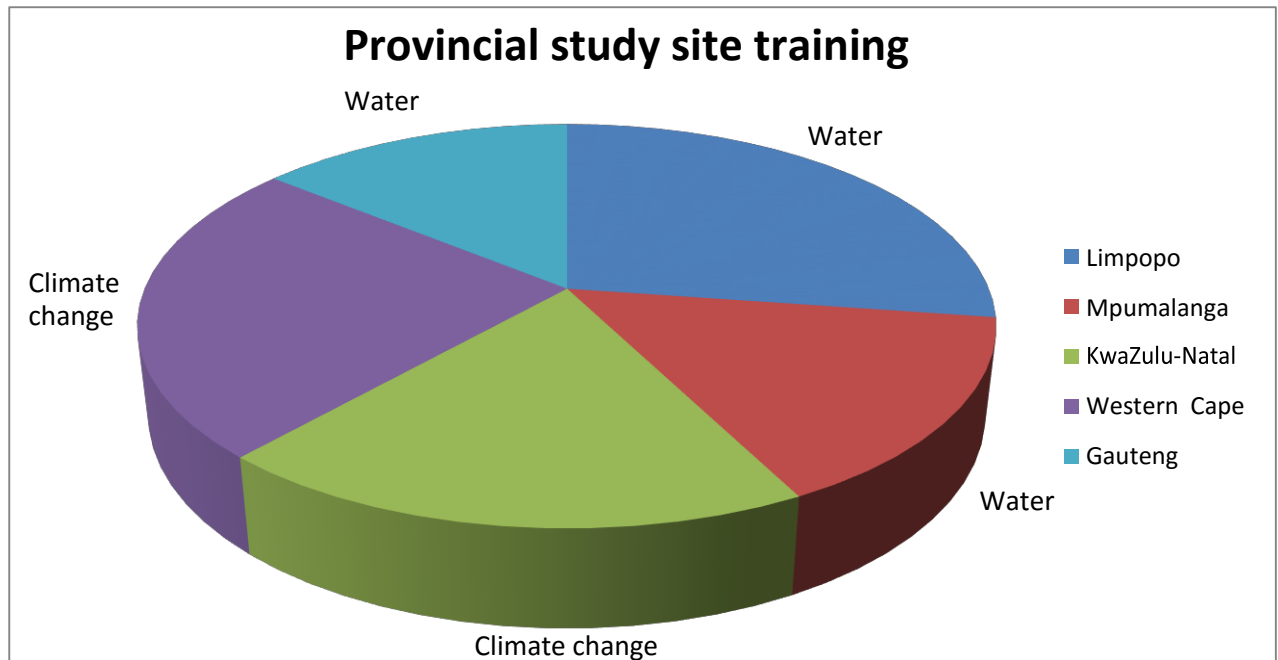


Figure 4.2 Modules offered in the provincial training sites where data was generated.

The advantage of direct observation is that a researcher gets an opportunity to generate ‘live’ real time data from naturally occurring situations (Yin, 2014). A researcher looks directly at what is happening *in situ* rather than relying on second-hand accounts.

Another advantage of observation is that one can understand something about a context by watching what people do and say in a setting without having to ask their views, feelings or attitudes (Robson, 2011). Sometimes people’s actions are more accurate than what they say they do. Observation can also allow a researcher to note things that people do which they may not necessarily mention in an interview. These observations can then be used during interviews.

One of the disadvantages of observation is the possibility that an observer can affect the situation they are observing. People’s behaviour and group interactions may change when people are aware that they are being observed. Sites had additional observers, for example, representatives from either the department of Basic Education and/ or Department of Environmental affairs who are Fundisa for Change partners. There is no knowing for certain how others would have behaved had they not been observed. I had planned to be a non-participant observer in order to be as unobtrusive and to minimise participant reactivity to my presence (Robson, 2011). I became a marginal participant observer in some sites as I was drawn into participating in some activities.

Training programme implementation observation was from September 2014 to August 2015. My presence at each site was explained before the start of the training. I was introduced as the Fundisa for Change co-ordinator observing the training to monitor and evaluate the implementation of the programme for Fundisa for Change. I was also introduced as a researcher with an interest into what works and what doesn't in Fundisa for Change training sessions. I think the introduction decreased anxiety of participants since the focus was not primarily on them but on the implementation of the programme.

In all the sites there were also other Fundisa for Change partners who came in to facilitate a session, and sometimes participants were not familiar with these partners. There were also Fundisa for Change funders in the training sessions. On the first day the participants might have been aware of the presence of observers but after informal conversations during breaks, they seemed to become accustomed to my presence. This is what Robson (2011) referred to as habituation. A researcher's repeated presence in a setting is no longer noticed by participants particularly if there is minimum interaction between the researcher and the participants. I was on site for the duration of the training sessions, from day one until the last day. I mostly interacted with participants and facilitators informally in between sessions and during breaks (tea and lunch). There was no observation schedule developed as the aim was to provide a thick description of what was happening at each site.

A substantial time commitment was required to conduct observations. I was on site for three to five days and also attended follow-up sessions in some sites (see Table 4.2). Depending on the site, a session would start at 08:00 in the morning and finish at 17:00. A considerable amount of data was generated which needed to be transcribed. The table below shows a summary of all observations conducted to give a sense of the amount of data that needed to be transcribed. There was a total of 41 hours, 47 minutes and six seconds (41hrs: 47min: 06s) of video recording that needed to be transcribed.

Table 4.5 Summary of observation data per site

Observation site	Date of video recording	Hours video recorded per day	Total hrs of recording per site
Gauteng	22 September 2014	3 hrs 7 min 1s	10 hrs 29 min 33 s
	25 September 2014	1 hr 22 min 11s	
	26 September 2014	2hrs 16 min 50s	
	22 October 2014	3 hrs 43 min 31s	
Limpopo	9 February 2015	3 hrs 6 min 15s	10 hrs 41 min 28s
	10 February 2015	3 hrs 56 min 59s	
	11 February 2015	1 hr 19 min 46s	
	9 March 2015	1 hr 9 min 13s	
	10 March 2015	1 hr 9 min 15s	
Mpumalanga	16 February 2015	4 hrs 10 min 55s	8hrs 26 min 5s
	18 February 2015	1 hr 56 min 24s	
	19 February 2015	2hrs 18 min 46s	
Western Cape	8 July 2015	2 hrs 57 min 42s	4 hrs 52 min 11s
	9 July 2015	1 hr 23 min 29s	
	10 July 2015	31 min 38s	
KwaZulu-Natal	18 August 2015	3 hrs 49 min 8	7 hrs 17 min 49s
	19 August 2015	2 hrs 16 min 48s	
	20 August 2015	1 hr 11 min 53s	

A web cam was used to record and this posed a challenge during outdoor activities. When it was not possible to carry the laptop around, field notes were taken. Details of observations are discussed in Chapter Six.

The focus of the observations was on the events as they happened during training. Data generation was more responsive as what I sought as a researcher was indeterminate, not predefined and I needed to go into the situation and respond to what emerged (Cohen et al., 2011). I wanted to observe what was taking place before I decided on the significance of what was observed. A key aspect of a realist evaluation is identifying what works (or not) in each context, so allowing the context to speak enabled me to identify contextual elements in each site. I also did not want to start analysing and interpreting prematurely what I was seeing before capturing what was happening. Video recordings assisted in minimising selective observation and possible bias, as I was able to watch the video recordings multiple times before analysing.

I observed actions, reactions and interactions (Gummesson, 2000) between participants, between participants and facilitators, between participants, facilitator and training settings.

Patton (1990) also argued,

The nature of a program emerges from the interaction of the physical setting, the social environment of people in the program, the nature of staff leadership and administration, and the activities provided for in the program. The “personality” of the human, social environment will affect how program activities are perceived and experienced by participants. Thus is it helpful to frame observations in the context of both the physical and social environments of the program. (p. 223)

It was important to observe programme implementation *in situ*, particularly in a realist evaluation as programme outcomes are framed in relation to the interaction between programme mechanisms and context.

I was selective when I transcribed data from observations. I picked out relevant passages where there were particular quotes and examples I wanted to use but this could only be done once I had listened to the recordings several times. I had not realised how time consuming transcribing would be, but I opted to do it myself so I would become familiar with the raw data. The transcription process was not a once-off event as I had to re-read the transcripts against the sound recording to ensure accuracy. This process helped with familiarisation with the text when I had to start with analysis. Video recording and audio recording of observations and interviews respectively, were transcribed into word documents and saved in folders created for each research site.

The following index codes were used to differentiate observation data in the five sites;

- **S1F1**
 - S – site
 - 1 – reference number
 - F – facilitator
- **S1P**
 - P – participant

4.5.4 Interviews

Following observation, participants were sent emails to invite them to participate in an interview. One cannot always judge intentions and purposes that lie behind actors’ behaviours from only observation (Cohen et al., 2011); hence participants were contacted to set up interviews.

It was necessary to conduct interviews to understand feelings, thoughts, intentions of observed behaviour and actions, as well as to understand how people interpret the world around them (Merriam, 2009). I interviewed different stakeholders as different people, based on their roles in the programme and the sector they represented. Different stakeholders might have different views about the Fundisa for Change programme and their experiences of the programme which give a broader perspective of the Fundisa for Change programme.

I used targeted, semi-structured interviews to understand how and why the programme was conceptualised and to understand the experiences of partners and programme facilitators. Open-ended questions in interviews allow the researcher to probe for greater depth. Interviews with facilitators were fairly informal and guided conversations. The flexibility of the interviews enabled me to modify the sequence of questions, change the wording, explain and add to them. Some of the topics covered were specified in advance and were similar for all facilitators interviewed. This enabled for increased comprehensiveness of data and made data generation systematic for each facilitator (Cohen et al., 2011). Some of the questions to facilitators emerged from observations while some were follow-up questions based on what interviewees said during interviews. An audio recorder was used to capture the interviews although I also took notes during the interviews in case the audio recorder malfunctioned.

4.5.4.1 Individual interviews

Time constraints made it difficult to conduct interviews during the training sessions; as a result, none of the facilitators or the participants were interviewed during the training sessions. I did have informal conversations with participants and facilitators on site although these were not recorded in any form. These were non-threatening discussions and were initiated to build rapport with the group.

Individual interviews were conducted with facilitators and partners. None of the interviews were face to face; they were telephonic. Interview questions were emailed to respondents prior to the day of the interview. For the telephonic interviews, the telephone was put on a loudspeaker mode to enable an audio recording of the interview. This was negotiated with the interviewees. For the interviews that could not be conducted due to time constraints, respondents sent their responses through email. This meant that the interview questions were questionnaires. Respondents received the interview questions and they responded to them at their earliest convenience. I had to send reminder emails to get responses back. The benefits of telephonic interviews are that they are cost effective and did not require any travelling for the

interviewer or the interviewees (Robson, 2011). Interviewees were able to have the interview in the comfort of their own spaces. I also ensured that the interviewees had access to telephones and computer with internet so it would not be challenging for them to participate in interviews. I had developed a rapport with the interviewees so it was not awkward to conduct the interviews telephonically. The advantage of the email responses in lieu of an interview was that I did not have to transcribe data as it was already in written form.

A follow-up email was sent to all the facilitators and participants in all the sites requesting an interview. Only one facilitator, main facilitator for Sites One to Three, was available for a telephonic interview (Appendix 5). Facilitators for Sites Four and Five opted to respond to the interview questions in the form of a questionnaire (Appendix 6). The telephonic interview lasted for an hour and four minutes. The easy flow of this interview is due to relations I had with the respondent prior to them facilitating the training I had observed. It was important to interview the programme facilitators as they were the ones who planned and delivered and translated programme objectives into practice. They would have insights into what worked and what enabled the programme to work based on their experiences of facilitating the training.

Another telephonic interview was with one of the Fundisa for Change partners who was involved in the conceptualisation of the programme and had been involved in the implementation of the Fundisa for Change training programme over the years (Appendix 7). She was interviewed in order to get her perspectives on the programme. This interview lasted for one hour twelve minutes. I felt she would be able to discuss professional development in environmental education as she had been involved in this aspect for a number of years. Additionally, she would have insights into how these kinds of programmes worked, in particular, the Fundisa for Change programme. However, there was a possibility that the interviewees who had been with the programme since its conceptualisation would be biased and only give a positive view of the programme. That was not the case, one of the facilitators reflected on the challenges (see section 6.3.1.3). Only two people were interviewed individually, one of the facilitators and one of the key Fundisa for Change partners.

I sent out emails to participants six months post the training and received one response from a subject education specialist. I wanted to find out if they had implemented any of the learning received from the training. A second email was therefore sent to the participants two weeks after the initial email and only two teacher participants responded and they both opted to respond via email (Appendix 8). The lack of follow up interview data from participants did not provide a

validity threat to the findings as the focus was mainly on the short-term training programmes outcomes which were observed during the training, and as can be seen from Chapter Six, rich data was generated from the observations and other data sources.

The following indexing codes were used to represent partner interview data:

- **IP1**
 - I – individual interview
 - P – Fundisa for Change partner
 - 1 – reference number

4.5.4.2 Focus group interview

A face-to-face semi-structured focus group interview was conducted. The focus group was composed of three Fundisa for Change key stakeholders from one of the participating HEIs who had been involved in the conceptualisation of the programme. The members of the focus group knew the Fundisa for Change programme from its establishment and they were easy to access, although it was a challenge to set up the interview at a time when all were available. The group members had played different roles in the life of the Fundisa for Change programme and this dynamism enabled a focus on various aspects of the Fundisa for Change programme. This also meant that the group was knowledgeable about different aspects of the CMO configuration and were able to provide different but complementary views of Fundisa for Change (Sorinola, 2014).

It was also possible to assess the extent to which the respondents shared a consistent view (Robson, 2011). The focus group interview worked well because it assisted participants to recall an experience that they had shared together (Fontana & Frey, 2011). I also noticed that it encouraged respondents to give additional information as they listened to others' responses, resulting in respondents sharing their perceptions in relation to those of others (Patton, 2002). Focus group interview questions (Appendix 9) were emailed to interviewees prior to the date of the interview. The interview lasted an hour and fourteen minutes. The focus group interview was valuable because respondents described events that took place in the past.

As Weiss (1994) stated,

Interviewing gives us access to the observations of others. Through interviewing we

can learn about places we have not been and could not go and about settings in which we have not lived. (1994, p. 1)

A second researcher was present during the focus group interview. The second researcher facilitated the interview. Merging the key interest areas allowed both of us to generate data we may not have necessarily thought of, had we each conducted a separate focus group interview. As I was not leading the group, I was able to make notes during the interview. I did the initial transcription which I shared with the second researcher so he could check it for accuracy when he listened to the audio recording.

The following indexing codes were used to represent interview participants;

FGP2

FG – Focus Group

P – Fundisa for Change partner

2 – reference number

The table below summarises data generated from interviews.

Table 4.6 Interview data from Fundisa for Change partners

Type	How	Who	When	Purpose
Individual	Telephonic	Environmental sector partner (facilitator)	19 July 2016	To get views on the training, participants and what was successful and what needed to be improved about the programme. Also reflections on what they did during the training and why.
Individual	Telephonic	Environmental sector partner	10 August 2016	Get an overview of the programme and what has worked well and what can be done to improve the programme.
Focus group	Face to face	University partners	28 September 2016	Determine views of those who know the practices and philosophy of the Fundisa for Change programme in order to develop an overview of the programme to develop a theory of change for the programme.

All hard copies of the documents used for generating data have been kept in a box labelled research data and are kept in a lockable office. The hard copies were scanned and saved as soft

copies in a folder under research data. The soft copies were saved on a laptop, desktop computer and on an external hard drive. Indexing codes were used to ensure anonymity of participants.

4.6 Data analysis

Cohen et al. (2011) stated that one of the challenges in qualitative data analysis is the amount of written data that needs to be reduced to manageable and understandable units in ways that respect the quality of the data. Content analysis is one of the ways data can be reduced without compromising its validity. Rigour in data analysis was required due to the fact that a qualitative analysis was used in the study.

According to Maxwell (2013),

There is no cookbook or single correct way for doing qualitative analysis; your use of these strategies need to be planned (and modified when necessary) in such a way as to fit the data you have, to answer your research questions, and to address any potentially serious validity threats to your conclusions. (p. 105)

Yin (2009) suggested four approaches to analysing data (1) using theoretical propositions, (2) describing the case(s), (3) using both qualitative and quantitative data, and (4) examining rival explanations. Data was analysed using thick descriptions of what was observed at each site using both qualitative and quantitative data (see Chapter 6) as well as CMO configurations (see Chapter 7).

There were two phases to the data analysis process:

Phase One: involved content analysis of Fundisa for Change documents and partner interview transcripts. There were two levels to this phase of data analysis. The first level was guided by questions developed to surface the training programme's theory of change (see Table 7.1). The second level was to use responses to the questions to develop a broad initial programme theory using the realist CMO configuration framework (see Figure 7.1 and Table 7.2).

Phase Two: involved content analysis of transcripts from observation data. Categories used to present the data were based on the training programme objectives (see section 6.2.2). The transcribed data was used to generate CMO configurations for each site. A refined CMO configuration was generated that incorporated similarities across the five sites (see Chapter Seven). Differences are noted as they indicate the influence of context in programme outcomes.

Danermark et al. (2002) viewed data analysis in social sciences as a process of working with

theory to gain insight of social phenomena in terms of meanings, structures and mechanisms. I had to decide on the process to follow to make sense of the ‘voluminous’ data I had generated (Patton, 1990, p. 379) to surface the theory of change of the professional development component of the Fundisa for Change teacher education programme. According to Rossi et al. (2004), data becomes valuable once it has been analysed. Data analysis goes beyond just organising, explaining and making sense of data but includes note-taking and writing reflections. It describes not only events in context but also participants’ intentions, strategies and agency. It involves consolidating and interpreting what people have said with data from documents. This is followed with a descriptive narrative out of the sense making process, to make theories for inferences (Merriam, 2009). The process of meaning-making during data analysis was guided by the theory of change and realist evaluation frameworks presented in chapter two (Yin, 2009).

Data in Chapter Six is thus represented site by site, so are the CMO configurations in Chapter Seven. It was easier to draw tables to illustrate the CMO configurations (see Chapter Seven) in answering what worked for whom in what circumstances at each of the sites. According to Edwards (2011), a multi-case analysis to demonstrate how mechanisms work to produce certain outcomes is more insightful. He argued that the analysis will show different CMO configurations due to differing contextual factors. Documenting each individual case using the CMO configuration makes ‘works for whom in what circumstances’ more explicit. This will also enable an identification of contexts and mechanisms that enable or constrain the achievement of Fundisa for Change desired outcomes. Moreover, this approach to data analysis would enable a development of a theoretical understanding behind the Fundisa for Change programme as it is implemented in local settings. The CMO configurations in each site would reflect dynamics found in each case (Edwards, 2011). I needed to have an analytic tool that would go beyond only showing the events but also explain how resources and activities led to outcomes whilst considering contextual conditions that might influence programme outcomes (Yin, 2014).

Research questions also influenced how data was analysed. Organising data this way ensures coherence and enables an exploration of relationships across data types (Cohen et al., 2011). All the data generated is synthesised into an analytical discussion to synthesise study findings in relation to the research questions.

Danermark et al. (2002) outlined four modes of inference that can be used to analyse data; deduction, induction, retroduction and abduction. To infer is to argue in different ways to reach

conclusions about a phenomenon under study. Although deductive logic provides guidance on how to draw valid conclusion, it does not provide guidance on how structures and mechanisms that have led to observed phenomena can be surfaced. Hence, I could not rely only on a deductive process to infer from the data generated.

According to Danermark et al. (2002), induction relies on drawing conclusions and generalisations from what has been observed. This may be valid in a closed system but problematic in open systems as social mechanisms may be triggered by multiple circumstances. For example, stakeholder actions and views and social structures are dependent on context thus individual observations are inadequate to provide valid claims. A researcher is not guided on how to gain knowledge of the structures and mechanisms that underpin what is observed.

Danermark et al. (2002) explained that abduction involves describing what is directly observed but also structures not directly observable. Abduction enables a researcher to determine whether observed individual events are embedded in universal structures or not. It allows a researcher to discover if certain behaviours are manifestations of normative structures. Abduction thus involves a process of re-describing or re-contextualising, where new insights about a phenomenon are drawn when a theory is used to interpret original ideas about a phenomenon. This gives new meaning to known phenomenon. It is argued that socialsciences research does not necessarily discover new events not known but rather makes explicit connections and relation that were not directly observable so that known occurrences can be understood in new ways (ibid.). It enables social scientists to use theory to ‘see something as something else’ (Danermark et al., 2002, p. 93). I used the CMO configurations to re-describe what I had observed. This was aimed at getting a better understanding of what works for whom and under what conditions in the Fundisa for Change training programme. I wanted to identify the connections and relations between context and mechanisms in producing outcomes.

Retroduction, according to Danermark et al. (2002), involves moving from observed events to determine what has given rise to observed phenomenon. Transcendental argumentation is at the core of retroduction where the aim is to determine the circumstances for the events and phenomenon under study. It is about finding out what conditions are necessary or contingent for peoples’ actions, reasons and responses for example in a professional development programme in this particular case.

Retroduction requires counterfactual thinking where a researcher utilises pre-existing knowledge and experiences to abstract and reconstruct preconditions for social events of known social situations (Danermark et al., 2002).

Abduction and retroduction were critical for this study. In evaluating the Fundisa for Change training programme, abduction was used to surface the theory of change of the Fundisa for Change training programme. The surfacing of the theory of change necessitated that I interpret and recontextualise assumptions of the programme drawn from Fundisa for Change documents and key partner interview transcripts (see Chapter Seven). Additionally, abduction was used to generate a CMO configuration to explain the Fundisa for Change training programme theory in relation to structure, culture, agency and relations which were not directly observable. Abduction was used to respond to the first research question: what theory of change shaped the conceptualisation of the Fundisa for Change training programme?

Retroduction was used to surface what was constitutive of the context and mechanisms in the Fundisa for Change training programme to explain programme outcomes. Retroduction was used to clarify the conditions required for outcomes to be achieved. Retroduction was used to generate CMO configurations for each site from observation and post-training interview and questionnaire data (Chapter Seven), what participants and facilitators said and did. Retroduction was used to answer the second research question with its sub-questions;

- For whom did the programme theory work and why?
- In what context did the programme theory work and why?
- What were the mechanisms that enabled the programme theory to work?
- What outcomes were achieved?

Retroduction enabled me to distinguish between necessary conditions and contingent circumstances when I looked at the similarities across the sites that enabled achievement of training programme outcomes (Danermark et al., 2002). Sayer (1992) stated that the outcomes of generative mechanisms in open systems depend on contingent conditions and as such cannot be predicted. It is only when we analyse causal mechanisms in social programmes that we can explain the potential consequences of mechanisms in different contexts (Danermark et al., 2002).

4.7 Validity considerations

According to Cohen et al. (2011), validity is a requirement and important in research. Maxwell

(2012) argued that validity is not determined by a method but by how a particular method was used in a context to reach conclusions. He added that a realist approach to validity pertains explaining the basis on which a researcher can make judgements that engage with the real phenomena. He argued that validity involves identifying the plausible alternatives to proposed explanations, interpretation, or conclusion. A researcher needs to make decisions on what available data count as evidence for or against alternatives offered for explanations.

According to Chen (2013), an integrative validity approach should be used in theory-based evaluations. He described integrative validity as a model that asks questions about viability, efficacy and transferability. In terms of validity, questions should centre on practicality and suitability of the programme implementation in the real world. Questions to ask include: is the programme practical, affordable, suitable, evaluable, and helpful in the real world? When this study commenced, the programme had already been piloted in 2012, thus the questions posed above had been answered. Efficacy questions test the credibility of evidence generated in terms of identifying how outcomes have been a result of programme mechanisms. Transferability is closely linked to generalisation as the question seeks to understand the extent to which findings can be transferred from one setting to another.

I had to make validity considerations throughout the research process. To minimise validity threats during interviews, I had avoided a tendency to seek answers that supported my preconceived notions about the Fundisa for Change training programme. An interview schedule enabled me to minimise bias as questions were pre-determined. The validity of the questionnaires was deduced from the accuracy in which respondents completed the questionnaire. The responses showed that they answered what was asked which meant they understood the questions. Validity in observation data was addressed by coding the transcribed data using categories derived from purpose of the observation, to observe training programme outcomes and how participants were supported (it at all) to achieve them. Content validity in the analysis of the Fundisa for Change documents, to surface the theory of change, was addressed by using set questions (see Table 7.1) to engage with the documents and interview transcripts in order to minimise subjective interpretation.

Maxwell outlined three types of validity relevant to qualitative research: descriptive validity, interpretive validity and theoretical validity. Interpretive validity involves making inferences from what people say and do but also regarding the meanings that people make of events.

Perspectives that people have about events cannot be directly observed which necessitates clarity seeking to minimise misrepresentation. Interpretive validity was addressed through open-ended interviews and questionnaires for insight into what participants perceived about the training programme (Patton, 2002) as well as from participants' work and facilitator reflections. All these data sources were analysed to ascertain the meaning Fundisa for Change stakeholders made of the training programme. I had to be conscious of my own bias and avoid imposing my own meanings on what I was observing and hearing as this would threaten the validity of findings and conclusions (Robson, 2011). Follow-up interviews with facilitators after the training enabled me to clarify what I had observed so my interpretation of what I saw was congruent with how they interpreted what they did. I asked facilitators to explain some of their choices during the training; this enabled me to infer what influenced their choices. This allowed me to determine whether or not I had accurately captured facilitators' actions. I have tried to minimise bias ensuring the participants' voices come through by using verbatim quotes when presenting data (see Chapters Five and Six).

Theoretical validity addresses the theoretical constructions that the researcher (and researched) bring to the phenomenon under study. The theory can refer to either physical events or mental constructions and can also incorporate participants' concepts and theories. Theoretical validity refers to the extent to which the research explains phenomena. Theoretical validity was strengthened through a careful use of theory-based approaches to evaluation of the programme (theory of change and realist evaluation). Robson (2011) suggested that threats to theoretical validity can be minimised by considering alternative explanations of the phenomenon under study.

I had to understand and define context and mechanisms in a realist evaluation study in order to be able to use them to analyse data and draw conclusions. I needed to explain why a programme tends to work for some while it might not for others by considering the context that tends to influence participants' meanings, intentions, beliefs and perspectives – which are essential elements in how they engage with a programme. Work with theoretical tools to answer research questions is presented in Chapter Seven.

Descriptive validity refers to a factual, accurate account of what a researcher has observed and/or heard. This type of validity must be backed by the raw data generated. In this study, descriptive validity was achieved through writing thick descriptions of what was observed during programme implementation and providing quotes from transcribed observations and interviews. Threats to descriptive validity were minimised with the use of video recording

during observations and an audio recorder for interviews (see sections 4.4.4 and 4.4.5), although not everything that was recorded was transcribed. A thick description of the site observations is presented in Chapter Six.

4.7.1 Rich description

Validity is strengthened by providing rich, thick and detailed description of the setting and participants and a detailed description of findings with adequate evidence presented as interview quotes, field notes from observations and an audit trail of documents analysed. This also increases possibility of transferability. Those who read the research can determine from the description how they can apply the processes engaged in the study in their own contexts. Detailed descriptions enable a reader to decide whether the findings can apply to their particular situation; therefore, providing enough detailed description to study the context enables readers to compare the ‘fit’ with their situations (Merriam, 2009).

4.7.2 Triangulation

A study’s conclusions are often based on triangulating the data generated from a variety of sources (Maxwell, 2012). Yin (2009) concluded that the use of multiple, corroborated sources of information make findings and conclusions more convincing and accurate.

Triangulation in social science research studies a phenomenon from more than one angle, making use of both qualitative and quantitative data. It is an attempt to provide a rich and full description of a phenomenon (Cohen et al., 2011). Yin (2014) viewed triangulation as a convergence of data generated from different sources, to determine the consistency of a finding. He argued that findings and conclusions are likely to be more convincing and accurate if based on several different sources of information thus strengthening the validity of conclusions made. In evaluating the Fundisa for Change programme, use was made of document analysis, observations and interviews. Documents were used to surface the theory of change partially articulated, observations were to look at the synergy between the articulated theory of change and programme activities and interviews were conducted to triangulate researcher observations and interpretations of the participants’ actions and words (Stake, 1995).

The use of multiple data generation tools helps to minimise threats to validity but this necessitates keeping an audit trail: full records of raw data, field notes, transcripts and details of analysis (Robson, 2011).

4.7.3 Generalisation

Robson (2011) explained that theoretical generalisations can be made where a theory generated from research can be used to understand other cases. This is true for theory based evaluations. In realist evaluation, a study can provide a set of CMO configurations which can be generalisable to other settings.

Providing thick descriptions of cases and their contexts can enable others to judge the transferability of the findings to their contexts (Stake, 1995). Hence, it was important in this study to describe each case individually in Chapters Six and Seven. Inferences, according to Simons (2015), can be drawn when the context of a case has been richly described. The thick description allows the reader to recognise and connect with the experiences of the case and the events. Additionally, this makes for generalisations that go beyond abstraction that are devoid of place and context. Meaning is derived from maintaining connectedness with the particulars of the concrete case in context.

Each case in the multi-case design provides ‘descriptive particulars’ of the Fundisa for Change programme in the different contexts in the form of CMO configurations (Pawson & Tilley, 1997). Yin (1994) warned that a major pitfall to the use of an embedded case study design is that the study tends to focus on some units of the programme and fails to return to the overarching unit of analysis, which is the Fundisa for Change training programme in this case. The sub-units are represented by the site cases. Data from the sub-units was used to refine the initial CMO configuration.

4.8 Ethics

Researchers need to gain and maintain access in a research study in an ethical way. Gaining access is not easy as certain protocols need to be followed before a study can commence. It was important that I follow ethical guidelines; hence I applied for and obtained ethical approval.

According to Cohen et al. (2007), ethics concern right and wrong, good and bad, so one has to consider how the research proposals, contents, methods, reporting and outcomes conform to ethical principles and practices. Additionally, Rossi et al. (2004) stated that the researcher should ensure honesty and integrity throughout the entire evaluation process and respect the security, dignity and self-worth of the participants and other stakeholders with whom a researcher interacts.

Gummeson (2000) differentiated between physical, continued and mental access. He

described physical access as getting entry into a setting in order to observe programme implementation. It is therefore permission that is granted to a researcher to be on site. Continued and mental access enables a researcher to understand what is happening in a setting, how to observe it and getting participants to describe it. I had privileged physical access at each site due to my role of being the Fundisa for Change co-ordinator at the time of data generation. As a researcher, I had to negotiate continued and mental access. What assisted with this was the fact that I had been a school teacher for more than ten years before starting this study. I was therefore able to relate to the participants. This common experience between the participants and I allowed for a good rapport. I think this also made it easy for me to establish credibility with participants. Most of the facilitators were known to me and we had built a relationship before this research.

As the Fundisa for Change co-ordinator, I attended Fundisa for Change training in many sites and at the start of the data generation I had not decided which sites would be used for the study. This was only decided after I have been to most of the sites and generated data in all of them. The data was not generated for research purposes but via the monitoring and evaluation system that was established in the Fundisa for Change programme to provide feedback to programme stakeholders (see section 5.5 and Figure 5.2). It was therefore difficult to request provincial access from the Department of Basic Education to conduct the research before deciding which provinces would be included in the research; hence, access was requested from the national Department of Basic Education. The choice to contact the national Department of Basic Education office to grant permission for the research was also because the training programme is implemented nationally. I was advised by the national office that I would need provincial permission if I wanted to do follow-up data generation outside the training sessions. I emailed the research proposal and attached the data generation tools (Appendices 3 and 4), an approval letter for implementation of the Fundisa for Change training programme given by the Department of Basic Education and the SACE endorsement of the Fundisa for Change programme. A telephonic conversation to clarify further the intentions of the study followed the submission of the documents mentioned above before I received an approval letter (Appendix 10). Another condition was that I share the research with the Department of Basic Education on its completion. Permission from the Department of Basic Education to undertake the research was required as per the University's Faculty of Education and Department of Education requirements for ethical protocols. The study received ethical clearance from the university after the study proposal was approved by the University's higher degrees' committee.

Informed consent from participants was requested at all the sites. It was explained to them that although the data was generated for reporting purposes to partners and funders of the Fundisa for Change programme, as a researcher I wanted to use it for my study as well. This was done on the first day of the training, immediately after introductions were made. It would have been a challenge and time consuming to request for consent individually from each of the many participants at the start. Hence consent was requested from the whole group but individuals were made aware that they could change their minds at any point during data generation. Consent forms were available on site but not all participants returned them at the end of the training (Appendix 11). The purpose of the study was shared with participants, as well as how information generated would be used. I had to request permission to use a video camera to record observations during training sessions. I also requested permission to use photographs taken during the training. Follow-up interviews were requested and this was followed up via email.

Informed consent gives participants the freedom to decide if they want to participate or not and to withdraw participation at any point during the study. I explained to the participants that the study would not require them to do anything they would not necessarily have done during the training sessions. I also informed them they did not have to participate in the interviews if they did not want to and that they could remain anonymous and any data generated would be confidential. In order to keep this promise, I did not write down any of their names even when recording and transcribing. I did not try to match the faces with names or with their questionnaires. I gave participants an opportunity to weigh up the pros and cons of participating in the study in terms of what they might benefit or lose by participating. Informing participants of the rationale and purpose of a research and elaborating on how confidentiality would be maintained reduces potential anxiety in participating in research.

Researchers need to take into consideration the effects that the research might have on the participants and act in ways that preserve the human dignity of participants (Cohen et al., 2011). I do not intend in any way to use data generated from participants outside of this study; if the need arises I will request permission from participants.

I must also add that the Fundisa for Change programme generates evaluation data and takes photographs during training and these are published in the Fundisa for Change newsletters and website. Consent to take photographs is requested for this and I requested consent to use the same evaluations forms and photographs for the study.

4.9 Researcher reflexivity

According to Chen (2013), our values and beliefs tend to influence our perceptions and how we look at issues. This also extends to how we do research, for example, how we define a study, what we see as important to note and analyse. This was noted by Hammersley and Atkinson (1983) cited in Cohen et al. (2011) that researchers are part of the social world they are studying.

As someone who was the co-ordinator of the Fundisa programme during this study, I had to take account of my researcher subjectivity and mentally step out of that role during data generation in order to minimise subjectivity and increase objectivity. I had to force myself to make the familiar unfamiliar and look at the programme with fresh eyes. It was critical to interrogate my subjectivity to avoid a potential threat to the validity of conclusions drawn (Maxwell, 2012). This strengthens interpretive validity. As a Fundisa for Change co-ordinator at the time of data generation, I had to guard against a positive bias towards the Fundisa for Change programme that might compromise validity of findings.

Lincoln and Guba (2013) explained that who we are shapes what we know, how we know it and how we frame what we know when we share it with others. Recognising this and maintaining reflexivity is part of limited and fallible but realistic theory-based evaluations.

4.10 Conclusion

This chapter discussed the research design and described the tools that were used to generate data and why those tools were appropriate for this study. Additionally, participants who provided data were discussed as well as where data was generated. A brief discussion on how data was analysed was given. Issues of validity and generalisation were described and the process of gaining access to generate data was also explained. The chapter concluded by stating the positionality of the researcher.

CHAPTER 5: DESCRIPTION OF THE FUNDISA FOR CHANGE TEACHER EDUCATION PROGRAMME

5.1 Introduction

This chapter introduces the Fundisa for Change teacher education programme. When the programme was conceptualised in 2010 it was called the National Environmental Education Teacher Development Network. After the programme's pilot phase in 2012, it was re-branded and re-named 'Fundisa for Change' after a national meeting was held with all programme implementing partners in January 2013.

To understand the programme, it is necessary to look not only at the policies that informed it but also the context in which the programme was developed. This chapter starts with the context and rationale for the conceptualisation of the programme. It shares the programme's objectives, assumptions, risks and the monitoring and evaluation strategy. It concludes with programme activities implemented to achieve its objectives. Data used in this chapter was sourced from programme documents, questionnaires from a training of trainers' workshop, individual interviews of two key Fundisa for Change partners and a focus group interview with four other key Fundisa for Change partners. Key Fundisa partners are partners who were involved in the conceptualisation of the Fundisa for Change programme.

5.2 Context and rationale

Any programme that is introduced into any social system is influenced and in turn influences what happens in that social system. To understand those effects and influences and the changes that may be brought by social programmes, it is imperative that there is "a deeper understanding of pre-existing contexts and the mechanisms in operation prior to the introduction of any social program" (De Souza, 2013, p. 142).

The Fundisa for Change programme was established after a call was made by the Biodiversity Human Capital Development Programme led by the South African National Biodiversity Institute (SANBI) and the Lewis Foundation. The aim was to form a consortium that would develop and pilot an environment and sustainability training programme and resources for teacher education, while simultaneously exploring wider partnerships for a national rollout of the programme (Fundisa for Change, 2011).

The conceptualisation of the Fundisa for Change teacher education programme was influenced by findings from three major national environmental sector strategy research programmes: the

South African Environmental Sector Skills Plan (South Africa. Department of Environmental Affairs [DEA], 2010); the Green Matter Biodiversity Human Capital Development Strategy (South African National Biodiversity Institute [SANBI] & Lewis Foundations, 2009) and the Global Change Grand Challenge National Research Plan (South Africa. Department of Science & Technology [DST], 2010). A key finding that emerged from the strategy research was that attention should be given to the foundations of environmental learning if the country wants to ensure the sustainability of South Africa's human capital development needs, in the environmental sector. The results from the three national studies also indicated that South African teachers have inadequate environmental knowledge to lay the foundation for further environmental learning and career path development in the environmental sector for South African learners. These results pointed to a need to support South African teachers' professional learning, focusing on environment and sustainability content knowledge and pedagogical content knowledge in ways that could enable them to teach the content, associated values and skills (Fundisa for Change, 2011).

The programme thus aims to strengthen transformative environmental learning in South African schools through teacher education. The programme is responding to two core issues that were identified by the strategic research: a) the quality of teachers' knowledge and their ability to engage with environmental knowledge and values associated with environment knowledge; and b) the curriculum content necessary for environment and sustainability education (Fundisa for Change, 2013a). The programme endeavours to capacitate teachers 'to translate environmental information into pedagogical strategies and processes' (Fundisa for Change, 2011, p. 3).

The programme works within a "co-ordinated, participatory national system of engagement", (Fundisa for Change 2013a, p. 4). According to Fundisa for Change partners who were the pioneers of the programme, this approach to working together occurred organically once the call was made by the Biodiversity Human Capital Development Programme:

We were at an EEASA [Environmental Education Association of Southern Africa] conference in Zambia. People said we need to look at this and one person said, 'why don't we put a united front instead of people putting in [i.e. a response to the call] individually as organisations?' We all agreed to it. (IP1)

...and then as a group of partners we felt that instead of competing with one another, we all come together and put in one proposal. (IP2)

... and we realised we needed to respond to the environmental content in the curriculum, to work together and that was also in response to the ESSP [Environmental Sector Skills Plan] which highlighted the importance of foundational knowledge required in the curriculum. We looked at the recommendations from the ESSP and noted it was necessary to give attention to teachers' knowledge, the foundations of environmental knowledge. It was a sector-based response to those national studies. (FGP1)

A national consortium, involving national environmental organisations, state departments and higher education sector partners in South Africa, was then established to develop a teacher development programme to respond to the issues identified in the strategic research (Fundisa, 2013a).

The human capital development strategy for the biodiversity sector (one of the strategies the programme is responding to) is a strategy that was set up for a 20-year period, from 2010 to 2030. The time frames for its initial activities were to start in the 2010/2011 period and be underway by 2012 with reviews every five years (SANBI & Lewis Foundation, 2010).

The establishment of the Fundisa for Change consortium and programme was also influenced by both national and education sector policies (see also sections 1.4.1 and 1.4.2). These include:

- The 1995 White Paper on Education and Training called for an active and integrated approach to environmental education in all levels of the education system (RSA, 1995).
- The Constitution of South Africa in its Bill of Rights states that every South African citizen has a right to an environment that is not harmful to their health and well-being. It further states that this environment should be protected for current and future generations (RSA, 1996).
- The 1998 National Environmental Management Act which called for educating and empowering South Africans through increasing their awareness of, and concern for, environmental issues, and assist in developing the knowledge, skills, values, and commitment necessary to achieve sustainable development (RSA, 1998).
- National school curricula: Curriculum 2005 (which had an environmental theme as a phase organizer that cut across all the subjects), the Revised National Curriculum Statement and the Curriculum and Assessment Policy Statement (both have the relationship between Human Rights, Social Justice, Inclusivity and a Healthy Environment as an underpinning principle of the curriculum).

- The 2011 *Integrated Strategic Planning Framework for Teacher Education and Development in South Africa, 2011- 2025* places emphasis on improving the quality of teacher education and development in order to improve the quality of teachers and teaching in the schooling system. This would be achieved through a development of pedagogically sound, content rich, quality assured, SACE endorsed and accredited continuing professional development courses (South Africa. DHET & DBE, 2011, p. 5).
- The 2015 Minimum Requirements for Teacher Education Qualification Framework that foregrounds knowledge, reflection, connection, synthesis and research, emphasizing five knowledge practices that should underpin teacher professional programmes; *Disciplinary Learning, Pedagogical Learning, Practical Learning, Fundamental Learning, and Situational Learning* (South Africa. DHET, 2015) (see Chapter 6, section 6.2.2).

5.3 Phase 1: Programme conceptualisation

When the Fundisa for Change programme was conceptualised, it had the following key assumptions:

- (i) The quality and content of environmental learning in teacher education can be improved and expanded through capacity building.
- (ii) Education policy and curriculum (and its implementation) can be influenced and strengthened to ensure adequate inclusion of environmental learning content in the schooling system.
- (iii) A national network of providers and teacher educators can be strengthened and expanded to willingly work together to achieve a national systemic impact.
- (iv) The programme will attract funding partners in its innovation stage, and over time become institutionalised within the national systems of funding teacher education (Fundisa for Change, 2013a).

The Fundisa for Change programme developed objectives that took into account the assumptions mentioned above. The programme's overall developmental objective is to enhance transformative environmental learning through teacher education (Fundisa for Change, 2013a). At the core of the programme is a combined sector effort of the Fundisa for Change partners to strengthen the teaching of environmental and sustainability concepts for transformative environmental learning in South African

schools. Transformative learning in the Fundisa programme denotes learning that supports learners to respond to questions of why things are the way they are; helping learners to solve problems and to develop new social practices (Fundisa for Change, 2013b).

The programme has five sub-objectives to enable the achievement of the main objective; 1) capacity development, 2) policy and advocacy, 3) build national system of engagement, 4) strengthen and review curriculum and learning and teaching support materials, especially textbooks, and 5) provide co-ordination support to strengthen the Fundisa for Change partnership programme (see Figure 5.1 below).

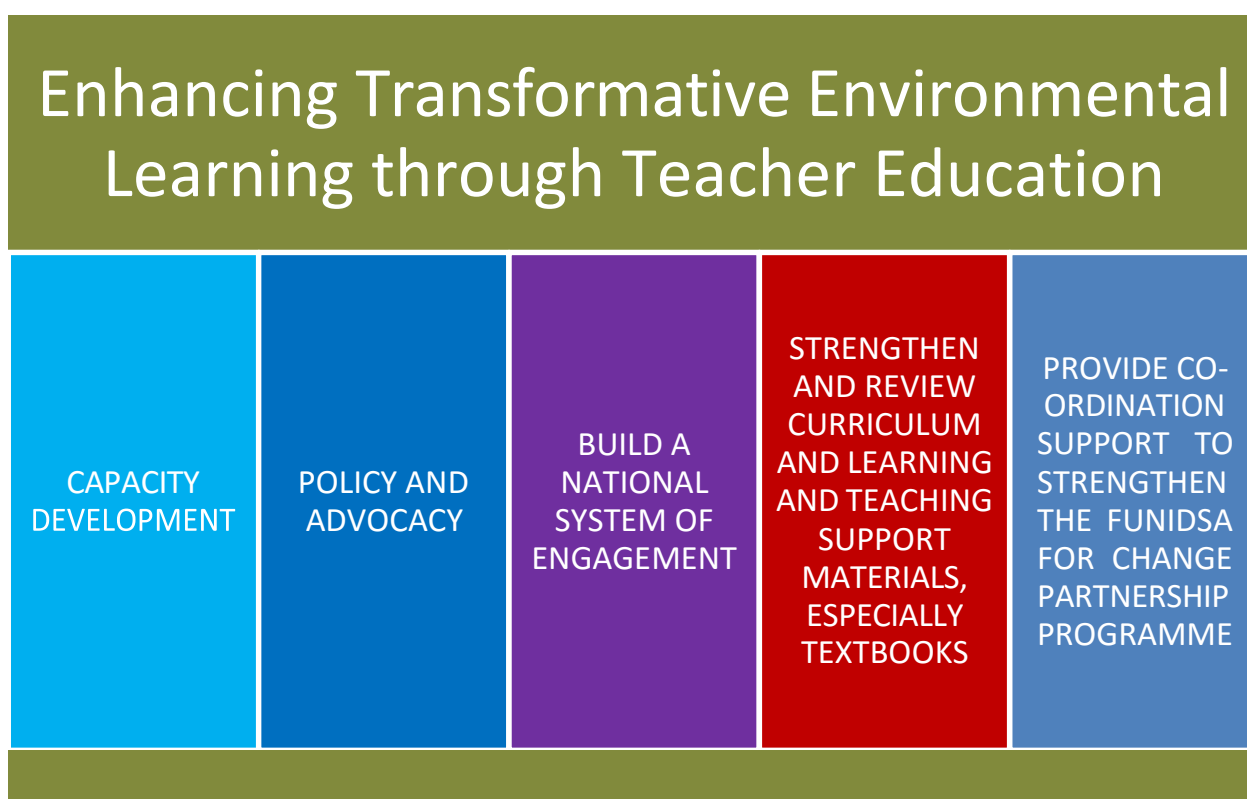


Figure 5.1 Fundisa for Change objectives

Each objective has activities:

1. *Capacity development*: Development of teacher education capacity oriented towards teacher capacity development for transformative environmental learning in the schooling system;
 - Programme and its network of partners develop and share teacher education materials;
 - Programme engages in the design, implementation and evaluation of

accredited and highly regarded nationally relevant capacity building programmes for Teacher Educators (first level) and Teachers (second level, implemented by Fundisa for Change partners).

2. *Policy and advocacy* (influence): Enhance national take up of environmental learning within the national system of teacher education.
 - Programme formed a working group to engage directly with national policy systems and structures through the National Environmental Sector Skill Planning Forum (NESSPF) and adopted a networked approach to advocacy;
 - Adopted a research-informed approach to engaging with policy systems.
3. Build *national system of engagement*: Expand the network of providers and the community of practice engaged with transformative environmental learning through teacher education.
 - Programme hosts and participates in annual conferences and colloquiums for teacher educators engaged with this focus area, and seeks to develop complementary approaches;
 - Established a strong networking infrastructure, and works with the guidance of university partners who are the national institutions responsible for teacher education.
4. Strengthen and review *curriculum and learning and teaching support materials*, especially textbooks: Strengthen the quality, progression and validity of existing curriculum knowledge and its representation in the national curriculum system.
 - Programme deepens analysis of environmental content knowledge currently represented in the national curriculum system through research.
5. Provide *co-ordination support* to establish the Fundisa for Change partnership programme: Provide the ‘underlabouring’ structural co-ordination, monitoring and evaluation and systemic implementation support necessary for the four objectives above.
 - Initially, a co-ordination ‘hub’ was set up at Rhodes University’s Environmental Learning Research Centre, where a co-ordination position was funded for three years, 2013 - 2015.

- A programme-wide monitoring and evaluation system was set up to inform reflexive development of the programme,
- The co-ordination office provides system knowledge for reporting to the Department of Basic Education, teacher education institutions and programme partners on the programme activities and outcomes. (Fundisa for Change, 2013a)

Annually, working groups are formed to lead the activities specified against each of the first four objectives (Appendix 12).

Funding to establish the programme came from national and international partners. Fundisa for Change partner organisations contributed support ‘in kind’ to match the funding that was provided by donors. The programme received initial funding to draw up an implementation plan but the funding was not enough to cover all the activities for conceptualising the programme. Partners in the consortium had to seek funding to support the establishment and piloting of the programme. It appears that the assumption that the programme would attract funding during its initial stage became a reality as different funding streams were sourced and received to support different components of the programme.

Although a strategic decision was made to align the programme with content specified in the national school curriculum, there was no funding commitment from the Department of Basic Education to fund national rollout of the programme. Partners were and still are encouraged to source funding from their networks to implement the programme. This showed the commitment of the partners to the programme (Fundisa for Change, 2013a, p. 5). Partners were aware of the funding challenges as indicated below:

The budget was small but we were able to initiate the first part. It was a donation by [Fundisa for Change] partner organisations. The funding only would have covered certain things but not people’s time. There was a donation made by [Fundisa for Change] partner organisations to make this happen. (IP1)

One of the key partners indicated in an interview that the consortium had meetings before it was confirmed that the consortium had received the tender to conceptualise the teacher development programme (IP2).

The first meeting of the consortium was in December 2010. The purpose and focus was on:

- Expectations of each partner of the programme and their role in it,
- A reflection of partner experiences with teacher education in environmental education,
- History of environmental education programmes for teachers in South Africa,
- Alignment of the programme with the South African Department of Basic Education school curriculum and Department of Higher Education and Training policies,
- Scoping of available materials for teacher education in environmental education,
- Framing of the teacher professional development programme, and
- Partnering with institutions of higher education.

Subsequent to this, an invitation was sent to the Deans of Education Faculties and Heads of Schools of Education in all the South African universities. This spoke to the programme's first two objectives of a) capacity development, and b) building a national system of engagement. A staff member from each institution was invited to attend a consultation meeting on the integration of environment and sustainability education in teacher education programmes. One of the key programme partners indicated that they wanted impact at the level of teacher education programmes. It seems there was inadequate emphasis of environment and sustainability education at institutions of higher education, as reflected in the following interview data:

We realised there was more environmental content included in the curriculum but the teacher education institutions were not responding...there were small scale activities via NGOs [non-governmental organisations] and some institutions but there was no national impact ... systemic impact was a critical issue, as was the need to bring this focus into the attention of teacher education; who have a mandate for teacher education. So it was not enough to do ad hoc teacher education programmes. (FGP1)

Corroborating this, a university partner, reflecting on a Fundisa for Change Training of Trainers workshop that took place in 2014, stated, "The environmental education part in teacher training needs improvement and Fundisa for Change equips me for that" (UPQ). This is an indication that the capacity development objective of the programme was addressed in the Training of Trainers' workshop.

The lack of attention to environmental education and ESD in teacher education mentioned above stems from a history wherein university partners were not given opportunities to build

their capacity in environmental education and ESD, as reflected in this comment referring to the earlier national environmental education programme that the former Minister of Education set up (see section 3.4.3.2):

In the NEEP project the last objective, objective 7, we had one for working with HEIs. We had one meeting with them [HEIs]. They [NEEP-GET project] focused more on working with subject advisors and teachers which in hindsight was a mistake. If we had started more consistently with HEIs way back in 2002 it would not have been such a critical issue to work with in 2010. (FGP1)

The Fundisa for Change programme's Training of Trainers workshops enabled individuals from universities and NGOs in the environmental sector, as well as subject education specialists from the Department of Basic Education, to participate in the Fundisa for Change programme. Training of Trainers' workshop participants participate actively when they found resonance between what they do in their institutions and the focus of the Fundisa for Change programme. Some individuals gave the following reasons for attending the Fundisa for Change Training of Trainers workshop;

"I saw it as an opportunity to expand environmental education in teacher education"
(UPQ)

"I wanted to explore and refine ways of working effectively on environment and sustainability focused work" (UPQ)

"I am attached to the Human Capital Development space where training and supporting of teachers is core" (EPQ)

Some of the participants who attended the Training of Trainers workshop did so in order to develop their capacity to engage with environment and sustainability education as evidenced by the quotes above.

5.4 Risk analysis

The Fundisa for Change programme identified internal and external risks that might affect the success of programme activities, objectives and goals. The risks include:

- Partners being over-burdened and not having enough time to dedicate to Fundisa for Change activities;
- Inadequate funding or too piece-meal approach to funding which makes administration difficult and time consuming;

- Poor uptake of the initiative by the Department of Education and national policy structures given other pressures and priorities;
- Availability of teacher educators with capacity to implement the programme successfully (time and experience) may not be adequate to meet demands; and
- Teacher education institutions are not able to easily integrate the Fundisa for Change programme activities in their regular programmes of work due to a range of pressures. (Fundisa for Change, 2013a, p. 12)

Two of the above risks seem to have affected Fundisa training activities; funding and university systems (see section 5.6.2), as reflected in interview data:

We have done so many years of conceptualisation, let's not lose focus that we don't implement, and that needs money which is the difficult one. (IP1)

Adequate buy-in and funding would be possible risks. (IP2)

Accreditation systems are tough and a tedious business and universities do not have innovative attitudes. (FGP1)

The risks stated above necessitated that the programme develop a monitoring and evaluation system to monitor how these risks would affect the programme.

5.5 Programme monitoring and evaluation

The Fundisa programme planned to monitor intended outcomes and results within a three-year window (2013-2015), based on the programme's intended results. The programme developed monitoring and evaluation systems in two impact areas (see Figure 5.2 below).

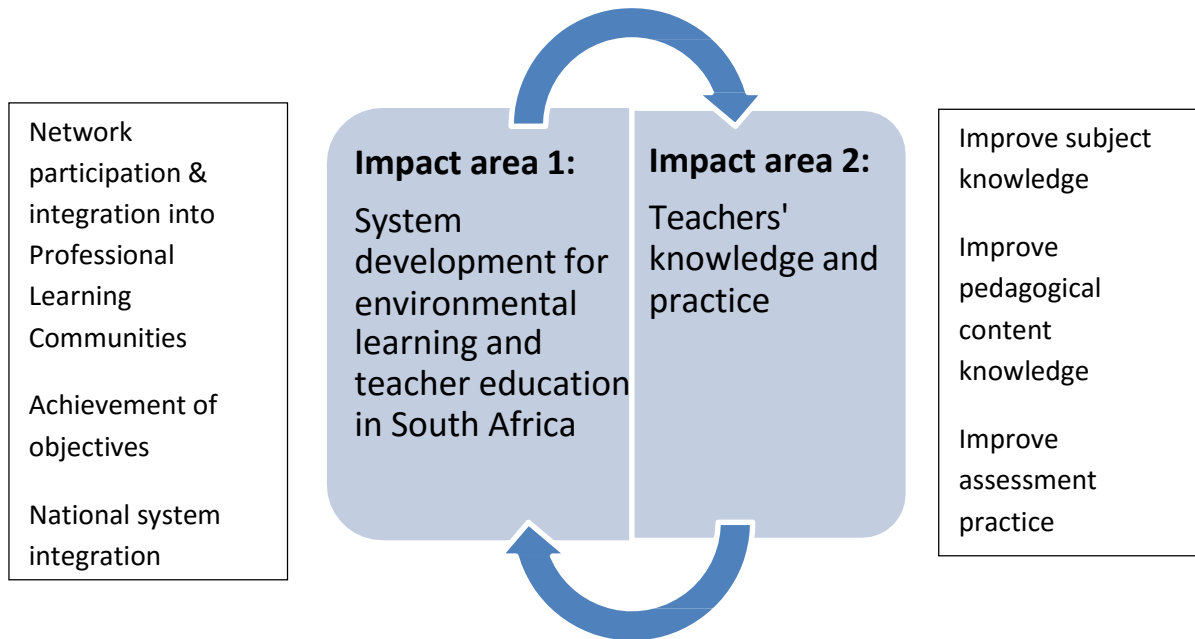


Figure 5.2 Fundisa monitoring and evaluation impact areas

Impact area 1: System development for environmental learning and teacher education in South Africa

This area monitors and evaluates the following:

- *Capacity building:*
 - use of Fundisa for Change materials during Fundisa for Change training
 - SACE endorsement of Fundisa for Change training materials
 - Number of trainers and participants trained annually
- *Policy and advocacy:*
 - Integration of the Fundisa for Change training programme and materials into the Department of Basic Education and the Department of Higher Education and Training's system of Teacher Education.
- *System of engagement:*
 - Number of institutions of higher education actively participating in the Fundisa for Change programme activities, for example, authoring training materials, facilitating training and offering certificates to Fundisa for Change short course participants.

- *Curriculum review:*
 - integrating of environmental learning into the national school curriculum to inform curriculum reviews. (Fundisa for Change 2013a)

Outcomes from this component of the monitoring and evaluation seek to:

- inform ongoing system development for environmental learning and teacher education in South Africa; and
- provide insights to partner organisations involved in the programme on the validity and value of their investment in the Fundisa for Change partnership programme.

Impact area 2: Teachers knowledge and practice

This component of the monitoring and evaluation evaluates the extent to which the Fundisa for Change influences and/or improves teachers' knowledge and practice. It addresses the following questions:

- If and how the Fundisa for Change programme is improving teachers' knowledge?
- If and how the Fundisa for Change programme is improving teachers' practice?
- What contextual factors influence teachers' engagement and success in the Fundisa for Change programme?

The outcomes of this component of the monitoring and evaluation provides the Fundisa for Change partners' implementing organisations insights into the extent to which the programme is achieving its main objective of enhancing environmental learning through teacher education (Fundisa for Change, 2013a).

Some of the data that the programme generates to answer some of the monitoring and evaluation components is from questionnaires completed by Fundisa for Change implementing partners and beneficiaries after Training of Trainer workshops and short course training sessions.

The next section focuses on what has been achieved by the Fundisa for Change programme thus far under each of the sub-objectives.

5.6 Phase 2: Programme implementation

5.6.1 Objective One: Capacity development

The capacity development objective includes three aspects: the development of Fundisa for Change teacher education training materials, the building of capacity of the Fundisa for Change implementing partners and the training of teachers and subject education specialists who are the beneficiaries of the Fundisa for Change teacher education programme. This objective aims to strengthen the schooling system through producing *‘capable teachers, a coherent curriculum and high quality learning materials to resource the foundations of further learning and participation in the environment, global change and biodiversity Human Capacity Development pipeline’* (Fundisa for Change 2013a, p. 5) [emphasis added].

5.6.1.1 Fundisa materials development

Fundisa partners developed teacher educator materials for use during Fundisa training. Three generic orientation materials and ten subject specific modules materials have been written collaboratively by Fundisa for Change partners (see table 5.1 & 5.2).

Authors were given writing guidelines that stipulated how the materials should be structured (Appendix 13). Key to the development of the materials was the teams of authors that worked together. Teacher educators from universities worked in collaboration with environment sector partners to provide up-to-date perspectives on environmental concerns for teachers. Each subject specific module is for a phase but highlights grade specific content knowledge. Each module covers subject content knowledge and concepts, teaching methods and assessment and provides links to other resources that can be obtained online. The modules extend what is the curriculum and in textbooks. It is termed as a CAPS plus (CAPS ++) approach. This approach orientates teachers to a wider knowledge scope than the minimum requirements specified in the CAPS national school curriculum. The approach would still prepare teachers to teach CAPS effectively (Lotz-Sisitka, 2011).

Additionally, the materials were constructed so that each module would extend what was offered in textbooks; and so that it could support teachers to extend and work critically with textbooks (Fundisa for Change, 2011). Good resource materials are one way of addressing teachers’ and learners’ shortcomings in content knowledge and concepts related to environment and sustainability content knowledge highlighted in Table 1.1 in Chapter One. One recommendation in the grade 12 diagnostic reports (see section 1.4.1) to address shortcomings in subject content knowledge is for teachers to read more widely on the topics they need to

teach by referring to more than one textbook and by keeping up to date with current trends in their subjects (South Africa. DBE, 2015).

The analysis of South African CAPS curriculum was a starting point for the development of the Fundisa for Change training materials. This exercise was done to identify the environment and sustainability content specified in the different subjects in the different grades (Lotz-Sisitka, 2011).

The CAPS review by the Fundisa partners showed the following:

- There was coverage of environment and sustainability topic in varying degrees in different subjects (see 1.4.1 in Chapter One).
- Engagement with these topics requires both global and contextual knowledge to enable meaningful acquisition of knowledge.
- The focus in these topics is on environmental issues which neglects a focus on the core concepts necessary for understanding the issues in ways that will lead to social innovation to address those issues.
- The environmental and sustainability topics create opportunities to engage with them in ways that speak to the knowledge practices specified in DHET's minimum requirements for teacher qualifications (see section 1.4.2 in Chapter One). (Lotz-Sisitka, 2011)

The results from the CAPS analysis influenced the principles and guidelines that were shared with partners on the development of the Fundisa for Change training materials. The aim was to produce a training programme that would firstly, align with CAPS but expand it to allow teachers to not only teach the minimum content specified in CAPS but also have competence to critically engage and expand the content knowledge in their teaching, and secondly, align with teacher education policy in ways that would lead to a critical engagement with the complex nature of knowledge associated with socio-ecological conditions (Lotz-Sisitka, 2011).

The development of the Fundisa for Change materials also played an advocacy and system building role. Additionally, the materials strengthened the conceptualisation and implementation of the programme. This emerged during a focus group interview. On being asked about the role of the Fundisa for Change materials in Fundisa for Change training, one of the respondents in a focus group interview stated:

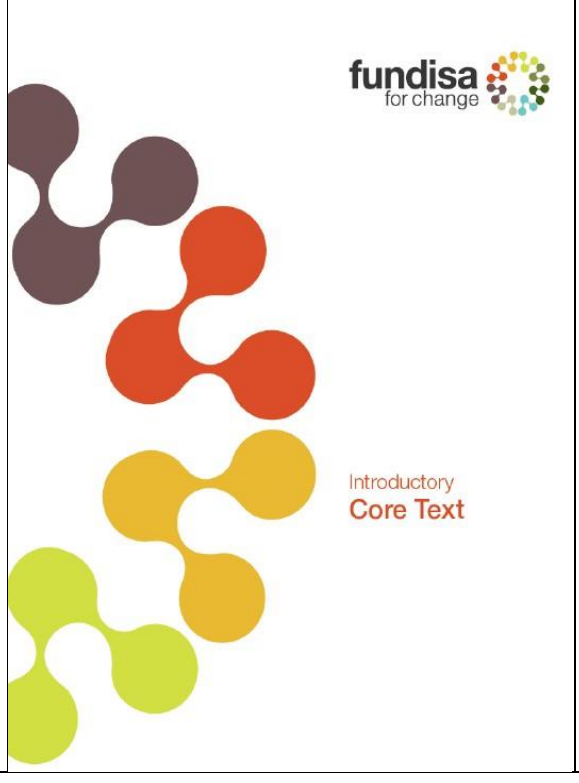
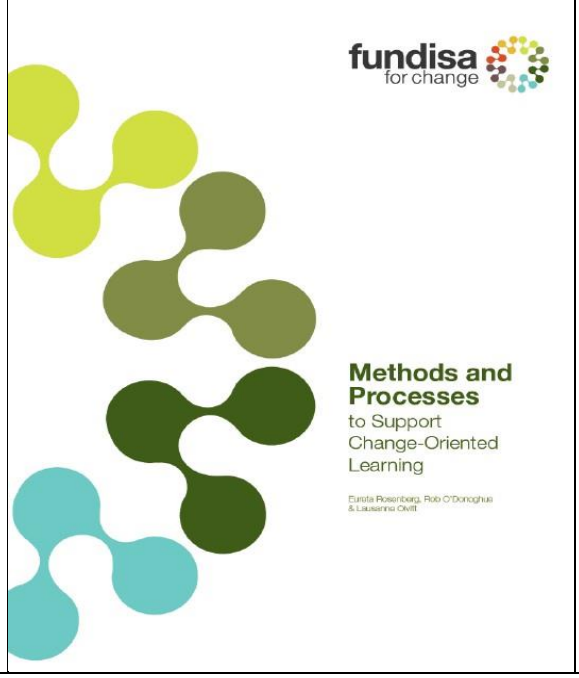
I think they [Fundisa for Change materials] are core to the whole project. We made the decision to start with the materials. It produces the conceptual capital with which people

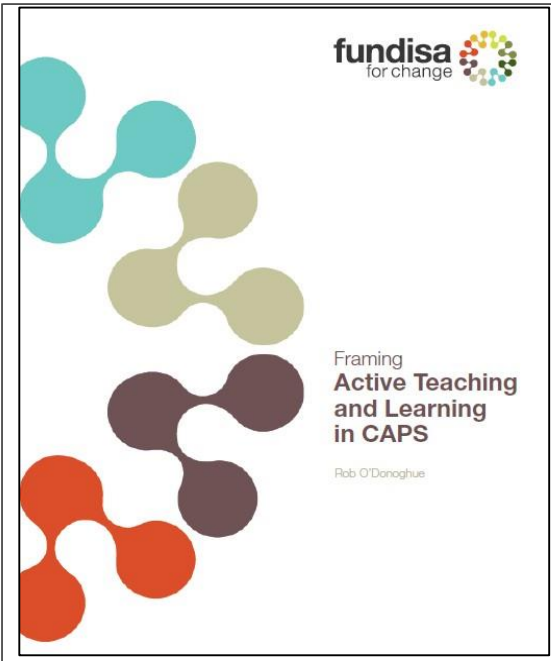
can work. We developed that model of focusing on the knowledge, teaching and assessment (see Figure 5.5). Without the materials the programme would not have materialised and we took the decision to have them co-operatively authored across institutions for collective conceptual capital. Even though the materials are not perfect, they have been pertinent in making the programme visible. People feel they have contributed. I think they have been critical. (FGP1)

The materials have been developed co-operatively and the Fundisa for Change community of practice may use them in other programmes. The materials are regarded as ‘common property’ within the Fundisa for Change network due to the way they have been produced and are used for non-profit educational purposes only, unless an agreement otherwise has been made with the co-ordination office (Fundisa for Change, 2014).

The three Fundisa for Change generic modules (*Introductory Core Text, Methods and Processes to Support Change-Oriented Learning* and *Framing Active Teaching and Learning in CAPS*) are generally used in all the Fundisa for Change training sessions, albeit differently depending on who is facilitating the training. Table 5.1 below shows the generic modules cover and briefly describes the content of each module.

Table 5.1 Fundisa for Change generic module content

Module	Content
	<i>Introductory Core Text</i> Introduces the Fundisa for Change programme and the training framework
	<i>Methods and Processes to Support Change-Oriented Learning</i> Shares some examples of teaching methods and processes to support change-oriented learning towards better environmental sustainability practices.

	<i>Framing Active Teaching and Learning in CAPS</i> Provides a framework for thinking through knowledge, teaching and assessment for a whole school approach to environment and sustainability education.

There is diversity in how each facilitator runs the training. The facilitators are not expected to implement the course in exactly the same way, neither are university partners expected to brand the short courses as Fundisa for Change short courses. They are expected to acknowledge the materials and the conceptual framework of the programme with appropriate references, as reflected by the following excerpt from a Fundisa for Change document:

Joining the Fundisa for Change network does not imply that implementation partners should follow a set of standardised training methods and techniques. However, partners are expected to draw on and work with the underlying conceptual framework of Fundisa for Change as embodied in the core Fundisa for Change materials. (Fundisa for Change, 2014, p. 3)

Interviews with Fundisa for Change partners revealed that the partners are aware of this protocol on how to implement the Fundisa for Change programme:

A course like Fundisa for Change is not a textbook and should not be run as a textbook. It won't have same impact with someone who just reads it. A good facilitator makes a big difference in how it is implemented. The Fundisa for Change community understands that it is not dissimilar even though it is implemented differently by partners. (IP1)

The co-ordination function is to establish the building blocks and then encourage partners to work with the framework in their institutions. That is why we have been careful not to be prescriptive. Institutions are doing it (the accreditation) on their own

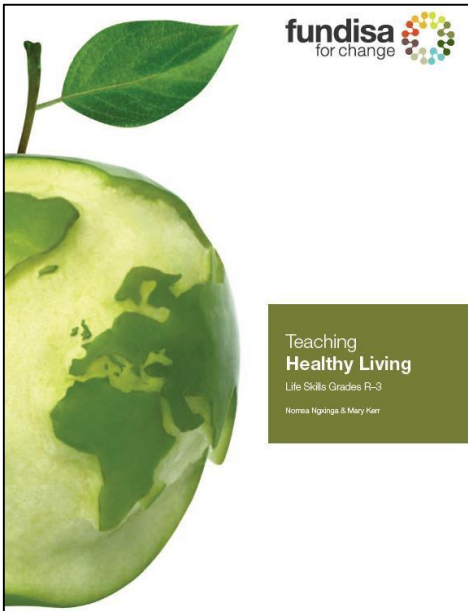
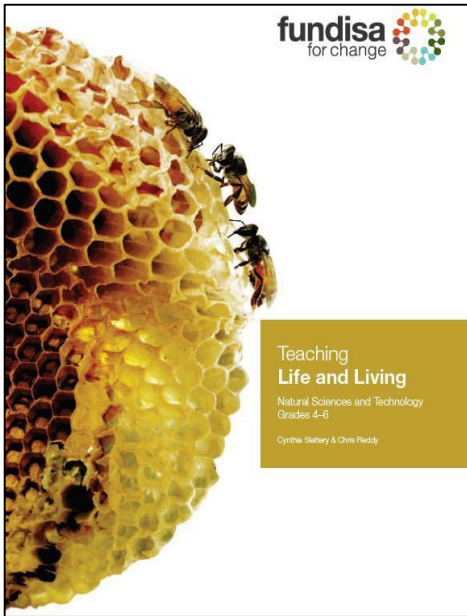
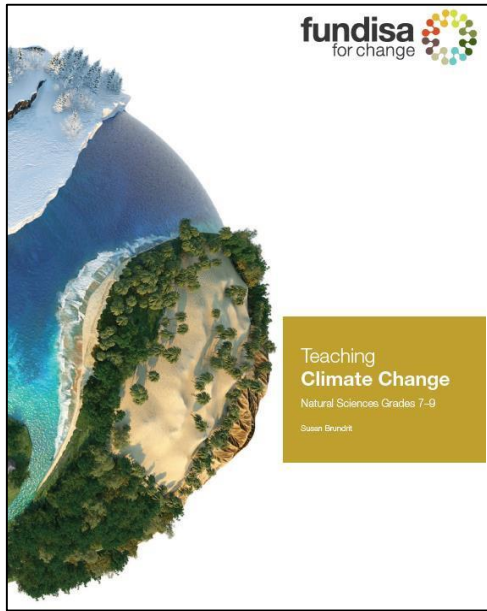
terms but they are using the Fundisa materials, but we are not prescribing to institutions to do it exactly the same way. You see, universities do not function like that; they are autonomous and work independently. They [universities] work within the national teacher qualification systems framework. It is not about achieving uniformity but for a community of practice to take up. It is a complicated strategy but it is a strategy that would increase impact and take up. (FGP1)

Facilitators work with the training programme in context and respond to contextual factors when they implement the programme. In 2015 a Fundisa for Change facilitators' guide was developed to assist facilitators in the planning and delivery of the Fundisa training programme. The facilitators guide is accompanied by supporting documents and assessment tasks.

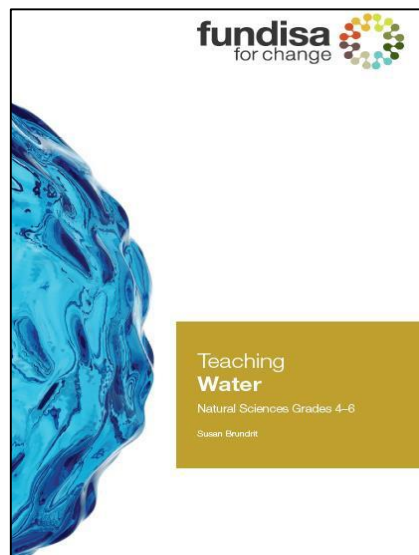
The materials were launched in 2014 by the then Deputy Minister of Environmental Affairs at the first Fundisa for Change conference.

Most of the materials have been used in Fundisa for Change training across the nine South African provinces. The table below (Table 5.2) shows the materials that were used during training, who was trained and where.

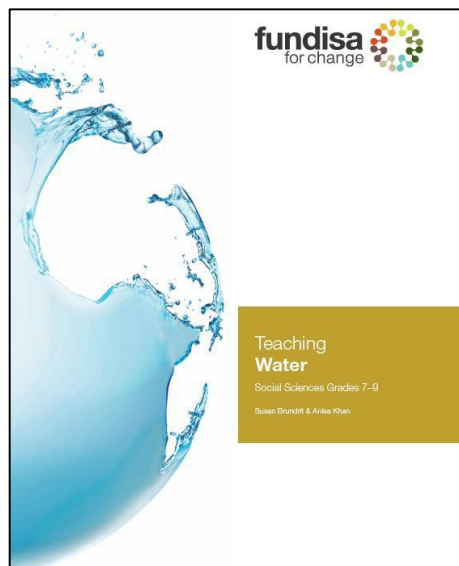
Table 5.2 Modules used in training with participants in different provinces

Modules		
Healthy Living – Life Skills Foundation phase Senior education specialists - Limpopo 	Life and Living – Natural Sciences & Technology intermediate phase Teachers - KwaZulu-Natal 	Climate Change – Natural Sciences Senior phase Teachers - Western Cape, KwaZulu-Natal, Gauteng, Free State, North West and Eastern Cape 

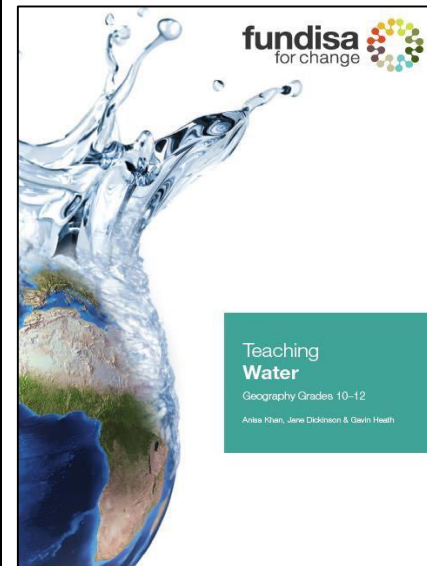
Water – Social Sciences Intermediate phase
Senior education specialists - Gauteng,
 Limpopo, Mpumalanga
 Teachers - Northern Cape

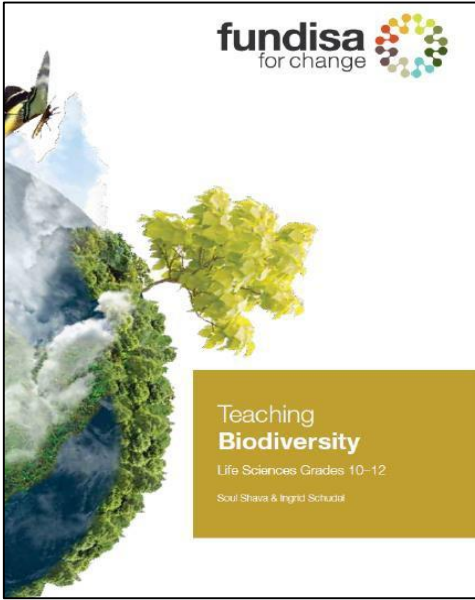
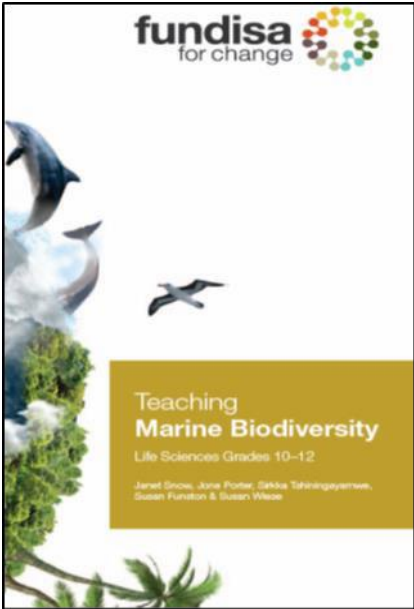
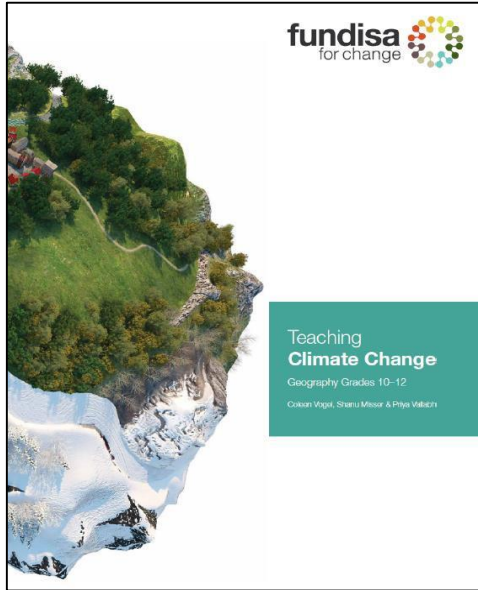


Water – Social Sciences Senior phase
Senior education specialists - Gauteng,
 Limpopo, Mpumalanga



Water – Geography FET
Teachers - KwaZulu-Natal



Biodiversity – Life Sciences FET Senior Education Specialists - Gauteng, Limpopo Teachers - KwaZulu-Natal, Eastern Cape, Mpumalanga, Western Cape, Limpopo 	Marine biodiversity – Life Sciences FET Senior Education Specialists - Limpopo Teachers - Eastern Cape 	Climate Change – Geography FET Senior Education Specialists – Limpopo Teachers - Northern Cape, Western Cape, Mpumalanga, Free State 

Only the ‘*Indigenous knowledge and technology*’ module for Natural Sciences and Technology in the intermediate phase has not been used in Fundisa for Change training as yet (at the time this research was conducted). All the Fundisa materials and the Fundisa for Change programme were endorsed by the South African Council for Educators in 2016 until 2019.

Usually only one subject and phase-specific module is used during training and participants who attend training are usually those who teach or support that subject in that phase. It was only during the training of Social Sciences Senior Education Specialists that both of the water modules (for intermediate phase and the senior phase) were used during the training. This was because all the provincial Social Sciences Senior Education Specialists were invited to attend the training in the three provinces (Gauteng, Limpopo and Mpumalanga) and some of them support teachers across the two phases. Each Fundisa for Change module covers three components, the content, teaching and assessment of the content. They all have activities that can be done during training. Each module shows the links between the content covered and the national school curriculum (see Appendix 14), indicating in which grade and phase the content can be taught. Some of the modules have a glossary page that defines concepts while other modules define the concepts in text. All the modules have links to other resources that can be used during training and links to resources that participants can use to extend their knowledge. This is a common feature in the modules because it is a brief that was specified to module authors.

5.6.1.2 Training of Trainers

Fundisa for Change partners who want to implement Fundisa for Change short courses and/or continuous professional development activities are required to attend at least one Fundisa for Change Training of Trainers session (Fundisa for Change, 2014).

The Fundisa for Change programme runs Training of Trainers for its partners (institutions of higher education, environmental educators from NGOs and state government officials). There were four provincial Training of Trainers in 2013, covering seven provinces (Limpopo, Mpumalanga, Western Cape, Northern Cape, Eastern Cape, Gauteng and KwaZulu-Natal) with 103 participants trained. Although questionnaires were completed by participants in 2013, they were not analysed as they were not part of this study.

A 5th Training of Trainers workshop was held in 2014 and it occurred during the period of the study's data generation. This ToT was attended by 45 participants but only 21 participants completed the evaluation forms at the end of the three-day training (9 environmental NGOs, 3 DBE officials and 9 HEIs representatives).

The aims of the Training of Trainers' workshop (as specified in the Training of Training programme) were to:

- Share the main objectives of the Fundisa for Change programme,
- Share the Fundisa for Change training framework,

- Share reflections and experiences from previous training,
- Orientate partners to the Fundisa for Change materials, and
- Have provincial clusters to use the Fundisa for Change materials to plan and develop a teacher training framework on their chosen Fundisa for Change subject specific module.

The training frameworks were developed in preparation for a national rollout of the programme for a three-year period (2014–2016). Provincial partners planned training programmes for participants in their provinces (see Figure 5.4 below).



***Figure 5.4** Partners planning provincial training during Training of Trainers’ workshop*

Data generated from the 2014 Training of Trainers’ questionnaires is categorised according to the following themes: **best part of the training, suggestions for future Training of Trainers’**

workshops, overall impression of the Training of Trainers’ workshop. Results categorised in Table 5.3 below are based on partner affiliations. Statements chosen capture what more than 50% respondents from each group noted.

Table 5.3 Questionnaire responses evaluating the 2014 Fundisa for Change Training of Trainers’ workshop (19 responses from 45 participants)

Partners Themes	Non-Governmental Organisation	Department of Basic Education	Institutions of Higher Education
Best part of the training	Develop framework for teacher training	Development of a framework for a teacher training	Deliberation and getting to know provincial partners
	Provision, access to and working with Fundisa materials (modules)		
Suggestions for future Training of Trainers’ workshops	More time to engage with materials and trainers could do or try out some of the activities in the units to better prepare for the training	All people to be thoroughly informed beforehand	More time to explore and critique the course materials
	More time to be allocated for engaging with materials		
Overall impression of Training of Trainer’s workshop and the Fundisa for Change programme	Effective way to help teachers find more effective ways to teach environmental issues found in the curriculum	Worthwhile course in the education system	Support teachers to teach environmental knowledge in relevant ways
			A professional learning community of experts in environmental education that aim to strengthen environmental education for transformation

From the table above, one can see what different partners value in a Training of Trainers’ workshop, both NGO and DBE partners predominantly appreciated the collaborative development of a teacher training programme. This could be attributed to the fact that both these groups support teachers on the ground. University partners, as lead agents in teacher professional development, are used to working with both the theoretical and practical aspects of teacher professional development in teacher education programmes and may not need

support in designing courses. Rather they value the sharing of ideas on how synergies can be developed between what they do as academics and what teacher supporters do on the ground.

Suggestions by participants regarding engaging more with training materials is an issue Maila (2003) had highlighted, indicating that resource materials that are made available to subject education specialists should be mediated so that subject education specialists can use them with confidence when they train teachers.

According to the Fundisa for Change *Introductory Core Text*, the Training of Trainers is aimed at supporting teacher trainers to prepare teachers to work with environmental and sustainability content knowledge specified in the CAPS curriculum. This is so that teachers can contribute to building a just and sustainable society (Fundisa for Change, 2013a). The overall impression participants shared about the 2014 Training of Trainers' workshop seems to suggest that the training to some extent succeeded in achieving this aim.

Lotz-Sisitka (2011) stated that Training of Trainers programmes should engage with the wider emergence of environmental education and its uptake in regional and national spaces. She argued that it is important for teacher educators to understand how the historicity of the emergence of this field of practice and the global imperatives, have shaped the South African curriculum landscape, the social knowledge landscape and the implications for all levels of the education sector. Thus, teacher development training programmes should not only interpret environmental teaching and learning in single subject context(s). As already stated above (see section 5.3), there has been a gap in building the capacity of teacher educators to support teachers with teaching and learning of environmental and sustainability content knowledge. "The focus in Training of Trainers' workshops is on teacher educators because of the absence of adequate responses to the environmental content in the teacher education system" (FGP1).

The Fundisa for Change programme argues that few teacher education institutions in South Africa have responded adequately to the integration of environment and sustainability into their curricula. Particularly with reference to giving necessary attention to pedagogical content knowledge and the new environmental content knowledge specified in the South African national school curriculum (see section 1.4.1). A key challenge that has been identified is the fact that environmental education is not a subject in the national school curriculum but rather a cross-cutting principle and content area in the curriculum. As a result, small scale NGOs have provided support in this area but those initiatives have not had the desired systemic impact.

Some efforts in this regard, according to Fundisa for Change, have been small, fragmented and uncoordinated and as such, lacked sustained impetus and impact. The programme predicts that a strong response to the integration of environment and sustainability development knowledge can have a significant improvement of education quality and relevance in South Africa. Additionally, supporting integration of environmental education into teacher education is critical for developing environmentally literate South Africans thus strengthening public participation in environmental and sustainability practices as envisaged by the South African 1996 Constitution (Fundisa for Change, 2011).

Stakeholders that support teachers are valued in the Fundisa for Change programme as each stakeholder brings their expertise into the programme, as reflected in the interview data:

Training of Trainers' workshops are designed to support all the partners to be able to run teacher training programmes but the focus is more on building the capacity of teacher educators as they are expected to lead the training programme. Environmental NGO partners are also supported because they support teachers on site but are not mandated to be teacher trainers. That role is for teacher educators and subject education specialists. (FGP1)

Many of the NGO groups do not have qualifications that are needed to provide teacher education. There are teacher educators also who are not qualified teachers but have teacher education expertise. That is why we differentiate between accredited training. Although everybody attends a Training of Trainers' workshop, but that must not be assumed that they can lead accredited training. That must be done within a clustered system with teacher educators or subject advisors. (FGP1)

The Fundisa for Change programme follows a collaborative model for training participants and partners value this model due to diversity of expertise in the different sectors that support teachers, as reflected in interview data;

Some partners have the environmental understanding but need to work in partnership with teacher educators. (FGP3)

Hence we made that model to have NGOs, teacher educators and subject advisors and that has worked quite well, I think. (FGP1)

The ability to work with teachers is imperative, some [NGO partners] believe they understand teaching but it is not that easy. Teacher education is a different form of

education. It involves the ability to encourage teachers to support each other in their district meetings. (IP1)

Environmental sector partners, although not lead agents in teacher professional development, need to be supported in their work with teachers, as they tend to have more opportunities to support teachers and provide them with learning opportunities in environmental education in their work contexts (Mokhele, 2007). Mokhele also argued that there seem to be more opportunities created for environmental learning when there is a strong partnership between environmental NGOs, environmental governmental departments and the provincial basic education department. Provincial basic education departments, he explains, have limited capacity in environmental education (ibid.).

The Fundisa for Change Training of Trainers is seen as a system building component; building capacity for partners to roll out the Fundisa for Change programme. One of the Fundisa for Change partners had this to say about the purpose of the Training of trainers workshops:

Support facilitators to conduct training in different regions. I need to grow the number of facilitators ... it [Fundisa for Change training programme] needs to be done by people who understand it and can make it work. How we get people into that stage, having future facilitators attending the course, so they understand methodology that we use, reasons why this is being done, techniques we use which we take for granted, that teachers buy into it and use. (IP1)

The next section discusses the training of teachers and senior education specialists who support teachers in schools.

5.6.1.3 Training of teachers and senior education specialists

The training of participants started in 2012 when the programme was piloted. The national rollout of the Fundisa for Change training programme started in 2013 for both teachers and subject education specialists. The facilitation of the training was across different environmental NGOs and university partners. Fundisa for Change participants receive certificates on completion of a Fundisa for Change training short course. Four Fundisa for Change universities have been able to provide short course certificates for participants from 2014–2018. The table below (5.4) shows Fundisa for Change training offered to teachers and senior education specialists since the programme was piloted in 2012.

Table 5.4 Number of teachers and senior education specialists trained from 2012 - 2018

Participants	Number of participants	Module
Senior Education Specialists	58	Water (intermediate phase) Water (senior phase)
	41	Biodiversity
	21	Marine Biodiversity
	32	Healthy Living
	20	Climate Change (FET)
Teachers	181	Biodiversity (FET)
	277	Climate Change (Senior phase)
	119	Climate Change (FET)
	12	Marine Biodiversity
	14	Life and Living
	90	Water (intermediate phase) Water (senior phase)
	11	Water FET

The course structure of the Fundisa for Change training programme focuses on enabling teachers to know their subject content, particularly the environmental and sustainability content knowledge embedded in their subjects. Fundisa for Change assists teachers to ‘bring out’ and expand the environment and sustainability content knowledge specified in the curriculum. Additionally, the Fundisa for Change programme recognises the importance of enabling teachers to use a variety of teaching methods to mediate learning and to assess learners. The 2013 Department of Basic Education grade 12 examinations diagnostic report recommended that interventions to support quality teaching and learning in South African schools should focus on the application of subject content knowledge and teaching practice (South Africa. DBE, 2013). The Fundisa for Change programme encourages teachers to extend the environmental content in the subjects they teach, in ways that will improve the school environment (Fundisa for Change, 2013b). The figure below shows the three aspects of teaching which the Fundisa for Change training programme covers.

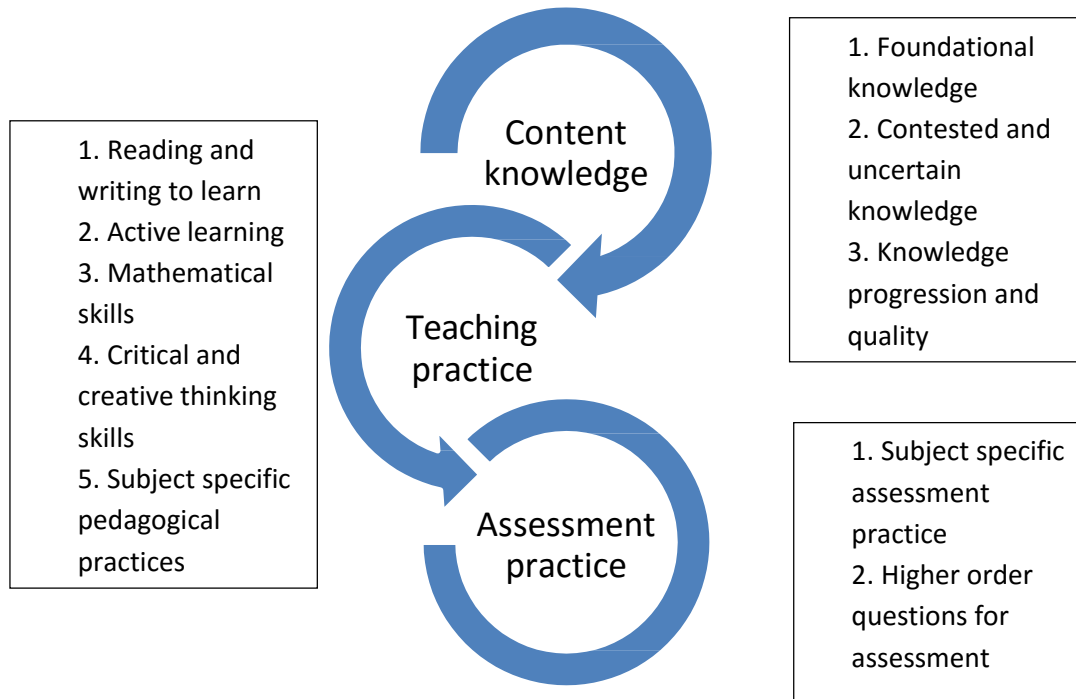


Figure 5.5 Fundisa for Change training course structure

The grade 12 examination reports on 11 key grade 12 subjects indicate that subject content knowledge, how content knowledge is taught and how learners are assessed are a challenge in the schooling system. Some of the issues highlighted in the 2015 grade 12 examination report are:

- Deficiency in understanding specific subject-content is probably caused by shortcomings in teaching strategies used by teachers, lack of content knowledge on the part of teachers, or by teachers neglecting to cover the entire curriculum;
- Reading skills of candidates and their inability to decode the requirements of a question strongly correlate;
- Candidates had difficulty in correctly interpreting cognitive verbs used in a question, responding to data response questions, understanding and applying the correct terminology where required;
- Candidates lacking mathematical or calculation skills are disadvantaged – this adds to the complexity of them responding to more cognitively demanding questions;
- Poor quality of answers even in lower-order questions suggests that some of the candidates were not adequately exposed to the relevant content, confirming the trends observed in the Annual National Assessments (ANAs) in lower grades; and

- Many learners lack basic understanding of concepts which are the prerequisite for higher level thinking. There is a lack of proficiency in dealing with analytical, evaluative or problem-solving questions. This indicates that teachers might be neglecting to cover basic concepts effectively in the process of progressing to higher-order aspects of topics, and are not providing learners with sufficient practical experience in applying higher cognitive skills in class activities. (South Africa. DBE, 2015).

The education sector, particularly the support structures responsible for quality teaching and learning, is expected to take cognisance of examination diagnostic reports and show how the reports will inform future plans to improve quality teaching and learning in South African schools (Motshekga, 2016). All stakeholders involved in teacher professional development and capacity building are urged to reflect on the contents of examination diagnostic reports as they plan for the future (South Africa. DBE, 2013).

Programmes like Fundisa for Change or any other programme that aim to impact the school system need to draw on such reports and the curriculum to make informed decisions on how to provide intervention into the schooling system. The Fundisa for Change partners developed new teacher education training materials rather than use environmental education school curriculum materials that were already available. The decision to develop new materials was because of the new demands of a content- and assessment-referenced curriculum in the schooling system and teacher education policy requirements (Lotz-Sisitka, 2011). A focus on knowledge was also emphasised by Motshekga, noting that CAPS is a high knowledge curriculum with subject content knowledge and assessment at the core of curriculum implementation (Motshekga, 2016). This seems to have been a significant influence on how the materials were conceptualised in Fundisa for Change, as expressed in the excerpt below from a Fundisa for Change document:

Significant to this initiative is the commitment in this strategic planning framework to **content-rich, pedagogically sound continuous professional development courses for teachers** [emphasis in original]. It is to this end that this initiative has adopted an approach which develops **Subject directed exemplars** [Fundisa for Change training materials] that will be used as part of the Fundisa course process. (Fundisa for Change, 2012, p. 7)

The Fundisa for Change training programme works on a principle of ‘building quality teaching and learning’ in South African schools, with a focus on science, the environment, society and sustainability (Fundisa for Change 2013b, p. 2). The focus on three aspects of teachers’ work and the use of the CAPS curriculum as a starting point was a deliberate decision that was made when the programme was conceptualised. Fundisa for Change partners who were interviewed indicated that it was something they discussed during their initial meetings:

It was at a time when the curriculum was changing. We looked at the shortfall and we didn’t want to have it as an ‘add on’ but something that teachers could work with. We were seeing there was a massive short fall of environmental component in the curriculum. Content knowledge was imperative and the pedagogical methods and assessment was an issue. (IP1)

Due to the different expertise in the Fundisa for Change consortium, and the different levels at which they engaged with teachers, the conceptualisation of the training programme drew on people’s expertise, research and personal experiences. The Fundisa for Change programme partner meetings allowed partners to learn from each other, as reflected in an interview with a partner.

... gave us a thinking platform and background knowledge of previous research which people on the ground didn’t know or have access to. It is a useful way of doing collaboration because we have researchers; we have people drawing knowledge from previous research and people currently working with teachers on the ground. So we did not only have people but also organisations that worked with teachers. HEIs [universities] were currently doing research in in-service teaching. [we were asking] What are the current teachers dealing with at the moment? ...knowing that these teachers needed our support. (IP1)

Research on the integration of environmental content knowledge in the curriculum showed that there were challenges to how environmental education was approached in schools: “*research was showing that EE [environmental education] was something that was sitting outside of the work of the teacher*” (IP2).

The challenges that were identified in research informed the focus of the Fundisa for Change programme's course structure, as outlined by interviewees:

We had to think about how to make this [Fundisa for Change programme] more aligned to the system [schooling system]. The content [environmental] is there but it was viewed as external content and not core to a subject. There was that kind of perception. And I think that is one of the things that was emerging within the research studies. (IP2)

Critical questions that the partners had to respond to were; *“How can we actually work within the system, look at how we can support teachers' foundational knowledge, teaching practices and assessment practices in what they actually do?”* (IP2).

The Fundisa for Change partners had to find an approach that would bring out the environment and sustainability content that was already specified in the curriculum and support teachers to teach and assess that content.

Research by Maila (2003) in KwaZulu-Natal and North-West provinces in 2003 shows that environmental learning was perceived by teachers and subject education specialists as an ‘add-on’ and peripheral to other learning in school. Some of the teachers in Mpumalanga were reluctant to participate in the NEEP-GET project because it was after school and they felt they could not stay after hours to engage with something that was not core business of teaching and learning. In some cases, teachers did not see themselves as environmental education teachers, that role they felt should be given to teachers who teach Natural Sciences (Mokhele, 2007).

The issue of environmental education as an ‘add on’ might have been caused by the approach NGOs used when they introduced environmental education in schools. This was indicated by one of the Fundisa for Change environmental sector partners in an interview:

Where we were starting to work from was an issue, we were looking at our agendas and how we can bring them into the curriculum, whereas the Fundisa model was looking at the curriculum and on how to bring it out. We were all passionate and wanted to bring our own agendas into the curriculum which is good, but it was bringing tension to the teachers regarding what we wanted to do and what they had to do. The Fundisa for Change programme was to shift our gaze as environmental practitioners, add what is not there in the curriculum that is necessary. How do we focus in and how do we focus out? (IP2)

Working from the national school curriculum document that teachers are expected to

implement is critical for any programme designed to support teachers as this will resonate with teachers. During the pilot phase of the Fundisa for Change programme in 2012, participants in KwaZulu-Natal were empowered by working with the curriculum documents during the training. They were able to see the relevance of the training on environmental teaching and learning in the subjects they taught in their schools (Songqwaru, 2012). Additionally, the Department of Higher Education and Training, in partnership with the Department of Basic Education state that *“the development and the delivery of high quality, content-rich pedagogically sound continuous professional development courses for teachers should be strongly aligned to the content frameworks for a particular subject and phase”* (South Africa. DHET & DBE, 2011, p. 6). In supporting teachers to work with environmental and sustainability concepts, these should be done through working from within the subjects and phases that teachers teach. This involves a ‘bringing out’ of the environmental and sustainability focus embedded in the subjects (O’Donoghue, 2013).

Environmental NGOs seem to understand how important it is to work from the curriculum; this was shared by one of the Fundisa for Change partners:

It is not only teachers who want to participate [in the Fundisa for Change training programme]. People from environmental NGOs want to attend. Although I tell them it is more relevantly appropriate for teachers. They want more information, those who currently work with teachers now understand the significance of working with the CAPS curriculum; they have been working with teachers for a while. I don’t think we thought we will have to explain curriculum the way we do [When we run training] (IP1).

The Fundisa for Change programme puts emphasis on teachers acquiring foundational knowledge. Foundational knowledge comprises the core concepts and processes that are necessary for the understanding of environmental issues. Foundational knowledge, which includes an understanding of earth systems, ecosystems and life supporting systems, enables its carriers to make informed problem-solving decisions (Fundisa for Change, 2013a).

Another key focus of the Fundisa for Change training programme is on teaching strategies. Environmental learning requires use of a combination of various teaching and learning approaches that culminate into a consolidation process that provides opportunities for reflecting about alternative sustainability practices (Fundisa 2013a, Rosenberg, O’Donoghue & Olvitt, 2008).

Assessment is a learning process that enables teachers to know their learners and to identify the kind of learning support they need. Assessment also helps learners to monitor their own performance. According to the Fundisa for Change programme, assessment in environmental learning should assess active action-centred, critical, creative and situated approaches to learning. Thought should therefore be given to how assessment is used to assess these kinds of approaches to learning (Fundisa for Change, 2013a).

A focus on subject content knowledge, teaching methods and assessment is perhaps what makes this programme different, a view held by one of the Fundisa for Change partners:

Working from DBE [Department of Basic Education] requirements in terms of curriculum, we speak to topics that are in the curriculum and a need for creative, critical and active learning approaches. Fundisa has spoken to that particular pedagogical call, and to higher order thinking in assessment. It's about the strong relationship with curriculum and departmental needs linked to quality education. (IP2)

Assessment is at the core of the South African national school curriculum. The Department of Basic Education diagnostic reports, that interpret grade 12 learner performances, show that learners struggle to interpret and respond to higher order questions. The reports also indicate that learners cannot be expected to apply higher order thinking skills when they have not developed confidence in middle-order application processes (South Africa. DBE, 2013 & 2015). The incorporation of higher order questions into learner assessment tasks is intentional. The increase in cognitive rigour through an increase in higher order assessment questions across all subjects is a means of improving the quality of teaching and learning in South African schools (Motshekga, 2016).

Fundisa for Change programme partners realised that they would have greater impact if they worked together to plan and train participants. This model of having partners from the different sectors plan together and implement the training programme combines expertise of environmental NGO partners, Department of Basic Education officials and university partners. The importance and value placed in the collaboration was highlighted in the interview data:

we are all working in silos, trying to do the same things but at different levels; others put emphasis on practice while others were focusing on theory. How do we create something that we don't focus on only one aspect, bringing HEIs [universities] and environmental organisations, getting the best of what they do, together? That is one of the first things we conceptualised in the model. (IP2)

This model seems to work for some partners but not for all, as reflected in the interview data:

Me personally I would look at who will be the relevant partners and involve local partners of the areas, e.g. Eco-Schools in WESSA [Wildlife and Environmental Society of South Africa], HEIs and DBE. Look around to see who are the people who are likely to support. In the sessions I ran I made sure I involved different partners, SANBI [South African National Biodiversity Institute], DEA [Department of Environmental Affairs] and other organisations. It has posed challenges and tensions in some cases. It worked when partners had funding and posed challenges where partners do not have funding. They [local partners] help with on-site support when we [programme facilitators] leave. They also provide resources during training sessions, for an example LEDET [Limpopo Department of Economic Development, Environment and Tourism] supported excursions in Mpumalanga, RandWater in Gauteng supported with excursions. They [local partners] become a link with the teachers and schools, providing additional support when we [programme facilitator] are not around. (IP2)

The issue of providing support to teachers on-site for continuity after the initial formal training session is critical. Maila (2003) identified that subject education specialists felt that ensuring success in environmental learning required that technical advisors of the NEEP-GET project provide regular on-site support to schools. Moreover, Reddy (2011) suggested that for teachers to be able to implement curriculum imperatives as defined in education policies, professional development programmes need to go beyond enabling teachers to learn new teaching approaches and content. He argued that to change teachers' current practices, there is a need for a revised process of professional development that includes continued support to teachers. This continued support would work best on site.

The capacity building objective, particularly the implementation of the short course, is discussed in Chapter Six, as it has its own objectives. Participants who have been beneficiaries of the course over the years often give positive feedback on the programme, as reflected below:

It made me to more aware of the requirements of the curriculum. I have studied and analysed the curriculum in depth. I have gained confidence in rolling out the curriculum. (2012)

The materials given will be of great use because I was never taught this topic; it will be of great help. (2012)

I have loved these workshops and it has been a ‘life-line’ for me as a first-time Life Sciences teacher. (2013)

I didn’t get an opportunity to thank you for the wonderful, informative and completely developmental workshop. Thank you very much for inviting our school to this excellent workshop. I have attended numerous workshops over the past 23 years and I have never gained as much as I have at these workshops. As a principal I teach very little, just a few hours per week, however these workshops have had such an impact on me that I am tempted to teach more. My approach to teaching natural science this year has changed so much as a result of the workshops that my learners are so enthusiastic and I have thoroughly enjoyed teaching these learners this year despite having such a weak class. I am hoping that we will have more workshops or sessions where you share your ideas on teaching learners in an innovative way. One can see that you are a very innovative teacher. A colleague sent me a message earlier saying that she was so fortunate to have been afforded the opportunity to participate in this workshop and she did say that she gained a lot. I would appreciate it if you could convey my appreciation to other facilitators as well for being part of our group and sharing their knowledge with us as well. Once again thank you for the fantastic workshop and I hope that we will have more workshops. I look forward to these. (2015)

5.6.2 Objective Two: Policy and advocacy

Fundisa for Change is a national resource established to influence policy by speaking with one voice to the Education Ministries through engaging with key players in those ministries (Fundisa, 2013a). Moreover, when the programme was conceptualised, the intention was to locate it within existing institutional frameworks that already provide continuous teacher professional development. This would ensure sustainability of the programme leading to wider adoption, expansion and implementation (Lotz-Sisitka, 2011). To achieve this, the programme partners had to engage with key policy forums and stakeholders. In 2011, the programme submitted a business plan to the national Department of Basic Education to have Fundisa for Change programme activities incorporated into the national system of professional development activities. The request was approved in 2013.

The Fundisa for Change programme’s focus on strengthening environmental learning received support from the National Environmental Skills Development Planning Forum. The forum supports initiatives that focus on the development of environmental skills. The Fundisa for Change programme is providing foundation building for the environmental skills pipeline in

the environmental sector, as well as providing quality and relevance contributions in the education sector (Fundisa, 2013b). To ensure longer term impact, the programme intended to ‘work systemically within a national system of engagement’ at teacher education and curriculum policy level (ibid.).

Fundisa for Change partners held meetings with the Education, Training and Development Practices Sector Education and Training Authority (ETDP SETA) and the South African Council for Educators (SACE) to ensure the integration of the programme into the national system of teacher education provisioning (Lotz-Sisitka, 2011; Fundisa, 2013a). ETDP SETA provides funding for teachers or aspirant teachers to register for short courses or qualification programmes. SACE ensures that professional development courses lead to the accrual of professional development points for teachers on successful completion (South Africa. DHET & DBE, 2011).

The Fundisa for Change programme is visible in national spaces. Two representatives of the Fundisa for Change programme attended a Professional Learning Communities colloquium hosted by the national DBE office, to present how the programme supports and strengthens teacher and subject education specialist professional communities provincially and at district level (Fundisa newsletter 3, 2015). The Fundisa for Change programme was also presented at a national consultation meeting held at the national DBE offices, at the launch of the Global Action Programme for Education for Sustainable Development (Fundisa newsletter 4, 2015).

Although the Fundisa for Change programme was approved by the Department of Basic Education at national level, uptake at provincial level has taken different forms. Fundisa for Change training has been implemented in all the provinces (see Table 5.2) and has been welcomed by provincial and district officials. Participation in and during the training has varied across the provinces and across provincial districts.

In Gauteng, the provincial Fundisa for Change partners held meetings with the provincial Gauteng Department of Basic Education in April 2014. The Gauteng DBE provincial office requested that subject education specialists (SEs) in the certain subjects (Life Sciences, Geography, Social Sciences and Natural Sciences and Life Orientation) be trained prior to the training of teachers to enable the SEs to provide adequate support at Fundisa for Change training sessions for teachers. The provincial DBE officials (Chief Education Specialist for

General Education and Training band and the Deputy Chief Education Specialist for Social Science) were actively involved in planning the Fundisa for Change training on water for intermediate and senior phase Social Sciences subject education specialists which was offered in 2014 (Misser, 2014). Due to funding challenges, the other subject education specialists have not been trained, as per the provincial request. This is an aspect that one of the Fundisa for Change partners reflected on in an interview:

In Gauteng we created the need but could not provide adequately because of the funding issue. Whilst we worked very hard on institutionalising the programme, because we did that, we actually got the department from top director level in Gauteng involved in conceptualising what they needed. We could not unlock the funding to get into the provision. We conceptualised what we need but could not unlock the funding for rollout. (IP2)

Advocacy is necessary to unlock provincial funding systems for a national rollout of the Fundisa for Change programme.

[There is a need to] look at more sustainable models of funding, getting funding from the system. It involves a lot of networking, and raises the profile of the programme in the right platforms. Put it in the national and provincial agenda. I think we have not networked adequately provincially. That has been the challenge. It is time consuming to network at a level that will make provinces see the value and get a request to come from the various provinces. Nationally we were given advice to engage more strongly provincially to unlock funding. It is not only about getting funding from DEA [Department of Environmental Affairs], though it might help to have a co-ordination hub in DEA (IP2).

Some Fundisa partners have taken up the advocacy role in their provinces. The Fundisa for Change programme is well received when the Department of Basic Education officials support it, as shown by the interview data:

I had a meeting with firstly DBE two years ago [2014]. There is more buy-in from DBE. We've got the buy-in from the national office but also from the local circuit offices and local training sectors. It seems to make a very big difference in that they then support teachers to be there and they don't mind them being there. There is no objection from the subject advisor; the subject advisor knows exactly what is going on. I think why we are getting a good response here; I think could be the support of the subject advisors.

They know what is happening, they know and understand what it is [the Fundisa for Change programme] and encourage [teacher] participation. Even the district manager knows what is happening and supports it and that plays a big role. The next step is for DBE to put money into it. The [DBE] official who had attended the [Fundisa for Change] launch is taking that role and that will assist. (IP1)

The role of the co-ordination ‘hub’ was to establish the core network and core resources for wider use by partners and to open pathways for access to funding for the rollout of the training programme. Partners can therefore use the Fundisa for Change banner to source funding for Fundisa related activities (Fundisa, 2014).

Fundisa for Change partners seem to be taking up the advocacy role differently in the different contexts and provincial responses have been different. More success seems to come when the person doing the advocacy is from the Department of Basic Education, advocating for the programme within the system in which they work. Limpopo DBE requested that the Fundisa for Change programme train subject education specialists in the following subjects: Life Skills, Natural Sciences and Technology, Social Sciences, Life Sciences and Geography (see appendix 26). The Limpopo DBE provincial office subsidised the training of the subject education specialists in four of the requested subjects. Only the Natural Sciences and Technology subject education specialists were not trained.

The Fundisa for Change programme co-ordination office appointed someone part-time, in the last six months of 2016 to lead the advocacy nationally and provincially, working in partnership with provincial Fundisa for Change implementing partners. It was suggested by Fundisa for Change provincial partners that the programme would make a significant impact if the co-ordination office did the advocacy work in partnership with provincial implementing partners. These sentiments were shared in an interview with one of the Fundisa for Change partners:

If X [a co-ordinator] were to come and present on her own they will say it is lovely but how do we implement? If X [co-ordinator] and Y [provincial implementer] who conduct the training [facilitate the Fundisa for Change programme], then they [Department of Basic Education] will know it is a project that is already running in our region. I think we are falling short there. (IP1)

It seems as if advocacy work is valued, particularly at district and school level as evidenced in the interview below:

It is important to do ground work with DBE at district and school principal level. Getting the region to understand what we are doing... We have potential to work more with subject advisors and teachers themselves. Work a lot more with regional and district DBE. That works well and makes a difference. (IP1)

As indicated in the data above, Fundisa for Change partners recognise the importance of advocacy to ensure sustainability of the programme and its institutionalisation into the teacher education systems and in government teacher professional development systems.

5.6.3 Objective Three: Build a national system of engagement

The Fundisa for Change programme is a national programme which implements training across the country, hence participants from all nine provinces are invited to participate in the Training of Trainers' workshops. The intention is to integrate Fundisa for Change and the Fundisa for Change training materials into existing and new teacher professional learning communities. To achieve this, the programme endeavours to build a national system of engagement through establishing a strong networking infrastructure that will enable integration of Fundisa for Change into the national system of teacher education and support (Fundisa, 2013b).

During the conceptualisation of the Fundisa for Change programme, the initial partners who were involved in the writing of the proposal, in response to the SANBI call, realised that there was a need to involve more partners to get systemic impact, as the interview data shows:

... we were doing similar things but not having the desired impact and we were working outside the field. We had not managed to become an institutionalised programme within the education sector. We were not having the desired impact that we wanted that is necessary. We wanted to be more institutionalised. (IP2)

... the realisation that all the activities that were happening were unlikely to impact the national system. So it was a national system focus... Run it [Fundisa activities] as a community of practice, get other universities involved. Establish building blocks and once we have that, have a system of decentralisation once we have building blocks in place... It was this idea of getting things in place co-operatively. (FGP1)

Building a national system of engagement was one of the key reasons for the establishment of the programme. There was a realisation that while there were good examples and practices in

teacher education for EE and ESD, these were small scale interventions with no systemic impact. Most of these initiatives were driven by NGOs and neglected in teacher education. The intention of Fundisa for Change was therefore to bring together existing experience from the different sectors involved in teacher education and support, to re-orient national capacity to support the environmental focus in the national school curriculum (Lotz-Sisitka, 2011).

Fundisa for Change sector partners have roles they are expected to play in this network structure:

- University and environmental sector partners are expected to contribute to conceptual guidance, materials development, training of trainers, training of teachers, evaluation and research.
- Additionally, university partners are also expected to provide teacher education knowledge and system support.
- Environmental partners are to provide relevant environmental sector networking support and environmental content knowledge.
- State and parastatal partners are expected to assist with policy sector engagement; funding of activities and support of training programmes; printing and distribution of materials (where possible); communication and network building support. (Fundisa, 2013b, p. 13)

One of the main activities that the Fundisa programme aimed to do to build a national system of engagements was to host annual conferences for teacher educators. This would be a platform to obtain synergy between teacher education institutions, the national teacher education policy system stakeholders, and environmental sector stakeholders who support transformative environmental learning and Education for Sustainable Development in South Africa (Fundisa 2013c). In February 2014, Fundisa hosted its first conference. The theme of the conference was *'Building a national system of teacher education engagement for transformative environmental learning and education for sustainable development'*.

In 2015 Fundisa held a symposium at the National Environmental Skills Summit and a seminar at the 25-year celebration of the Murray and Roberts chair at Rhodes University. These spaces created a platform for knowledge sharing, critical review of practice and evaluation of the work done; with a goal to strengthen transformative environmental learning through teacher education to which every stakeholder can significantly contribute, as reflected in the data presented below.

Fundisa for Change is a partnership-based programme founded on principles of

collaboration, transformative learning and evaluative review of practice in order to build a national system of engagement to broaden and deepen capacity for environment and sustainability education in South African schools. Working within a networked structure, as set up by Fundisa for Change, allows for greater synergy and potentially the national impact required by both national educational policy, and the national human capital development strategies for the environmental sector that led to the establishment of the programme. (Fundisa, 2014)

Fundisa for Change partners seem to appreciate the space that the Fundisa programme is creating for its partners in terms of capacity development, as reflected in the interview data:

It is a wonderful opportunity for teacher capacity development to be facilitated in a co-ordinated way. (EPQ)

It continues to be a reflexive project. One of the learnings we have done so far is to understand the CAPS curriculum better and to frame the way that environmental knowledge can be worked with in the curriculum. (FGP2)

I think we have established a very powerful teacher education agenda with CPD [continuing professional development]. It is a powerful model and the concept of teaching for change across universities with academics teaching other disciplines involved. (FGP1)

A positive unintended outcome is the strengthening of partner organisation capacity. It's a way for partners to strengthen what they were doing and finding opportunities to working more closely with the curriculum and working with the Fundisa programme. And I can say a lot of partners are actually finding that very valuable to be linked to the Fundisa for Change programme. (IP2)

The Fundisa for Change co-ordination office has also hosted seminars at five institutions of higher education, to orientate staff in education faculties and schools of education on the Fundisa for Change programme and to introduce the Fundisa for Change training materials. This was with a view of establishing a strong networking infrastructure in universities as they are the national institutions responsible for teacher education (Fundisa, 2013b).

The collaborative model of Fundisa for Change materials authorship is also a form of strengthening a national system of engagement and also advocacy for institutionalising the programme. Authors use the materials in other teaching they do in their institutions and/or

organisations.

Already five universities in the Fundisa for Change programme are currently using the Fundisa for Change materials in their teacher qualification programmes, for example, in the Bachelor of Education: Foundation – Senior phase, Postgraduate Certificate in Education and Bachelor of Education Honours.

5.6.4 Objective Four: Strengthen and review curriculum and learning and teaching support materials, especially textbooks

Textbooks are important resources in every teaching and learning space. The South African curriculum documents all indicate that each learner should have a textbook for the subjects they are learning. Carl (2009) argued that teachers select suitable and relevant textbooks to extend and develop the curriculum of the subject they teach. What is included and excluded in textbooks is of utmost importance as textbooks are still the primary source of content used by teachers (le Grange, 2008). In some instances, teachers work mostly with textbooks when they teach, rather than working directly from a curriculum document (Songqwaru, 2012). The Fundisa for Change programme requests that participants bring the textbooks they work in their work context when they attend training, *‘throughout the programme teachers will work with their particular curriculum statements and textbooks’* (Fundisa, 2013a, p. 9).

The Fundisa for Change programme reviewed curriculum and environmental learning through research studies that have been conducted. The programme received research funding for three years (2015 - 2017) from the National Research Foundation (NRF). The research programme explored the interface of situated learning and the acquisition of new disciplinary knowledge.

The aim of the research was the production of knowledge that will *‘strengthen the quality, progression and validity of existing curriculum knowledge and its representation in the national curriculum system’* as some of the studies *‘seek to deepen analysis of environmental content knowledge currently represented in the national curriculum system’* (Fundisa, 2013b, p. 7)

Work that came from the research has been shared at various conferences national and international conferences. Masters and doctoral theses, research papers and book chapters have been produced under the Fundisa research programme;

- BOOK: Lotz-Sisitka, H.B., Lupele, J., Shumba, O., & Wilmot, D. (Ed.s). *Schooling for Sustainable Development in Africa*. New York: Springer

- A total of eight book chapters in refereed books and three journal articles have been produced which emerged from or are related to the Fundisa for Change programme's objectives

5.7 Fundisa for Change programme in transition

Towards the end of the study, Fundisa for Change was entering a transition period where co-ordination was moved from where it had been hosted at Rhodes University from 2013 – 2016. Gauteng was chosen as central location to host the national co-ordination office. A planning meeting was held to decide on a strategic direction for the programme. All the sector partners (universities, government and environmental) were represented in the meeting. Some of the critical questions asked about the programme were (see also Figure 5.6):

- What is the relevance of the programme currently; has the context changed?
- What are the functional issues and challenges?
- Can the programme sustain itself with the current partnership or should more partners be brought in?

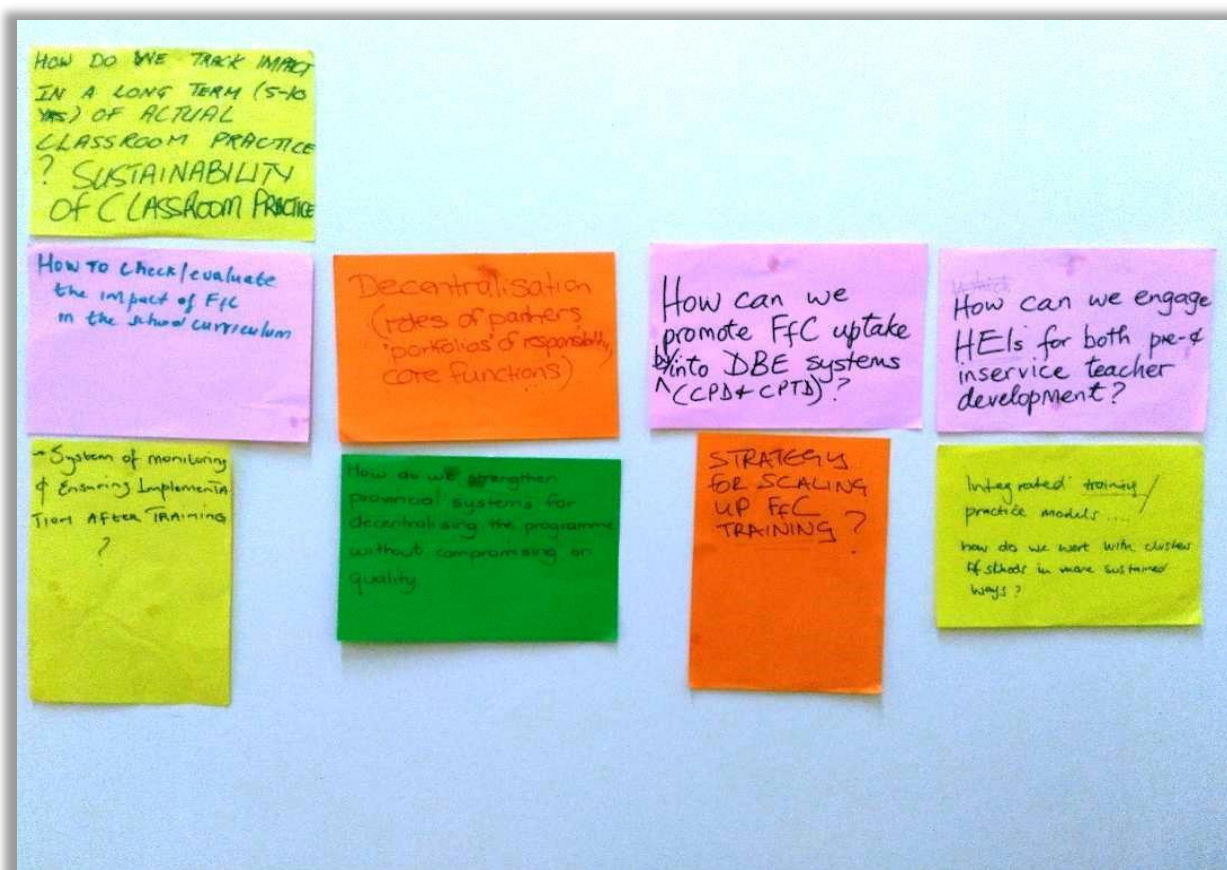


Figure 5.6 Questions posed at the Fundisa for Change strategic planning meeting in 2016

Some of the responses from the deliberations were:

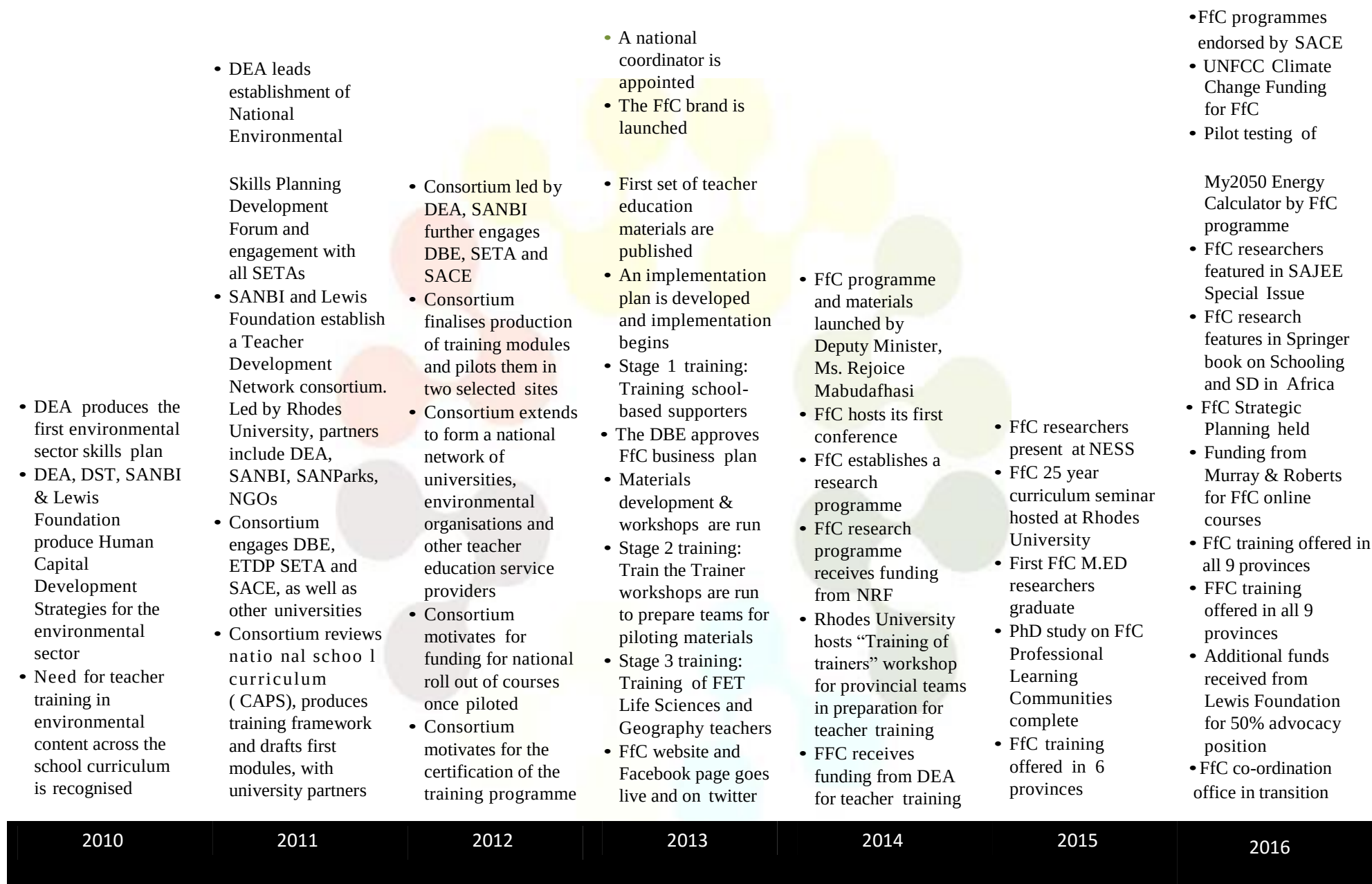
- Delivering the Fundisa for Change courses using blended methodologies (e-learning);
- Aligning Fundisa for Change work with national development mandates and Department of Basic Education core interests;
- Decentralise the programme and establish provincial nodes for ‘situated’ support for participants which will be led by universities;
- Strengthen advocacy for the Department of Basic Education to fund Fundisa for Change training; and
- Review of current materials and develop new ones for green economy.

What also emerged from the strategic planning meeting (see Figure 5.6 above) in addition to the questions noted above was a call to strengthen the evaluation, monitoring and research components of the programme to determine the impact of the programme in formal education systems.

5.8 Conclusion

This chapter focused on the context and rationale for the conceptualisation of the Fundisa evaluation of the programme. It further discussed the implementation of programme activities against programme objectives which are summarised in Figure 5.7 below. The next chapter will discuss the implementation of the Fundisa for Change short course training sessions.

Figure 5.7 Fundisa for Change activities timeline (2012 –2016)



CHAPTER 6: IMPLEMENTATION OF THE FUNDISA PROFESSIONAL DEVELOPMENT SHORT COURSE

6.1 Introduction

In the previous chapter, the Fundisa for Change Teacher Education programme was introduced. In this chapter, the focus is on the five sites where observations were made and on the implementation of the Fundisa for Change professional development short course. The chapter starts with discussing the objectives of the professional development short course. The chapter examines how the course was implemented to achieve the short course outcomes in five sites.

When participants attend training, they have assumptions about the programme and about the facilitators who implement the programme. These assumptions may be reflected in the reasons they give for attending a training programme. These assumptions will likely influence how participants engage with programme activities and programme facilitators. Additionally, facilitators themselves have assumptions about the participants who attend training courses. These assumptions are likely reflected in how facilitators engage with participants during the training and in the kind of activities they choose to include and exclude during programme implementation.

The education context across all the cases is similar in terms of the integration of environment and sustainability content knowledge in the teaching of Social Sciences, Geography and Natural Sciences. The differences in context in each case are described in detail and these include geophysical context of the venue where the training took place, the work experience of participants and their familiarity with working with environment and sustainability content knowledge as well as the facilitation of the training sessions.

This chapter presents the five sites where data was generated through interviews, document analysis and observation. Each site is presented separately in order to describe the context of each site and how it influenced outcomes that were observed.

6.2 Fundisa for Change professional development processes

The main aim of the Fundisa for Change teacher education programme is to support teachers to work with environment and sustainability content knowledge specified in the national school curriculum as well as support the teaching and assessment of that content. The training

programme seeks to broaden teachers' capacity to engage with socio-ecological concepts, issues and related sustainability practices. This is achieved through 'supporting critically reflective and applied practice in which new concepts and approaches are tried out and reflected on in classrooms' (Fundisa, 2013c, p. 1).

6.2.1 Professional development processes

According to one of the Fundisa for Change documents, the short course delivery process (taking cognisance of contextual factors) should ideally:

- Involve a partnership approach involving teacher educators in universities, Department of Basic Education officials (especially subject education specialists), teachers, environmental organisations and other key stakeholders (defined at cluster level);
- Be linked to processes that support Professional Learning Communities at district and provincial levels;
- Be a facilitator-led, interactive professional development programme that has a strong structure, with opportunities for teacher participation, practical and reflective engagement with concepts, approaches and ideas, informed by Teacher Professional Development research and best practices;
- Commit to, maintain and ensure the highest possible quality in Continuing Professional Development programme design, implementation and assessment through ongoing evaluation and reflection within a wider community of practice; and
- Contribute to a national system of evaluation which builds knowledge of Continuing Professional Development and environmental learning in the South African Schooling system (co-ordinated by the Fundisa for Change co-ordination 'hub'). (Fundisa, 2013c, p. 1)

The professional development programme is supported by Fundisa for Change teacher education materials, the three generic orientation modules (see Table 5.1) and the subject specific modules (see Table 5.2). The professional development course is run as a university short course training programme and implemented by institutions approved by the Department of Basic Education. The training programme is offered either as a six or a three credit short course. The training programme is endorsed by the South African Council for Educators (SACE) for six university partners and three environmental organisation partners. The three credit version of the programme is endorsed by SACE as a short course and the six credit is endorsed as a long course. The Fundisa for Change professional development programme can

also be integrated into formally accredited full qualifications in Higher Education Institutions within the Minimum Requirements for Teacher Education Qualifications Policy (Fundisa, 2013c).

6.2.2 Professional development course objectives

The objectives of the short course have been adapted from the Minimum Requirements for Teacher Education Qualifications policy. The policy explains that the standards have been set to ensure that the higher education system produces the kind of teachers the country needs (DHET, 2015). The policy has identified five types of knowledges that need to be acquired, integrated and applied by competent educators: Disciplinary Learning, Pedagogical Learning, Practical Learning, Fundamental Learning, and Situational Learning.

- *Disciplinary Learning* refers to disciplinary or subject matter knowledge (in the context of this study, this would be environment and sustainability content knowledge), which involves the study of education and its foundations, history of education; and the study of specific specialised subject matter that underpins teaching subjects or specialisations.
- *Pedagogical Learning* includes general pedagogical knowledge, which involves knowledge of learners, learning, curriculum, teaching methods and assessment practices and specialised pedagogical content knowledge, which includes knowing how to represent the concepts, methods and rules of a discipline in order to create appropriate learning opportunities for diverse learners, and how to evaluate their progress. It also includes Inclusive Education.
- *Practical Learning* involves learning in-and-from practice. Learning from practice includes the study of practice, being a reflexive practitioner to form a basis for learning in practice and learning from other's practices which is referred to as Work Integrated Learning (WIL). Practical learning is an important condition for the development of tacit knowledge, an essential component of learning to teach.
- *Fundamental Learning* in the South African context refers to learning to converse competently in a second official language, the ability to competently use Information and Communications Technologies, and the acquisition of academic literacies which lay the foundations for effective learning in higher education contexts.
- *Situational Learning* refers to knowledge of the varied learning situations, contexts and environments of education (classrooms, schools, communities, districts, regions, countries and the globe) as well as prevailing policy, political and organisational contexts. It involves learning both *in* context and *about* context. This

involves understanding the complex and differentiated nature of South African society and learning to work in nuanced ways with the diverse challenges faced by children in schools and the communities that they serve, for example, promoting inclusivity, and environmental sustainability. (South Africa. DHET, 2015).

The weighting of these knowledge types depends of the purpose of the learning programme.

Outcomes of the Fundisa for Change professional development course:

- *Subject Knowledge and Learning (Theory):* Show improved understanding of environment and sustainability subject knowledge in the context of a specific subject and phase [content knowledge].
- *Pedagogical Knowledge and Learning (Theory & Practice):* Show ability to use appropriate teaching methods and assessment approaches for specified subject knowledge, skills and values.
- *Situated Knowledge and Learning (Context):* Relate subject specific environment and sustainability content knowledge to broader issues and contexts.
- *Practical Knowledge and Experience (Work Experience):* Design, develop, implement and reflectively review a lesson plan / sequence of lesson plans relevant to an environmental and sustainability content focus in a particular subject and phase / grade. (Fundisa 2013c)

Assessment evidence expected (criteria can be adapted) as articulated for the Fundisa for Change programme:

- Evidence of acquisition and command of environment / sustainability subject content knowledge relevant to teaching in a particular subject and phase.
- Evidence of successful application of appropriate teaching methods and assessment strategies for the relevant subject knowledge (e.g. designing higher order questions for assessment).
- Evidence of being able to make situational connections between subject content knowledge, pedagogy, assessment and social-ecological issues and contexts and educational contexts integrated and reflected in lesson plans.
- Evidence of teaching a lesson and reflecting critically and constructively on practice. (Fundisa 2013c)

The criteria would be contextualised for subject education specialists for their specific professional roles and responsibilities (e.g. evidence of supporting teachers to reflect critically and constructively on practice or evidence of being able to support teachers to acquire a good command of environment / sustainability subject content knowledge relevant to teaching in a particular subject and phase).

The course outcomes are integrated in and through the Fundisa for Change professional development framework (see Figure 5.5) focusing on, know your subject, improve your teaching practice and improve your assessment practice (Fundisa, 2013c). The assessment of participants is through submitted tasks, evidence of classroom practice and materials, curriculum artefacts compiled into a portfolio of learning. Institutions have the flexibility to structure the assessment process. A recommendation is that workplace-based tasks be undertaken by participants as the programme has an intention to support applied improved practice (Fundisa, 2013c).

The next section provides an in-depth description of implementation in five sites.

6.3 Fundisa for Change training implementation

6.3.1 Site 1: Gauteng (*Teaching Water in Social Sciences in grades 4 – 9*)

6.3.1.1 Context

The training in Gauteng was hosted by two of the Fundisa for Change environmental partner organisations. The first session (four days) was at Delta Environmental Centre and the one-day follow-up session was at the South African National Biodiversity Institute, Walter Sisulu Botanical Garden. The focus of the training in both sessions was on ‘*Teaching Water*’. The provincial Department of Basic Education office decided who should attend the training. The training was attended by 14 intermediate and senior phase senior education specialists. All the provincial districts were represented at the training. The training was for five days, the first session was four days in September 2014 and a one-day follow-up session in October 2014. The participants had a self-initiated session in early October to work on the assignment tasks that formed part of the training for certification. There were a total of six facilitators in the five-day training period. Four of the facilitators were Fundisa for Change environmental sector partner organisations and two were Fundisa for Change university partners.

The main facilitator of the training has been involved in the Fundisa for Change programme since its establishment. She has co-authored one of the training modules and has been conducting Fundisa for Change training since 2012. She has been supporting teachers for the past 15 years when she was still a subject education specialist. She became involved with environmental education during the NEEP-GET project in the early 2000s and has been involved ever since.

Reasons for attending the training varied amongst the subject education specialists, but they were about learning, as reflected in the questionnaire data presented below:

- *I felt it necessary to attend the training in order to keep up to date with relevant content.*
- *Just to add to what I already knew and to learn new ways of teaching environmental education.*
- *I wanted to expand my knowledge of environmental issues.*
- *I wanted to learn new strategies that I can use in supporting teachers on curriculum delivery.*

The participant questionnaire, as discussed in Chapter Four (see section 4.6.2) has a section for participants' profiles. The table below gives an indication of the expertise and experience of participants. It is evident from the table (Table 6.1) that the majority of the subject education specialists have been supporting teachers for more than five years. It is also evident that most of them were quite familiar with the environmental teaching and learning that is specified in the national school curriculum.

Table 6.1 Participant profile questionnaire responses

Statements	Responses
Experience with supporting teachers	• 37.5 % had been supporting teachers for 2-5 years • 50% had been supporting teachers for 6-10 years • 12.5% had been supporting teachers for 10-20 years
Experience in engaging with environmental learning in the school curriculum	• 25% were very familiar • 62.5% were quite familiar with it • 12.5% had heard about it, but knew very little about it

A participant who had 6-10 years of experience in supporting teachers had very little knowledge about environmental learning in the curriculum (see Figure 6.1). This is surprising as environmental education has been part of the school curriculum since 1998 when environment was a phase organiser in Curriculum 2005. There was also a participant who has been supporting teachers for more than 20 years who was very

familiar with it.

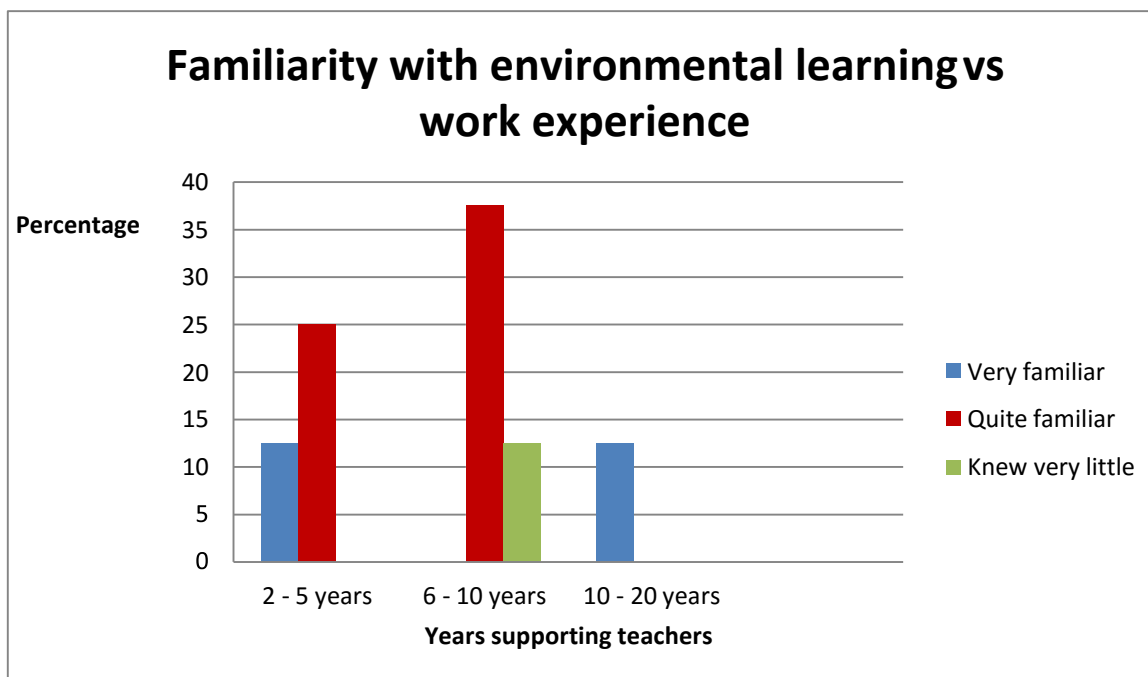


Figure 6.1 Familiarity with environmental learning in relation to work experience

I attended all the training sessions conducted in Gauteng. I wanted to observe how the Fundisa for Change training objectives were operationalised. Five Fundisa for Change modules were used during the training sessions, the three generic Fundisa for Change modules (see Table 5.1) and two Social Sciences water module for intermediate and senior phase (see Table 5.2). Additional resources on water were used by the facilitators during the training.

The first four days of training focused mainly on the three components of the Fundisa for Change course structure; subject content knowledge, teaching practice and assessment practice (see Appendix 15) and the follow-up day was focused on the portfolio task participants had to submit at the end of the training. The next section focuses on the implementation of the Fundisa for Change training programme. The discussion is for each day of the training and each day highlights the programme outcomes that facilitators wanted participants to acquire.

6.3.1.2 Delivery of the Fundisa for Change training to achieve programme outcomes

Day 1

The first activity after the introduction was for participants to illustrate in a diagram what makes up their environment. Participants were also requested to illustrate what they would rather see in their environment. Each participant had to present both their diagrams to the whole group. One of the things that came up during presentations was that their current environment drawings had negative things, for an example, depicting pollution and the future environment drawings showed a more ecological sustainable picture, for example recycling bins. What was highlighted was that people may know what needs to be done but may not do it. One notable contribution from a participant was that “*we should check what contributes to the gap between theory and practice*”. This led to a discussion on what education should look like if people want to move from what they see in their current environment and what they would like to see in their environments in the future. Some of the comments from the discussion are noted below:

We need education with action. (S1P)

Education should impart knowledge to create awareness but that has to be followed with activism. Wherein we do something with the knowledge we have. (S1P)

This kind of education should be taught to parents too. We can teach these things at school but when the children go home, they get home the parents are doing the opposite and that is contradicting and confusing. But if parents get the information it will work. (S1P)

The discussion highlighted that environmental teaching and learning should be engaged with both formally and informally for changes to be visible.

Participants were given a journal article titled, *Conceptions of Quality and ‘Learning as Connection’: Teaching for Relevance* authored by Heila Lotz-Sisitka, which they had to read overnight for discussion the next day. As they read the article, they had to have the following questions in mind:

- How do we teach for relevance at a time when the curriculum is specified?
- What is the role of education?
- What needs to happen in the education system to create an environment people want in the future?

After a quick orientation to the Fundisa for Change *Introductory Core Text* generic training module, the facilitator moved to subject content knowledge. The activities that followed focused on Fundisa for Change's training programme Outcome One:

Outcome 1: Subject Knowledge and Learning (Theory),

- Show improved understanding of environment and sustainability subject knowledge in the context of a specific Subject and Phase. Participants have to show evidence of acquisition and command of environment / sustainability subject content knowledge relevant to teaching in a particular subject and phase.

In order to support participants to achieve the first outcome of the programme, the facilitator requested participants to identify how water is represented in the national school curriculum documents. This activity gave the participants an opportunity to engage with the curriculum document in depth. The subject education specialists were asked to capture the main topic on water that they find in the Social Sciences Curriculum and Assessment Policy Statements (CAPS). They had to find topics on water that were represented in the curriculum. Participants worked in pairs to complete the task. The facilitator provided the curriculum documents for participants who had not brought theirs. Participants worked in groups and each group focused on a particular grade. The flipcharts that were produced traced water concepts from grades 4-9. One of the aims of the activity was to show conceptual progression across the grades, as reflected in the observation transcript data:

We will work with grade 4 – 9. I want you to be able to get a bigger picture. We need to scope the whole thing to know what concepts are covered in intermediate phase up to senior phase. Learners come from the intermediate phase to the senior phase with the same topics actually, so we need to scope the whole thing. It is nice to know even what you are not teaching. (S1F1)

The topics were captured, from grade to grade, on flipcharts which were posted on a wall. Participants had to identify similarities and differences across the terms and grades from the flipcharts. They had to justify what they identified as similar and what they identified as different. Participants had different opinions on how the concepts linked to each other, some saw explicit links whilst others saw the links as implicit. What also emerged from the discussion was that none of the subject education specialist had conducted workshops with teachers in their districts on the topic of water and its related concepts. The water topic was

recognised, after the activity, as a core topic in the curriculum, as reflected from observation data:

But you'll notice it is quite a big topic. (S1F1)

It is everywhere. (S1P)

What was also surprising was that some of the participants did not know that the water cycle was a topic in the Social Sciences curriculum. They had to look through curriculum documents to find that it was indeed a topic that had to be taught. What I also observed was that participants were explaining concepts to each other. The facilitator also introduced the importance of having foundational knowledge. She used the questions below to explain the importance of having foundational knowledge:

Can someone understand water pollution if they don't know how the water system should work? If someone does not understand the science of water or where water comes from can they understand the concept of water pollution? What can we do differently? (S1F1)

She emphasised that it is important to know this content in order to know how things have been in the water system, how they have changed and what needs to be done to make them work sustainably. She also highlighted that the approach to teaching about water is different from subject to subject as subjects have different aspects they emphasise, as reflected below:

In Social Sciences it is different how content on water is approached. It focuses on understanding the system, how it works and the science of it. How water is used, managed, abused and how it can be sustained and conserved. (S1F1)

The next activity was led by another Fundisa for Change environmental sector partner. The participants were taught the journey of a water droplet from a river through a purification system until it reaches residential areas. Visuals were used to help with the explanations. Afterwards participants in groups had to build up a water cycle from puzzle pieces and to use water cycle concepts to label a complete diagram of a water cycle (see Figure 6.2). The putting together of the water cycle puzzle was not a problem, challenges came when the groups had to put conceptual labels on the water cycle. Matching the visual water cycle process with the water cycle concepts was a challenge for some of the participants.



Figure 6.2 *Participants assembling a water cycle puzzle*

The next activity was led by another Fundisa for Change environmental sector partner. The participants were given a short presentation about the importance of water and water conservation, after which they were quizzed. Participants were split into two groups and they competed for points in an oral quiz. Generally, the groups did well, they were knowledgeable about local wetlands in their province and rivers in the country and water transfer schemes. To contextualise the knowledge, some of the questions were on water systems in Gauteng. Information on water was shared with participants during the quiz, the facilitator explained answers to participants even when they had been correct. This was a strategy that reinforced the content participants already knew but also filled knowledge gaps that possibly existed.

After the activity, participants were given a RandWater information booklet that was used to design the quiz and a RandWater website they could visit to get more information and teaching materials on water. This they could share with teachers in their districts who could also share it with learners in the schools. The participants were encouraged to do research on the topic of water. The facilitator asked participants how they would empower themselves to be able to support teachers to be able to answer the quiz questions and what research they would encourage teachers to do.

Participants were asked how knowledge was presented in the quiz and none of them seemed to understand what was asked. The facilitator explained that a characteristic nature of environmental knowledge as being contested, complex and contextual into the discussion, as reflected below:

We say environmental knowledge is always changing, it is never static. We have climate change scientists arguing about what is and what isn't. Environmental knowledge is contested because there are many views to it. It is complex, it is not easy and straightforward because everything environmental involves people in it and we have different views coming into it. (S1F1)

The facilitator challenged participants to think about how they would support teachers to deal with this nature of environmental knowledge. She asked participants, "*What role would you play to support teachers to work with this kind of knowledge?*" The participants' responses suggested that they see their role as people who encourage teacher to do things. There was no mention of modelling or showing teachers how to do things. Responses to the facilitator's question were:

Encourage them [teachers] to do research. (S1P)

Get teachers involved in attend environmental conferences. (S1P)

Encourage schools to participate in environmental projects. (S1P)

The facilitator accepted all the responses but asked what they as subject education specialists need to do to be able to support teachers to work with knowledge that is contested. This question prompted participants to recognise that they also had to be researchers who had the latest information in order to be able to support teachers with up-to-date information on water. It emerged from the discussion that even when subject education specialists do research and share it with teachers, this does not necessarily assist teachers in the classroom as teachers prefer to work with a textbook in their teaching, as reflected in the quote below:

Teachers like what they get from an approved textbook, they are comfortable with that. If you do the research and give it to them, it is an additional resource that they keep in their cupboards. They tell us the textbook they use is one of the approved textbooks and that their learners love it. (S1P)

This comment led the facilitator to ask the participants to discuss in groups what their role would be in developing teachers' critical minds as they work with textbooks.

Some of the responses are below:

Teachers need to attend subject-specific workshops. (S1P)

This was an interesting comment considering that they had all stated that they had not supported teachers in teaching the topic of water which is quite a big topic in all the grades in Social Sciences. This comment seems to suggest that subject education specialists think that these kinds of workshops are external to the work they do.

Other comments;

Teachers need to know the content before they can teach it. (S1P)

Teachers follow textbooks as is, only to find that some of the textbooks are not good. Teacher should follow the content as specified in the curriculum document. Textbooks are a resource; teachers need to use the curriculum document because it is national. Textbooks are not national and teachers use different textbooks and you cannot advise them, rather advise them on the policy because everyone is using it. (S1P)

What I observed is that participants tended to give the responsibility to teachers in both instances above when asked what their role should be in supporting teachers. None of the responses thus far gave an indication of what they would do. The facilitator's response to their answers seems to suggest that she also noticed this and wanted to highlight that subject education specialists needed to take a more active role in supporting teachers, as reflected in her comment below:

Textbooks give curriculum policy documents meaning as they give the content. Curriculum policy is a base for launching into a topic. It's a given so we should work from policy. But we know that teachers use textbooks. So are we using one textbook or more when we support teachers? Something to think about is, when we work with teachers, is not to put one textbook over the other but to have more than one textbook in a workshop which we refer to. This will encourage teachers to develop a critical mind to see that the same concept is represented differently in different books. It is a start on how to work with textbooks. (S1F1)

After the discussions participants were introduced to the portfolio assessment tasks. They were asked to reflect on their practice and personal capacity (see Appendix 16). The way the task has been designed assumed that participants have supported teachers with water concepts.

Participants informed the facilitator they will not be able to respond to all the questions as they had not given the support on water to teachers, as reflected from the observation data:

I have not supported the schools on this topic based on the curriculum. Maybe what I can talk about is what I am going to do in future. (S1P)

One of the participants highlighted that the focus in supporting teachers should not only be on the content but also on the teaching of that content, as reflected in the data:

Our focus is on supporting content but isn't that at the expense of supporting methodology? A teacher may understand the content but can they deliver it in the classroom? That is one of the challenges also. (S1P)

Day 1 of the training was dominated with sharing content about water with participants. The teaching practice and assessment practice were not discussed. Even so participants recognised the importance of taking cognisance of pedagogy.

Day 1 of the training was concluded with the facilitator posing the following questions to challenge participants to reflect on their practice:

- How are we supporting the content in the curriculum?
- What are we doing?
- How are we doing it?
- Is it working?
- What do we need to change?
- Are we able to do what is core to our work which ties with our key performance, that is, to support and advise teachers?
- If we are not doing what is core to our work, what changes need to take place?
- What powers exists within your systems, that is, in your districts and yourself that enables you to do what needs to be done?
- Are we just administrators busy with other projects at the expense of doing our core functions?

Although the participants were not given a chance to respond to these questions during the training, these questions set the scene for participants to reflect on their practice and to achieve the aim of the Fundisa for Change training programme of “supporting critically reflective and applied practice in which new concepts and approaches are tried out and reflected on” (Fundisa 2013c, p. 1).

Day 2

The next two days were geared towards achieving Fundisa for Change Training Outcome Three in addition to Outcome One:

- *Situated Knowledge and Learning (Context)*: Relate subject specific environment and sustainability content knowledge broader issues and contexts
 - Evidence of being able to make situational connections between subject content knowledge, pedagogy, assessment and social-ecological issues and contexts and educational contexts integrated and reflected in lesson plans

One of the Fundisa for Change environmental sector partners subsidised transport to take participants to the Vaal Dam and to the RandWater purification plant. On the way to the Vaal Dam the participants were given a background to the area, how people lived, and businesses in the area as well as environmental issues that existed.

At the Vaal Dam RandWater facilitators offered presentations on the damming of rivers and associated implications. Participants were given a history of the Vaal dam. The Lesotho Highlands Water Project was explained to the group (see Figure 6.3).



Figure 6.3 Presentation about damming of rivers

An employee of Vaal Dam took the participants around to show them how, when and why water is controlled through the sluice gates. The sluice gates are opened to release water to the river where it travels to the purification plant before it goes to residences (see Figure 6.5).

The day ended with a trip to the RandWater purification plant. Participants were given RandWater pamphlets which defined concepts and diagrams of the purification process.

Day 3

The day started with participants requested to reflect on their activities from the Vaal Dam visit and the RandWater purification plant the day before. They were given a worksheet to guide their reflections (see Appendix 17). The worksheet required participants to share what they had learned from the trips and what had enabled that learning to happen. They were also asked to reflect on what they would do in future and on how they could use the places they went to, to support teachers in future. In sharing their response to the first question (what was learned and how) on the worksheet, participants reflected that:

“I learned about the water control systems in the Vaal and the water purification process from the river until I get water from the tap. I learned through observation as I observed everything.”

“I’ve learned about the Vaal water catchment and the processes it takes to get your drinking water and also the things that pose threats to our water like industries.”

“It was powerful thing because I had to observe, listen and give input where it was necessary.”

“I learned about the management of the catchment in terms of water quantity and quality.”

“Vaal Dam changed my perception of water; it changed how I saw water as just a drop of water from the rain to my tap. Learning has transformed me.”

“There was an addition to my existing knowledge, I knew certain concepts and processes but we have learned new ones.”

It was good to see that participants recognised that the knowledge that was shared with them had implications for how people get water into residential areas. Participants were also able to explain how they learned.

The excursions seem to have touched the participants at a personal level and enabled them to clarify what they valued. Participants wanted to make changes in their lives and to take personal action, as reflected in the responses below:

“I think it is important that I am mindful of how I use water. My attitude towards water has really changed.”

“In future I would like to have an awareness campaign and take people to the Vaal Dam.”

“Seeing is believing. If people can see the water purification process, they may be willing to pay for water services.”

“I’m already applying what we’ve learned at home. I’ve started reading labels on water bottles to see what is in the water and to see the pH of the water.”

“After seeing the water purification process I don’t think it is necessary to buy bottled water.”

Participants were challenged to think about what they would do with teachers in their districts. Some indicated they would run workshops with teachers on the water topic while others would encourage teachers to take learners to the excursions.

The reflections from the excursions led to a discussion on the adequacy of the content that has been specified in the curriculum on the teaching of water. There was a suggestion that there was an opportunity to give input toward policy change.

Is our CAPS curriculum really emphasising what we have seen, or do we need to do something? Right now we are given a platform as districts to form our subject committees where we need to have our teachers and teacher unions to discuss and to revise the policy documents. Can’t we start here as we are, to have input into the Social Sciences curriculum policy to decide on the important skills we want our learners to develop? (S1P1)

This question highlighted that participants were thinking critically about what is in the CAPS policy documents in relation to context and lived experiences. Participants were interested in knowing whether or not the CAPS curriculum was “relevant for the kind of knowledge and skills we want future generations to have?” (S1P). These questions from participants were showing how the activities were developing critical analytical capacity for curriculum review.

The discussion continued regarding how a curriculum policy document is a guide and that textbooks expand on the concepts specified in curriculum documents. The discussion also touched on the importance of working between the curriculum document and textbooks and other knowledge resources. Participants were requested to bring the textbooks they work with the next day so they could compare content specified in curriculum documents and how the content is presented in textbooks.

The next activity of the day was linked to Outcome One (noted above), which has a focus on subject knowledge and learning.

Participants were put in groups and each group received different fact sheets from a 2007 *GEO4 Report* and a 2012 *Foresight Report* on biodiversity loss, climate change, population, food security, water and poverty. Each group was tasked to read the summary of the topic they were given and decide which of the topic(s) given to other groups were connected to or contributed towards their topic. Participants had to justify the links they were making and give examples to strengthen their arguments. There was a twist: the group they made the links with had to accept or reject the connection to their topic. These generated lively discussions and highlighted the complex nature of environmental issues and how issues are linked together. The activity contributed to developing in participants a systems thinking approach to environmental issues. Different perspectives arose and participants agreed to disagree on some of the arguments that were brought forth. The facilitator provided input to add to the discussions. Other Fundisa for Change partners in attendance also provided input.

The main facilitator gave a presentation on water use and water shortage in the world and in Africa. She shared with the participants that she had used a WWF *Living Planet Report* to prepare the presentation. Throughout the presentations on content, the facilitators informed participants of the source of the presentation to illustrate that research needs to be done in order to prepare knowledge resources or presentations.

The last activity of the day engaged participants in a problem-solving activity where they had to design a water distribution system in an hour. There were three groups and each group was given a set of instructions and resources to create a water distribution system (see Figure 6.4).



Figure 6.4 Participants creating a water distribution system

It was made into a fun activity as groups were competing with each other on the design and functionality of their distribution system. Participants were given an overnight reading, *Transformative learning: Theory to practice* by Jack Mezirow.

Day 4

The day started with an orientation and there were changes to the initial programme. One participant, on hearing that the day involved mainly presentations, commented that she was relieved as she felt drained from the active learning activities of the past two days.

The focus of Day 4 was on supporting participants to achieve the second Fundisa for Change training outcome:

- *Pedagogical Knowledge and Learning (Theory & Practice)*: Show ability to use appropriate teaching methods and assessment approaches for a specified subject knowledge, skills and values
 - Evidence of successful application of appropriate teaching methods and assessment strategies for the relevant subject knowledge (e.g. designing higher order questions for assessment)

Participants were given photographs of group activities taken during the previous days three days of training. Each participant had to choose one photograph and use the Fundisa for Change *Methods and Processes to Support Change-Oriented Learning* module to find a method of teaching and learning that was reflected in the photograph.

This activity required participants to read the Fundisa for Change *Methods and Processes to Support Change-Oriented Learning* module. This module has 25 different teaching methods; each method is explained, examples of how the method can be used are given, ideas and possibilities about the method are mentioned as well as pitfalls of the method (see Appendix 18).

There were additional questions once participants had chosen a photograph to work with:

- What were the advantages of using the method depicted in the photograph? (Responses were to be drawn from what is written in the Fundisa for Change *Methods and Processes to Support Change-Oriented Learning* module combined with participants' experiences during an activity as shown in a photograph they had chosen)
- What was the role of the facilitator?
- How did you think you were learning?
- What do you think supported you to learn?
- What skills were you using?
- How did the method support or not support transformative learning? (participants had been given a reading on transformative learning to read overnight)

Once each participant had completed the task, they had to swap their responses and read what their colleagues had written. Participants were allowed to add to their colleagues' narrative and swap again once they were done reading. In the end each participant had read about three to four narratives. This activity gave participants insight into how their colleagues interpreted the methods that were used in activities in the past three days. Moreover, it gave participants an opportunity to link practice (their experiences of the activities) to theory (what was written in the Fundisa for Change *Methods and Processes to Support Change-Oriented Learning* module). It was also an alternative method from the usual practice of asking each person to present their work to the whole group.

The water distribution problem-solving activity was the first one that was discussed in terms of the questions above. Participants' responses are noted below for each question asked:

1. How they learned:

- By observing so we won't forget, learning from each other, exposure to other's interpretations, social participation

When participants were challenged to explain what they meant by social participation, their responses were:

- Sharing views, worked as a team, group members involved in solving the challenge.

Participants also pointed out that a disadvantage to social participation could be that some members can stand back and not get involve, some members can dominate the activities and it could be time-consuming.

2. Facilitator's role

- Provides guidance and instruction, monitors involvement and participation of everyone and to give feedback to the groups.

3. How did they think they were learning (what supported the learning)?

- Participating in the group, observing, sharing ideas, discussions, reading and listening

4. What skills were used in the learning?

- Problem-solving as we tried to come with solution to the water distribution task, critical thinking as we corrected our mistakes as we worked

Participants first explained their understanding of transformative learning before they could say how a method during the water distribution activity would lead to transformative learning. Their definitions are noted below:

“Getting people to challenge their perspective and to do research to find alternative to how they have been doing things instead of indoctrinating others in their way of thinking and doing things.”

“It is learning that encourages change to oneself, attitude and way of doing things.”

“It is about reflecting on practice, how we have been supporting teachers and include hands-on activities. Combine theory with practice”

“I had my point of view which was elaborated. I came with my own point of view but have been transformed from hearing other points of view.”

“Transformative learning allows for critical thinking, that is, not to take things at face value. Even if something is a general consensus it does not mean you need to accept it, look at it critically and have your own perspective.”

In the quote below, the facilitator gave an explanation of the importance of education that has a transformative agenda and challenged participants to think about what transformative learning would require in an education system:

We cannot continue the way we are doing because we have unsustainable lifestyles and we have major things we are not happy with in our environment and we want to change that environment. That is the ideal we want to achieve. The question is how should education look like for transformative learning? What kind of teaching methods would support transformative learning? What would that education look like in terms of how we teach and how we assess? (S1F1)

In responding to the questions posed on transformative learning, one of the participants had the following to say:

We need a dedicated environmental specialist in the Department of Basic Education that would look into how environmental topics are integrated in the curriculum. Social Sciences is two subjects in one and as a subject education specialist I need to support both the Geography and History content and we lack time to do that.

Although the facilitator acknowledged this challenge, she pointed out that this has been a debate for many years in the education system and rather encouraged participants to think of what can be done to enhance transformative learning in the current system. These points allowed participants to concede that transformative learning can be achieved in the current system but that there were other challenges:

We receive complaints from schools that there are teachers who are passionate about the environment and start and maintain vegetable gardens but it is at the expense of classroom teaching and learning. Other teachers want to implement Eco-Schools and other government projects. The challenge is how to strike a balance between theory and practice as demanded by the curriculum policy. There are timeframes we need to adhere to, when do we do the environment? (S1P)

This is a valid point and requires that in teacher professional development activities related to environmental education, explicit links are made between what the curriculum requires in terms subjects content knowledge and how environmental education contextualises that content.

A follow-up comment from another participant was that, the current “curriculum only gives time for content not the practical” (S1P). This comment highlights this divide that has between plaguing the integration of environmental education into the education system. The separation of subject content knowledge and environmental and sustainability content knowledge and concepts and the viewing of environmental education as an ‘add-on’ (see also section 5.6.1.3). Each of the Fundisa for Change modules makes explicit links between the environmental content and the subject content knowledge in the different subjects (see Appendix 14).

Another participant added that they did not have a problem with how teachers taught and assessed subject content knowledge; her concern was on “how the curriculum integrates the practical”.

What also emerged was that teachers generally “transmit knowledge and learners are recipients. Teaching is focused on the abstract and not looking at concrete evidence. Teachers teach and learners listen and get assessed on what teachers tell them”.

The comments above were rather surprising as the Social Sciences curriculum does place an emphasis on practical work, particularly the Geography component.

The Geography curriculum aims to develop learners who observe and engage with phenomena in their own environment. Examples of the skills involved include; learners’ ability to develop observation, interviewing and recording skills through fieldwork, interview people and apply social skills as well as process, interpret and evaluate data. (South Africa. DBE, 2011, p. 14)

Additionally, “all the Geography projects have a strong focus on field observation and research in the local environment. The Geography projects are specified as they form part of the essential knowledge required to complete the curriculum” (South Africa. DBE, 2011, p. 15).

There are therefore opportunities for teachers to engage with the practical aspects of teaching Social Sciences, meaning that the focus should not only be on teaching the content knowledge. Practical work may not be happening currently in some schools due to lack of capacity on the

part of teachers. This highlights an important role that a teacher plays in the learning process and the importance of ensuring that teachers have the capacity to adequately teach their subjects. Since subject education specialists were introduced to a water purification process fieldwork activity, they now had the tools to support teachers to plan fieldwork on the water purification process in their districts. The Fundisa for Change training programme, through the excursions provided capacity for subject education specialists to be able to support teachers to do fieldwork. The programme has modelled how fieldwork can be conducted.

The next activity was the strengthening of Outcome One of the Fundisa for Change training programme which focuses on *Subject Knowledge and Learning*. Participants were tasked to choose any concept used in teaching about water in the intermediate phase or in the senior phase. They could choose to work with any of the concepts they had identified when they mapped water concepts in the curriculum documents on Day 1. They were expected to work with any Social Sciences textbook and a Social Sciences curriculum document to see how the concept was presented. Participants were encouraged also to use the water resources they had received during the previous days' sessions to see how the same concept was represented. Participants worked individually on this task and they had to present their findings to the group.

Some of the findings from the comparative activity shared by participants are noted below:

“The textbook I have worked with gives a summary, it is very brief in terms of content. A teacher who is not confident with Geography will struggle as some teachers teach using only a textbook without any other resources. This will disadvantage learners and that is a crisis.”

“The textbooks link well with what is stated in the curriculum document but there is not much in terms of content. A teacher will have to do research to teach more than what is in the textbook.”

“The content as specified in the curriculum is covered in the textbook. But the textbook does not enough information.”

The responses above seem to suggest that the textbooks that are used do not provide adequate content although some of them do cover the concepts as specified in the curriculum document. Some of the participants were in a position to critique the textbooks as they have been exposed to other resources on water in the past three days. The reality is that teachers in government schools choose textbooks from a National Catalogue of core Learning and Teaching Support Materials (LTSM) issued by the Department of Basic Education.

This is because in most public schools, government funds are used to purchase Learning and Teaching Support Materials. The assumption is that textbooks in the national catalogue have passed appropriate evaluation and quality standards hence their inclusion. One may argue that school textbooks are primarily for learners and as such cover minimum content. Teachers would need to work with other resources to build up their knowledge of topics to be able to teach content specified in curriculum documents better. This puts the responsibility of research on teachers.

The Department of Basic Education views textbooks as an important resource that each learner should have. The Department also acknowledges that textbooks may not necessarily outline content in exactly the same order as it appears in curriculum documents but that the content should be accurate. This is articulated in an extract from the Social Sciences curriculum policy document:

Each learner should have a quality textbook and a neatly kept notebook. Textbooks must be suitable for the grade, context and language level of the learner. They should provide accurate content that is aimed at the development of the appropriate skills, concepts and values. Textbooks must include appropriate and adequate assessment activities. It should be noted that the order in which the content in the sub-topics is listed is a guideline only. LTSM writers need not cover these sub-topics in the exact order in which they appear in this document. (South Africa. DBE, 2011, p. 8)

What is required in professional development is also to build the capacity of teachers and that of subject education specialists on how to select quality Learning and Teaching Support Materials (LTSM) for teaching and learning in South African classrooms as some participants were still not sure how they should support teachers with regards to choosing textbooks.

The comparison activity participants did linked with participants' portfolio Part 2 assessment task (Appendix 19). The facilitator urged participants to think about what they needed to do in light of what came up in the discussions, as reflected in the data presented below:

What do these discussions imply in terms of the support you have to provide to teachers as subject education specialists; knowing what is out there and what is in the textbooks and policy requirements. What are the implications for you on how to support teachers to teach water content adequately? (S1F1)

According to the Education Labour Relations Council (ELRC) collective agreement no. 4 of 2017, which replaces the ELRC Collective Agreement 1 of 2008, the following tasks are some of the key performance areas for subject education specialists:

- Provide professional guidance and this includes conducting regular on-site support visits to teachers in schools;
- Monitor and support curriculum implementation in their specialist subjects;
- Ensure classroom-based educators have requisite subject specific curriculum and assessment documents;
- Guide and support teachers in effective delivery of curriculum in the classroom;
- Support teachers in strengthening their content knowledge and organising relevant co-curricular activities;
- Have thorough knowledge and understanding of the relevant subject/phase Curriculum and Assessment Policy Statement;
- Build Curriculum and Assessment Policy Statement knowledge and understanding among classroom-based educators. (ELRC, 2017)

Therefore, at the core of subject education specialist's duty is to support delivery of the national school curriculum through supporting teachers to implement. This requires that subject education specialists be specialists in their subjects as their name suggests. It is therefore imperative that they develop capacity to be able to do their work effectively. This is probably the reason some provinces preferred that the subject education specialists be trained first in the Fundisa for Change programme than for teachers to be trained first.

The next activity focused on strengthening *Pedagogical Knowledge and Learning*. Participants were introduced to the Fundisa for Change module titled *Framing Active Teaching and Learning in CAPS*. The framework integrates knowledge **acquisition** and learning through **participation** to construct knowledge" [emphasis in original]. The framework works with an open process framework of tools and starting points for knowledge-based teaching and learning for sustainability within the South African Curriculum and Assessment Policy Statement (O'Donoghue 2013). See Figure 6.5 below.

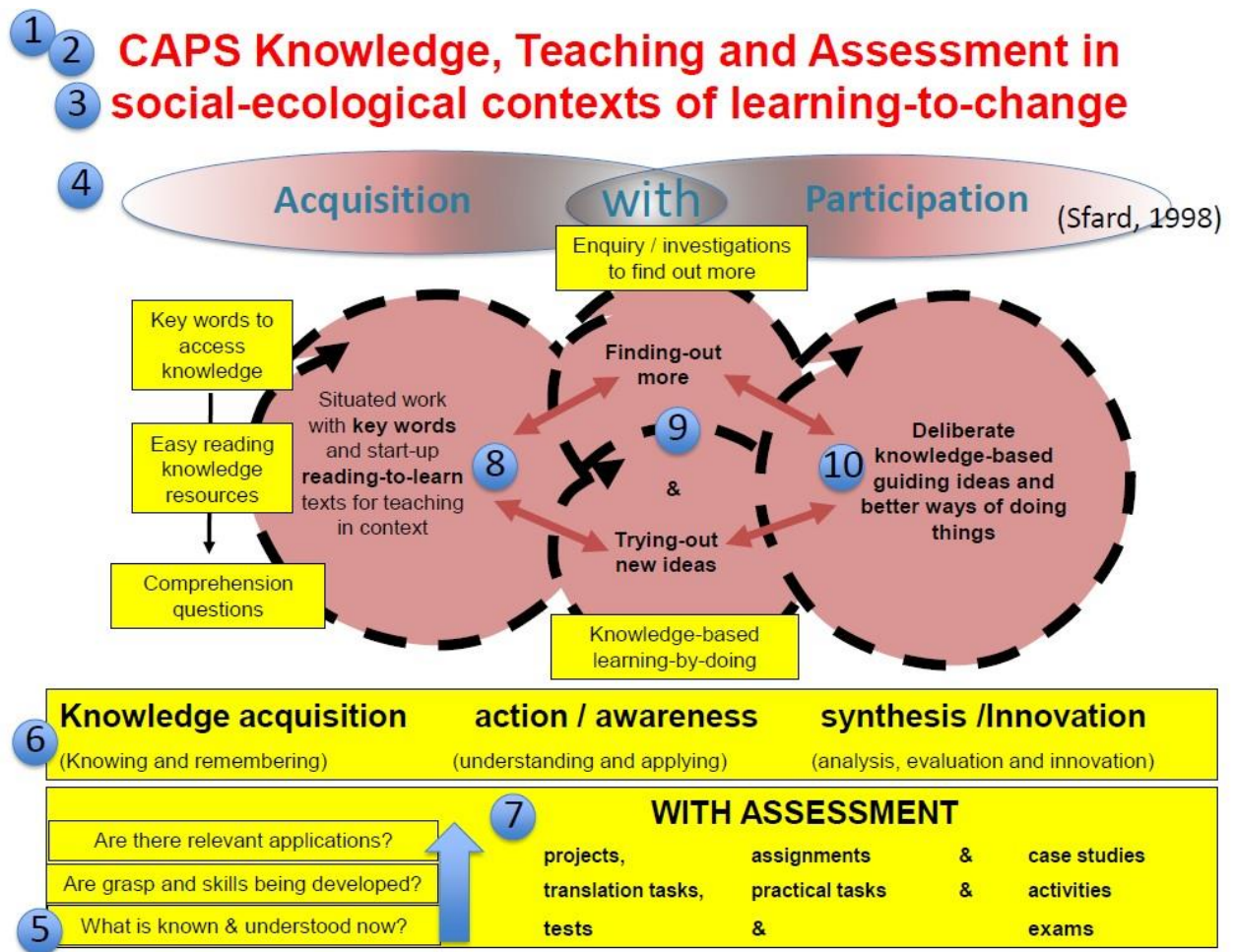


Figure 6.5 Framework for active teaching and learning (O' Donoghue, 2013)

The framework works with a T-Sheet knowledge and assessment planning tool in lesson planning (see Figure 6.6). Planning and the mediation of learning include knowledge, pedagogy and assessment to bring out Education for Sustainability processes (O'Donoghue, 2013).

12. CAPS Topic:

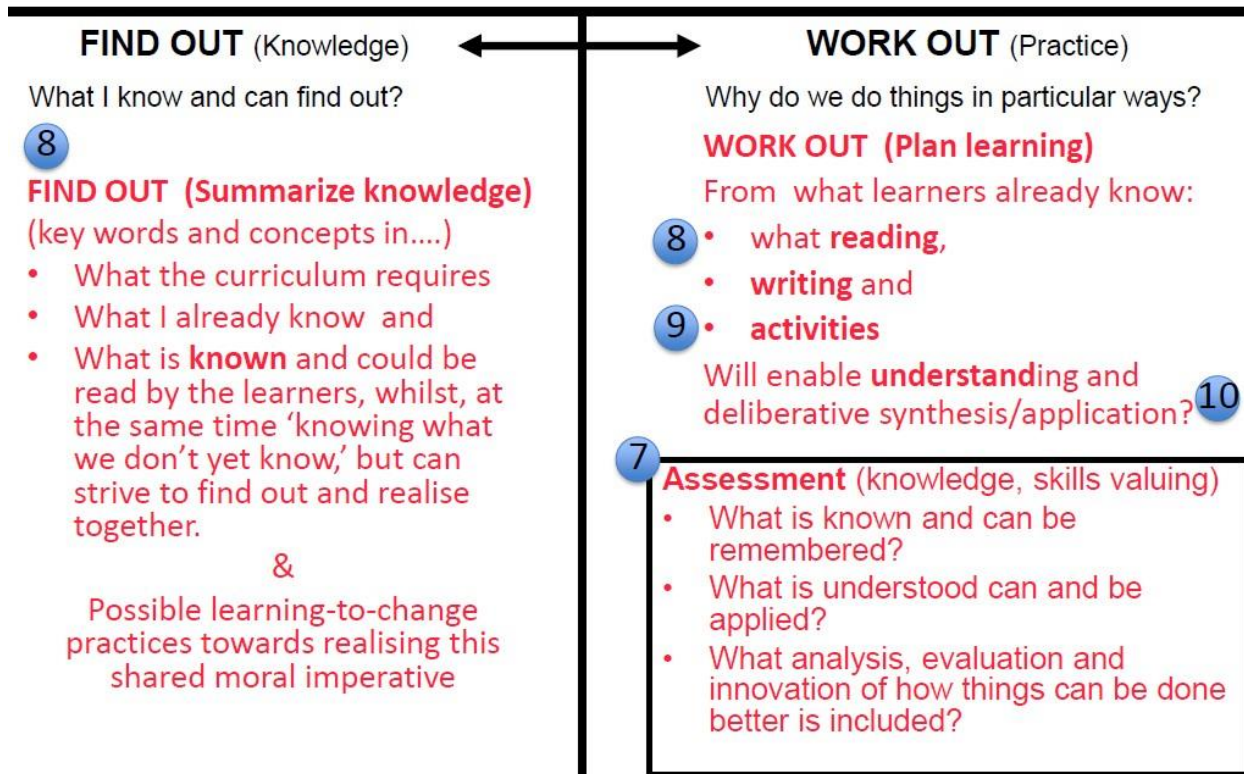


Figure 6.6 Lesson planning T-sheet (O' Donoghue, 2013)

After presentation of the Active Teaching and Learning Framework, participants were given an activity on teaching and assessment (Appendix 20). The activity required that participants individually:

- Choose a topic on water in a grade;
- Determine knowledge needed to teach that topic; and
- Determine the skills needed to address that topic

The table below summarises a participant's presentation on the activity

Table 6.2 Summary of participant presentations (site 1)

Topic	Knowledge	Skills
Water usage	Wise water use can be acquired through research	Problem-solving, critical thinking on water use, observation on how water is used, conservation how to conserve water, monitoring water usage e.g. measure how much water is used in different activities, presentation to share what they have learned and active participation

The next activity required participants to critique assessment tasks. To assist with reflecting on assessment tasks, the following question was asked by the facilitator, “*What assumptions do we make about knowledge and ability when we set assessment about what learners are able to do?*”

Participants were tasked to analyse any assessment tasks they had either from a textbook or a common assessment task they had developed for teachers in their districts. There were not enough assessment tasks and textbooks for the activity so participants worked in pairs and in small groups for the activity. They were expected to choose three questions and use *Bloom’s Taxonomy* and the *Teaching and Learning Framework* to analyse the questions. In using *Bloom’s Taxonomy* they were tasked to analyse questions looking at what cognitive levels the questions were pitched e.g. low order, middle order or high order thinking skills. In working with the *Teaching and Learning Framework*, participants were tasked to think of the following questions (see Appendix 21):

- Are learners encouraged to find out?
- Are learners encouraged to read to unlock concepts to find out more?
- Are learners encouraged to try out new ideas, to deliberate deeply about things?
- How are learners given opportunities to analyse and apply the skills and knowledge they have learned?

The Social Sciences curriculum document is explicit on how tests and examinations should be planned to cater for a range of cognitive levels. The figure below indicates what is expected of teachers when they set assessment tasks.

Cognitive level	Percentage
Lower order: Knowledge and recall	30
Middle order: Comprehension and application	50
Higher order: Analysis, Evaluation and Synthesis	20

Figure 6.7 Table extracted from the Intermediate phase Social Sciences curriculum document (South Africa. DBE, 2011, p. 48)

Additionally, the curriculum document also gives teachers key suggested words they can use in setting questions that will cater for a range of cognitive levels and learner abilities (see Appendix 22).

During group feedback there were disagreements on how questions had been weighted. One of the arguments was that if learners were taught the content, irrespective of what the action verb is in a question, then the question is low order. It would only be middle order if learners apply the knowledge they have been taught in a new context. The facilitator provided the following input to the discussions:

Using a verb does not necessarily make it a higher order. It is what comes after the verb, the cognitive function required to answer the question that makes it a higher order question. The curriculum document gives the verbs and cognitive weighting as given [referring to Appendix 22] but it is not a given. We need to understand that it is in the context in which the verb is used that will determine that it is a low or middle or high order question. Rather look at the structure of the question to determine the cognitive weighting. It [referring to Appendix 22] is a guide of possible verbs that can be used to structure the questions but it comes down to how the verb is used. (S1F1)

The facilitator posed the following questions to the participants: “What should be considered when we set higher order questions? What are the kinds of cognitive functionings that are required?”

The facilitator was challenged by participants to clarify her argument that a verb does not necessarily determine the cognitive level of questions.

We are using the CAPS document using revised Blooms Taxonomy. If we have a new teacher who doesn't know Blooms and just give them the CAPS document and advise them to work with the cognitive levels, would I be off track? (S1P)

Another participant voiced her discomfort with the argument that the assessment guide in the curriculum document should be used cautiously and not be taken as is. The discomfort is perhaps due to the fact that a national policy document is being critically scrutinised, as reflected in the narrative below:

I have a problem with this discussion; please forgive me if I am stepping on someone's toes. You know this is a national policy document [referring to Social Sciences curriculum document], all of us as facilitators sitting here have been workshopped at provincial level. This was designed at national level and it was approved. We were workshopped on how to use these cognitive levels the way we are currently interpreting them. I understand the way you are saying that there is something hidden. For an

example in my district we had a workshop in July last year [2013] and this year[2014] on how to workshop teachers on guidelines on setting exam questions. We've gone through this curriculum document because this is the document they have and we went through it in terms of low, middle and high order. Now you are saying that this is a guide and that there is something hidden in there which myself I wasnot workshopped at provincial and national level. I am expected to move from here to workshop my teachers. How am I going to workshop my teachers something that is not policy? Our policy is this policy [holds up a CAPS policy document] and anything that is not in the policy document, I'm sorry we do not take it. (S1P)

It was not clear from the participant what the difference was between what the CAPS policy document expected of them and what was presented in the training.

Other participants joined the debate to clarify for themselves the use of the action verbs when setting assessment questions as indicated below:

I thought we would analyse exam and textbook questions as per the verbs stated in policy for cognitive levels to see alignment and shortfalls in the questions, as stipulated by the policy document. That would assist us because, although we have the policy document, which we are bound to implement we still have something beyond which we can use to support teachers. (S1P)

Before we conclude that this is a low or middle or high, let's give the example of the verb 'define', it is in both low and middle order [Appendix 22] then what is the distinction between the two to say this is low, this is middle? If learners are given an extract and asked to define something that is in the extract then it is low order, if not then it is middle. (S1P)

It was quite an intense discussion but ultimately the examples that were given by fellow colleagues clarified the ambiguity and confusion of simply using a proposed verb to categorise the cognitive level of a question. The facilitator concluded the discussion by flagging that Bloom has two other domains, the psychomotor and the affective but that the curriculum primarily foregrounds the cognitive domain.

To close the session, participants were challenged to find out how environmental and sustainability content in the curriculum is assessed, if at all. They also had to find out the

curriculum requirements for assessing water content and how it is being assessed currently in schools, for example, have there been projects on the water topic? They were further tasked to find out if the water content scheduled in term four does get taught in schools.

The last activity of the four-day training required that participants in groups use the water resources they had received to design a project, assignment, a test or exam questions on content that is in the curriculum. This task was linked to part three of their portfolio task (see Appendix 23). Each group presented their work, with some groups indicating the cognitive levels for the questions they asked, mark allocation, subject aims and skills to be developed as well as how the task would be assessed, for example using a rubric or a memorandum.

Judging from the comment that was made by one of the participants, the Fundisa for Change training was valued. There were nods from the group as one of the participants thanked all the Fundisa for Change partners for making the training possible:

We always say we have to change things around. This type of initiative [Fundisa for Change] we really appreciate. And I also think it shows in the attitude of the colleagues who are here. I speak for all of us when I say it was not easy; it was draining and really intense. The challenge I suppose for us now is to produce the portfolio [assessment task]. We will try to produce a product that will be becoming of the kind of workshop that we have gone through. So we want to thank you [facilitator] and your partners [Fundisa for Change partners] that are here, much appreciated. (S1P)

The day ended with the facilitator going through the portfolio task with participants. Participants were expected to have completed 65% of the portfolio task (part 1 – part 3) by the next session which was in four weeks' time. Participants decided that they would organise a day amongst themselves to come together and work on the portfolio tasks before the follow-up training session.

Day 5

The follow-up session was on 22 October, four weeks after the first session. It was a support session to assist participants to complete their portfolio tasks. The first activity of the day started with a discussion on wetland content knowledge. Some of the participants had requested that they be given some knowledge on wetlands as what was in the textbooks was insufficient, as reflected below:

The textbook does not tell the learners what a wetland is, it just gives only one sentence telling just the disappearing of wetlands and two or three sentences why we are conserving them and that's it! So that is my challenge, I need to do something about it. (S1P)

Participants were referred to the Fundisa for Change Senior Phase Water module that gives information about wetlands, for example, features of wetlands, functions of wetlands, threats to wetlands and protection and rehabilitation of wetlands (Brundrit & Khan, 2014).

One of the other environmental sector Fundisa for Change partners taught about wetlands, covering some of the aspects on wetlands mentioned above and also gave participants additional resources on wetlands. Participants were encouraged to read through the materials and to “identify any concepts or words on wetlands that are difficult or new around wetlands” (S1F1).

The next activity was a miniSASS activity in a manmade pond inside the Walter Sisulu Botanical Garden. MiniSASS is a tool that is used to determine the health of a water source by collecting macroinvertebrates from the water which indicate the health and quality of the water source.

Participants were split into groups and given all the tools they would use. Participants had to determine the health of the pond and thus collected organisms from the water (see Figure 6.8) and use field guides to identify the organisms (see Figure 6.9).



Figure 6.8 Participants collecting organisms from a pond



Figure 6.9 Participants identifying organisms collected from a pond

The discussion at the end of the practical activity was about social issues that may cause threats to a water source.

Participants had to think about possible human activities that would negatively affect a water catchment and ways in which these can be mitigated. One of the university Fundisa for Change partners encouraged participants to link what they were doing with the curriculum and to find opportunities for integrating across subjects, as reflected below:

Now link that [mini SASS] with the curriculum, what do you want to teach your learners by doing this exercise? How do you link this up with your specific subject? Think about your subject when you do the activities and make the links but you can also move to other subjects.

The knowledge sharing on wetlands and the miniSASS activity were aligned with Outcome One of the Fundisa for Change training programme, *Subject Knowledge and Learning*.

The next activities were aligned with outcome four that focuses on Practical Knowledge and Experience. In the Fundisa for Change documents this is how the outcome is stated:

- *Practical Knowledge and Experience (Work Experience)*: Design, develop, implement and reflectively review a lesson plan / sequence of lesson plans relevant to an environmental and sustainability content focus in a particular Subject and Phase/ Grade.
 - Evidence of teaching a lesson and reflecting critically and constructively on practice (Fundisa for Change, 2013c)

A concession has been made in the Fundisa for Change documents to accommodate subject education specialist:

Should the programme [Fundisa for Change] be offered to subject education specialists, the same criteria would apply, but would need to be contextualised for their specific professional roles and responsibilities (e.g. evidence of supporting teachers' to reflect critically and constructively on practice or evidence of being able to support teachers to acquire a good command of environment / sustainability subject content knowledge relevant to teaching in a particular subject and phase) (Fundisa for Change, 2013c)

Subject education specialists are office-based educators and as such do not necessarily plan and teach lessons in the classroom; instead they support teachers who have to do that work. Their task to show achievement of this outcome is to plan a workshop for teachers in their districts (see Appendix 24).

Some of the participants had brought completed portfolio tasks to the session so they could receive feedback and improve their work. Some indicated that they had struggled to complete

most of the task due to time constraints. There was also recognition of the value of the portfolio tasks in developing knowledge, as reflected below:

It was a challenge to be honest to write the assignment. One, the question of time, some of us really tried but we didn't finish it but at the same time there is something I have learnt. My topic is on wetlands, whatever article I used or the information I downloaded it always expanded on what is in the textbook.

It is challenging to complete the portfolio in time; however, it was an informative session programme [Fundisa for Change] and hopefully it will assist to make others understand, we understand it [teaching water] better.

The programme is detailed [Fundisa for Change] and I see the need to involve teachers is escalating.

Participants who had managed to complete 65% of their portfolio indicated that it was possible because of the discussions they had with colleagues, downloading information from the internet, and using the materials they had received in the previous training session.

Participants reflected that completing the portfolio would be easier if as colleagues they shared resources and worked together. Support from colleagues could be better structured in Professional Learning Communities but only 12.5% of the participants indicated, in the Fundisa for Change training evaluation that they would like to be in a Professional Learning Community. This may be because the potential role of Professional Learning Communities is not yet understood.

The facilitator gave participants two readings, one on scaffolding (*Understanding scaffolding and the ZPD in education research* by Irina Verenikina) and the other on assessment (*Assessment to promote learning: Linking formative assessment to scaffolding* by Lorrie Shepard). She then gave them the following instructions:

How can we scaffold people to learn through the assessment that we do? How do we scaffold people through assessment to achieve transformative learning? That is what I want us to challenge ourselves with. First familiarise yourselves with these concepts and then put yourselves into groups of five people. Each person in that group will take a current portfolio activity [colleagues' completed portfolio task] for the course and I would like you to design assessment tools. I want you to look at a portfolio task and

think about what kind of assessment tool you can use to mark that. The only criterion I have is that your assessment tool must support scaffolding for transformative learning.

Participants grouped themselves for the task. The facilitator walked around and gave input to the different groups as they worked. This activity was aligned to the improving your assessment practice outcome (*Pedagogical Knowledge and Learning*). When the groups reflected back on the activity, they observed that it was a challenge to design an assessment tool for a task they had not developed. They mentioned that it is easy to design an assessment tool when you know the purpose of an assessment task. What emerged was that assessors do not assess simply for the sake of assessing; embedded in the task is what the assessor wants to achieve with the assessment.

In discussing the last part of the assessment portfolio task (see Appendix 24), where participants were expected to design a teacher workshop on water, it emerged that there were contextual issues that made planning a workshop a challenge in the districts. Some of these challenges were systemic, from teacher unions and managers in the Department of Basic Education district offices. Some of the issues are reflected below:

I've made a submission to my supervisor to implement the water training for teachers in November this year [2014]. I've said in the submissions that the training will be over three days from 08:30 – 15:30. My immediate supervisor was concerned about the time of 08:30, but at the very same time we cannot do it over weekends and they cannot finish later than 15:00 as the unions are against that.

The absence of teacher support is very glaring at the moment. The process at the moment at provincial level is to develop materials modules to support teachers but there is nothing in place at the moment to take that support down from teacher level to the level of learners.

I know the areas I need to support the teachers with, but I work on a zero budget and if I invite service providers I will have to provide catering if the workshop is on the weekend. I only have 14:30 to 16:00 during the week, how much can we cover during that time? So those are the challenges. I'm actually stressed before I think of a workshop for teachers.

A programme that we formally evaluate will take a full day if there is catering and other stuff. If not, we cut it into three days. That is a challenge because, we might have teachers on day 1 but by day 3 we have two thirds of the teachers attending. They get tired of coming back to the workshop.

Two weeks ago we had an invitation from a local service provider who wanted to partner with the district on a water wise theme but the district office seems not to be willing. So, even if service providers are coming, saying they want to empower our teachers, the district office is reluctant. It is a problem. I think for the sake of the portfolio, I'll see what I can ... but I'm not sure as far as implementation, will I really?

Once we develop and are able to address this course [training teachers on water], as subject advisors we are the ones working with teachers, so if there is an improvement we are able to see that. Unfortunately, those who are our superiors will not see that. You call teachers in the afternoon; it's also a problem at times with their priorities. You want to achieve a particular thing but teachers will say there are other activities that they are supposed to be doing for the district. You're trying to sacrifice here and there, but in the end we will try and achieve what we want.

The facilitator pointed out that they can support teachers in schools during class visits. They did not have to wait for a workshop in order to support teachers.

It looks like there are opportunities for subject education specialists to influence what the Department of Basic Education prioritises when it comes to teacher professional development, as reflected below:

The issue of teacher development lies with the teacher professional development directorate and funding for that has decreased. But there is a step now to identify areas of the curriculum where intervention is needed so it's not just blind support of teachers or thumb suck. It's basically looking at targeted support for every subject. That gives us an opportunity to say let's look at the sections that we think support is needed and develop materials as well as training for those particular sections. (S1P)

This would require participants to be proactive and conduct a 'needs analysis' audit in their districts in the teaching and learning of Social Sciences. It could be on environmental content

knowledge if they so wished. Results from the analysis could be used to write a proposal to the district office citing what the needs are and the intervention needed to address those needs.

Participants were given an additional portfolio task (Appendix 25) to implement their plans and were given a month to submit a completed portfolio for assessment and certification. The kind of activities and questions that were asked of participants pushed them to reflect on their practice and provided opportunities for metacognition. The on-course tasks that were given were also aligned to the portfolio task that participants were expected to complete. This scaffolded the learning. The programme activities were closely aligned with the outcomes of the professional development short course.

Reflections from the participants throughout indicate that they learned as they engaged with programme activities and from reflecting on the activities, as reflected below by one of the participants:

I must say when it comes to environmental matters we get tremendous support coming through. It is much appreciated. It assists us to do things much better. The facilitation, we are never given answers but are allowed to reflect and think of answers ourselves.

The Fundisa for Change programmes' tagline is 'transformative environmental learning through teacher education'. This speaks to the expectation that participants who attend the professional development course will be personally transformed. A transformation that is beyond change in their professional practices. Some of the participants reflected that their view of the environment has changed through their engagement with programme activities (see Day 3 section 6.3.1.1).

6.3.1.3 Post-training data and reflections

In analysing the questionnaires (appendix 3) completed by participants (see section 4.5.2) at the end of the Fundisa for Change training short course. The following emerged:

- Some of the participants felt that they needed more time to engage with the course than was given during the training session. Some of them stated that the course content was relevant to their needs and five days was not enough.
- Participants indicated that the materials were generally excellent and the best part of the course for them was the field work and the use of different teaching methods. Some also enjoyed engaging with assessment. Some said they would apply what they had learned in workshops they conduct for teachers.

The table below shares how different aspects of the training were rated by participants.

Table 6.3 Participants' rating of different aspects of the training

8 responses from 14 participants	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The content of the course was relevant to my needs as a teacher	75%	25%				
The course materials were used effectively to support my learning on the course	75%	25%				
Facilitators were knowledgeable	87.5%	12.5%				
The methods and approaches used on the course were appropriate	87.5%	12.5%				

Participants also indicated areas where they needed to be supported to be more effective in their work. These are noted below:

- 25% needed more training on environmental concepts in the curriculum
- 37.5% needed support from the Department of Basic Education
- 50% indicated they needed more resource materials
- 12.5% felt they needed to keep in touch with a professional learning community
- 12,5% indicated a wish for opportunities to do research and/or publish their environmental work

Despite what they indicated above, below are participants' description of the Fundisa for Change programme:

- Provides knowledge and skills that can help teachers have confidence in integrating environmental education in the subjects that they teach;
- Informative and providing up-to-date information;
- Has activities that allow educators to learn through experience (practical work);
- Excellent as it assists teachers and subject education specialists to teach and assess content very well:
- Uses training methodologies that simplify how teachers and subject education specialists can teach and asses content but developmental enough to allow the teaching and assessment to be done in a meaningful way;
- Has excellent facilitators who enabled a good engagement and enlightenment during the training.

- Innovative!

The table below shows results of the different ratings the participants gave to statements about the relevance of the training to the work that they do.

Table 6.4 Participants' rating of Fundisa for Change's relevance in their work

8 responses from 14 participants	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The Fundisa for Change course clearly relates to teacher training in South Africa	75%	12,5%				12.5%
Environmental learning is clearly part of the school curriculum	87,5%	12,5%				
Fundisa for Change can help me to better identify and explain key environmental concepts in the school curriculum	75%	25%				
Fundisa for Change can help me to better teach environmental content beyond the CAPS curriculum to teachers or student teachers	62.5%	25%	12.5%			
Fundisa for Change can help me to better explain the transformative nature of environmental learning to a colleague	62.5%	37.5%				
Fundisa for Change can help me to better demonstrate teaching methods for higher order environmental learning	62.5%	37.5%				
Fundisa for Change can help me to better demonstrate how to assess higher order environmental learning in the classroom	62.5%	37.5%				
Fundisa for Change can help me to link environmental learning in the classroom with whole school development	62.5%	37,5				
I would be able to use the Fundisa for Change materials to teach my own course	75%	25%				
I am able to identify additional teaching resources for environmental learning	50%	50%				

The results suggest that the Fundisa for Change programme is relevant to what subject education specialist do, although some aspects were more relevant than others.

6.3.1.4 Post training reflections from main facilitator

The main facilitator of the training session wrote the following reflections that cover both the successes and challenges she experienced during facilitation. She has also included recommendations for future Fundisa for Change professional development courses:

- Strengths:
 - There was active involvement from the provincial office of the Department of Basic Education.
 - There were multiple stakeholders involved in the programme and who were represented at the training sessions.
 - The programme had both theoretical and practical aspects with support given to participants to complete their portfolio tasks.
 - The relevant materials and resources were available for participants. Fundisa for Change water materials were used with supporting materials and posters from partners.
 - Contextually relevant examples and experiential learning opportunities were sourced and utilized to support the materials. The curriculum advisors valued the learning opportunities and enjoyed the experience.
 - Through engagement with the portfolios it is evident that participants have developed a plan for implementing the water programme in their districts.

Challenges experienced by the facilitator are noted below:

- Challenges
 - Working within a tight budget, it is difficult to find the funding to support the work that is required to be carried out in this province.
 - Working in a partnership model requires a protocol on the nature of the partnerships with regards to roles and responsibilities of each partner organisation during training to ensure no partner feels left out or side-lined.
 - The handing of the portfolios has been slow due to the period [November] when the course took place. Participants are engaged with many responsibilities during the last quarter of the year.

Some recommendations to improve programme delivery were offered by the facilitator:

- Recommendations
 - Provincial planning sessions for each of the modules should be conducted to ensure that a plan and programme is developed and worked out in advance ensuring that all partners know their roles, responsibilities and all relevant resources are brought into the planning.
 - It is important that the Fundisa for Change training take place in the first five months of the year to allow adequate time for the implementation and preparation for the portfolio assessment tasks.
 - Funding needs to be in place to support the workshops with the teachers hereafter, particularly as the momentum has now been created with the involvement of the subject education specialists.

6.3.1.5 Summary of reflections

Looking at the strengths of the programme, the Fundisa for Change programme can be institutionalised into the Gauteng's Department of Basic Education professional development systems. There is already buy-in from the province, the next step would be to unlock provincial funding and to accommodate Fundisa for Change training within provincial annual professional development programmes.

When I contacted 14 of the participants to hear how and what they implemented only one responded saying the following;

I thought there was going to be a teacher training before one could implement what she learnt from training. I organised training for teachers but was given an impression that Fundisa and DBE are communicating and they would inform us when time is due. I had to cancel the memorandum that was already in schools. However, there was no further communication until today. I can implement only if there is effective training and clear communication from Fundisa for Change and DBE so that one does not undergo the pain of arranging training and again cancelling training, apologising to managers, unions and teachers. (email response)

There seems to have been an expectation that the Fundisa for Change partners would conduct training for teachers in the province and work with participants who have been trained to implement the training. Following-up with participants post training to see what they might have implemented was not part of the study. I made contact nonetheless to check if they had implemented anything new learned from the training.

From the 14 participants who attended the training, seven of them received certificates for successful

completion of the portfolio tasks. Does this 50% successful completion mean that only 50% of the participants were developed professionally? Does the 50% successful completion mean that what carries more weight is the grading than the process of learning that occurred during the training sessions with the 14 participants? Do these results mean that the Fundisa for Change programme has not achieved its aim of improving subject content knowledge, improving teaching and assessment practice of the participants? How should programme measure success?

The next section discusses implementation of the programme in Limpopo.

6.3.2 Site 2: Limpopo (*Teaching Water in grade 4 - 9*)

6.3.2.1 Context

The water training took place over five days, with three days of initial training in February 2015 and a two-day follow-up session in March 2015. It was attended by 27 provincial Social Sciences subject education specialists, representing the entire province. Participants were identified by the provincial Department of Basic Education office. Two of the four facilitators were from two Fundisa for Change university partners and the other two were Fundisa for Change environmental sector organisation partners. The Limpopo provincial Department of Basic Education was proactive in requesting that the province release funds to subsidise participants' participation in the Fundisa for Change training (see Appendix 26).

Participants cited similar reasons for attending the training; they were hoping to get knowledge on environmental content as reflected below:

- I want to learn more about integrating environmental education in the curriculum
- To extend their knowledge of environmental learning, to be reskilled in teaching strategies
- To be able to share the knowledge with teachers
- To have knowledge concerning environmental education and how it relates to the curriculum
- To be empowered and capacitated to work with environmental content in the school curriculum I want to enhance understanding of environmental aspects in the subject I co-ordinate

Participants already knew the training was on environmental teaching and learning and their interest was on how this is linked with the curriculum with which they worked.

Analysis of participant profile revealed that more than 50% of the participants have been

supporting teachers for more than 10 years. Additionally, more than 50% of the participants were familiar with environmental learning in the curriculum. One of the participants who has been supporting teachers for more than 20 years stated that they have never heard of environmental learning in the school curriculum (see Figure 6.10). It may be that some educators still see environmental learning as something that is an ‘add-on’ and not part of the curriculum.

Table 6.5 Participant profile questionnaire responses (site 2)

Statements	Responses
Experience with supporting teachers	• 4% had been supporting teachers for 0 -1 year • 12.5 % had been supporting teachers for 2-5 years • 21% had been supporting teachers for 6-10 years • 25% had been supporting teachers for 10-20 years • 37,5% had been supporting teachers for more than 20 years
Experience in engaging with environmental learning in the school curriculum	• 42% were very familiar • 17% were quite familiar with it • 37% had heard about it, but knew very little • 4% had not heard of it before attending Fundisa training

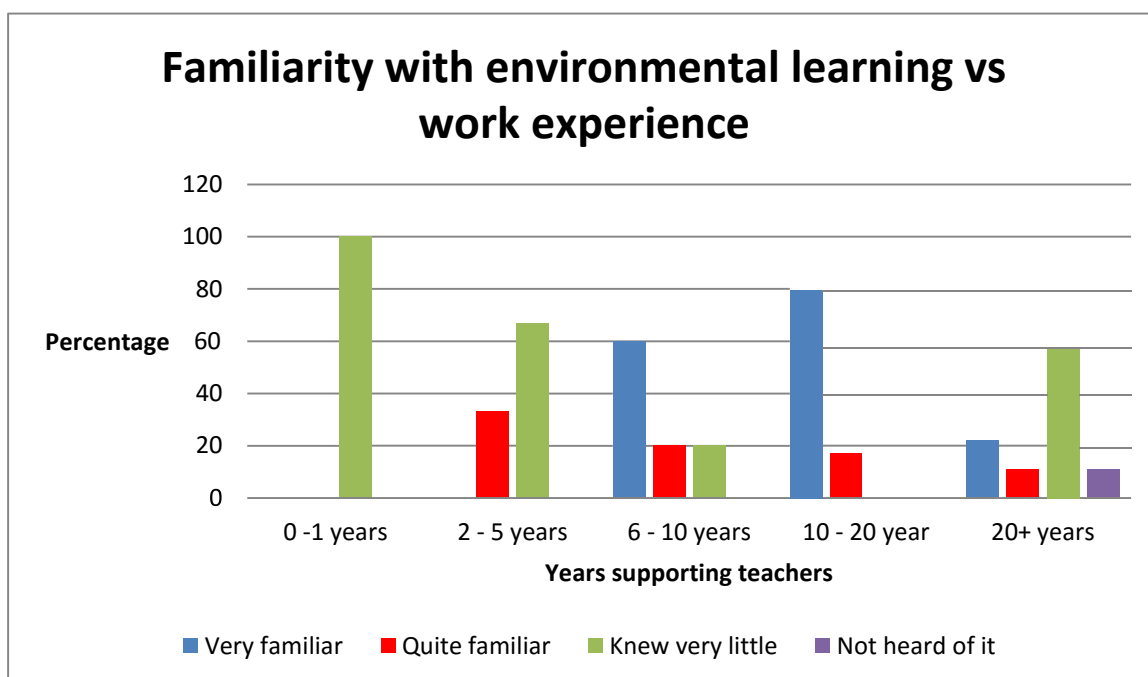


Figure 6.10 Familiarity with environmental learning in relation to work experience

6.3.2.2 Delivery of Fundisa for Change programme to achieve programme outcomes

Day 1

As the co-ordinator of the programme at the time of data generation, I presented an overview of the Fundisa for Change programme. I shared its history, objectives and the partners involved in its implementation.

The main facilitator opened up discussion by inviting participants to talk about the future they want for themselves and for the learners in the schools they worked with. Participants wanted a safe future with a clean and healthy environment that provided them with resources. They also wanted learners in schools to understand and value the environment, and know what they need to do to care for it.

Participants were introduced to the concept of transformative learning. Their understanding of transformative learning was that it is learning that brings change that is “change in how we work with content teaching method and assessment, learning to put what we learn into practice, learning to adapt to change” (S2P). Participants stated that it was an important concept to think about in education. One of the participants stated that, “the current education does not address environmental issues. We want to respond to the environmental challenges we have created but we don’t know what to do” (S2P).

There was recognition that transformative learning has the potential to empower people to address environmental issues. What was also highlighted by the statement above was that people had to take responsibility for the negative impacts their actions have on the environment. Although participants indicated that they were not currently supporting transformative learning in Social Sciences they could start by involving learners in environmental projects and competitions. They saw transformative learning as outside of the formal school curriculum. Through the discussion they realised they could support transformative learning by using teaching methodologies and assessment practices that could support it.

Participants talked about some of the environmental concepts that were a challenge for them and which they felt they struggled to assist teachers with. The discussion was based on one of the activities (see Appendix 1) they had to submit at the end of the training as part of their portfolio of evidence. Concepts that they mentioned were; tsunamis, carbon footprint, carbon emissions, sustainable use of water, global warming, energy sources and wetlands. One of the participants said these concepts were abstract.

Some of the participants shared that they accessed information from the internet, textbooks, own experiences and colleagues from other provinces. It emerged from the discussions that they have not been supporting teachers with developing content knowledge due to challenges of teacher resistance and this includes a lack of support for teachers with environmental content. One of the participants had this to say:

Teachers resist workshops on subject content. We ask teachers to give us topics they struggle with so we can prepare but environmental content never comes up from teachers. Some say they don't have challenges except map skills. (S2P)

It seems teachers in this particular district prefer to be supported with practical skills rather than content knowledge.

The main facilitator shared the 2015 DBE diagnostic report with participants. She particularly focused on learner performance in Geography over a period of three years. Concepts taught in Geography progress from concepts taught in the Geography component of Social Sciences hence it was important for participants to know what grade 12 Geography learners struggle with.

To enable participants to achieve the first outcome of the Fundisa for Change short course, *Subject Knowledge and Learning (Theory)*, participants worked with Social Sciences curriculum documents to identify the water content specified in the Geography component of

the subject. Participants were put in groups with each group identifying the water content in one grade. Flipcharts with water content from grades 4 – 9 were then displayed on the walls for participants to see how water was presented in the curriculum. Groups presented their flip charts (see Figure 6.11 below) to the whole group and had to justify why they had included some of the topics and excluded others. One of the discussions was that some of the content in the curriculum explicitly referred to water whilst some was implied. Participants were also expected to identify conceptual progression within and across the grades. This discussion enabled participants to see what foundational knowledge learners needed in order to teach the concepts from grade to grade.

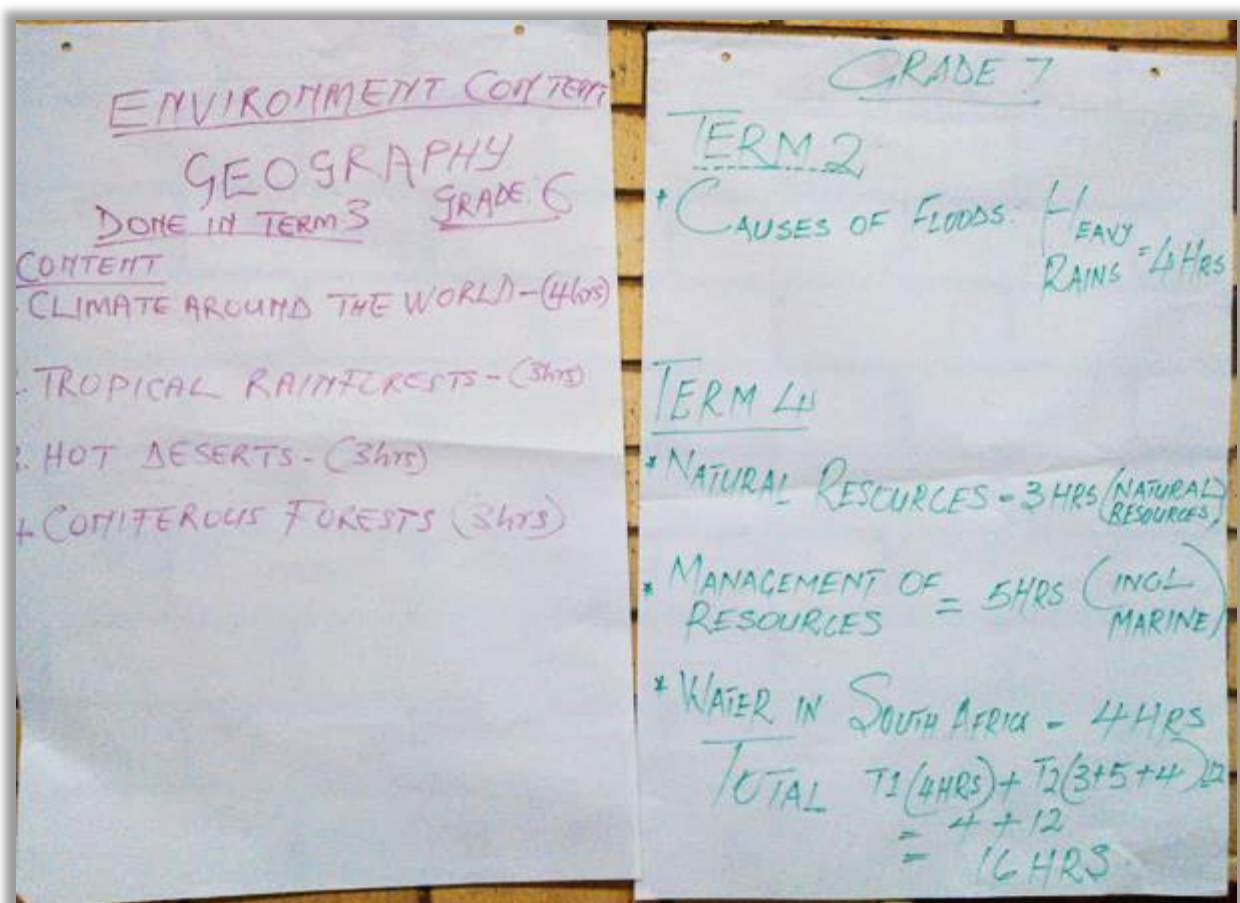


Figure 6.11 Participant's work from working with Social Sciences curriculum document

When all the groups had presented, the main facilitator introduced participants to the Fundisa for Change training modules. A second facilitator gave a presentation on wetlands. This was an important topic to address as participants had indicated earlier that they struggled to support teachers with this content. Participants were given a resource that covered content on wetlands. Fundisa for Change partners worked well together during this session as questions asked by

participants during the presentation were responded to by other facilitators when the presenter was not sure of some of the issues. This showed good rapport between Fundisa for Change partners and modelled to participants the importance of collaborating with colleagues and how co-teaching can enhance learning.

In order to contextualise the *Teaching Water* Fundisa for Change module, the next presentation was on water sources in Limpopo with a particular focus on rivers found in the province. This was to enable participants to achieve the aim of *Situated Knowledge and Learning (Context)* which is focused on relating subject specific environment and sustainability content knowledge with broader issues and contexts.

Provincial maps were used to show the location of the maps and use was made of a SANBI online resource that showed which of the provincial rivers were endangered or threatened. Participants, because most knew the location of rivers, were able to share what activities occurred close to the rivers, for an example, industries or residential areas that may have impacted the health of the rivers.

Another activity that brought intense discussions amongst participants was a topic on the water cycle. Participants were given puzzle pieces of a water cycle which they had to assemble. They worked in groups to produce a complete diagram of a water cycle and to label the processes on the diagrams (see Figure 6.12). When all group diagrams of the water cycle were displayed on the wall, participants presented their posters (see Figure 6.13).



Figure 6.12 Participants creating a water cycle poster

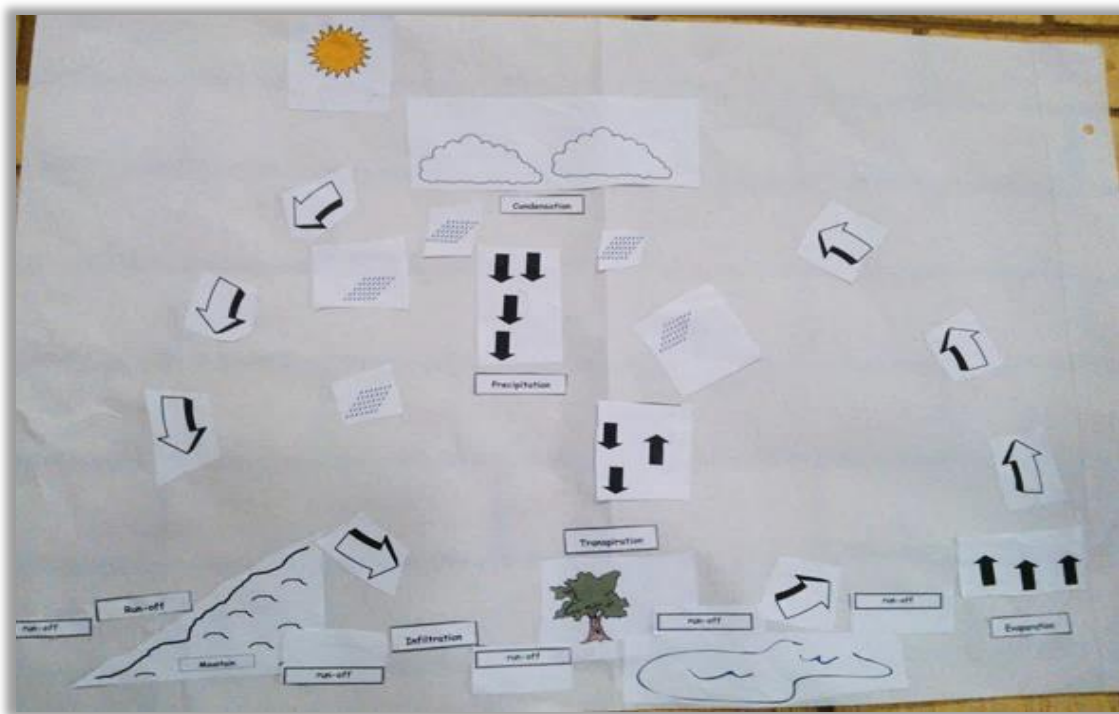


Figure 6.13 One of the water cycle posters created by participants

Groups were asked questions about their diagrams as some of the diagrams were incorrect in showing the direction of the water in the cycle, other processes were incorrectly labelled. Participants were able to critique each other and to correct errors in the posters. This activity gave participants an opportunity to teach each other about the water cycle and to clarify what each process was. To consolidate the presentation, participants were invited to share how they would adapt how the activity was presented to them so it is appropriate for the different grades where this topic is taught. This activity brought disagreements amongst participants which led to the main facilitator stating that people learn through discussions, as reflected below:

Greatest learning comes from conversations. We learn from each other from the conversations we engage in. And we sometimes question our knowledge when someone else gives another point of view. (S2F1)

Participants were given an overnight task to work on part two of the portfolio (Appendix 19) using the resources they had received. On reflecting about the day, one of the participants said they thought the training was for training them to support the teachers. He was struggling to understand the approach that was used, “it seems like now we are in the classroom with the work we are given and I don’t know how this is going to assist me to support teachers with environmental teaching.”

Another commented, “I want more examples on how to teach these concepts”.

It seems some of the participants wanted to be given information on how to support teachers rather than to go through the process themselves. They did not seem to appreciate the modelling approach that was used in how facilitators built participant capability.

Day 2

The day started with a discussion on how people defined quality education. Some of the definitions from participants were:

Education should not only be about the knowledge and bachelor passes but also be about attitudes.

Education must not only be about exams but learners must be able to solve problems.

Education must produce responsible citizens who do not destroy what they have.

The responses above illustrate that participants recognise that quality education is not only about textbook knowledge but that it extends to the role that knowledge plays in the development of those who receive it, and includes values.

To orientate participants to teaching methods in environmental teaching and learning, they had to read the Fundisa for Change *Methods and Processes* book. Different methods were assigned to different groups and groups had to consider how they could use the method during training and how they would use the method when working with a large group of teachers. Participants created posters which they shared with the rest of the participants (see Figure 6.14)



Figure 6.14 One of the groups working with the *Methods and Processes* book to create a poster

The facilitator gave input as each group presented their work, also explaining the difference between deep vs surface learning. Participants were also challenged to think about how they would cater for different participants in a workshop who had different learning styles. The aim of the activity was to develop participants' *Pedagogical Knowledge and Learning (Practice)*.

The activity was not only about participants understanding each method but also on how practical it would be to use the method and what needs to be taken into consideration to ensure that the method can lead to learning. After the presentations, participants were asked to reflect on the facilitation methods that had been used during the training and how (if at all) the methods have contributed to their learning (see Figure 6.15). Some of the methods mentioned were guided questioning and case studies. They also mentioned that reading, writing and discussing with colleagues enhanced their learning.

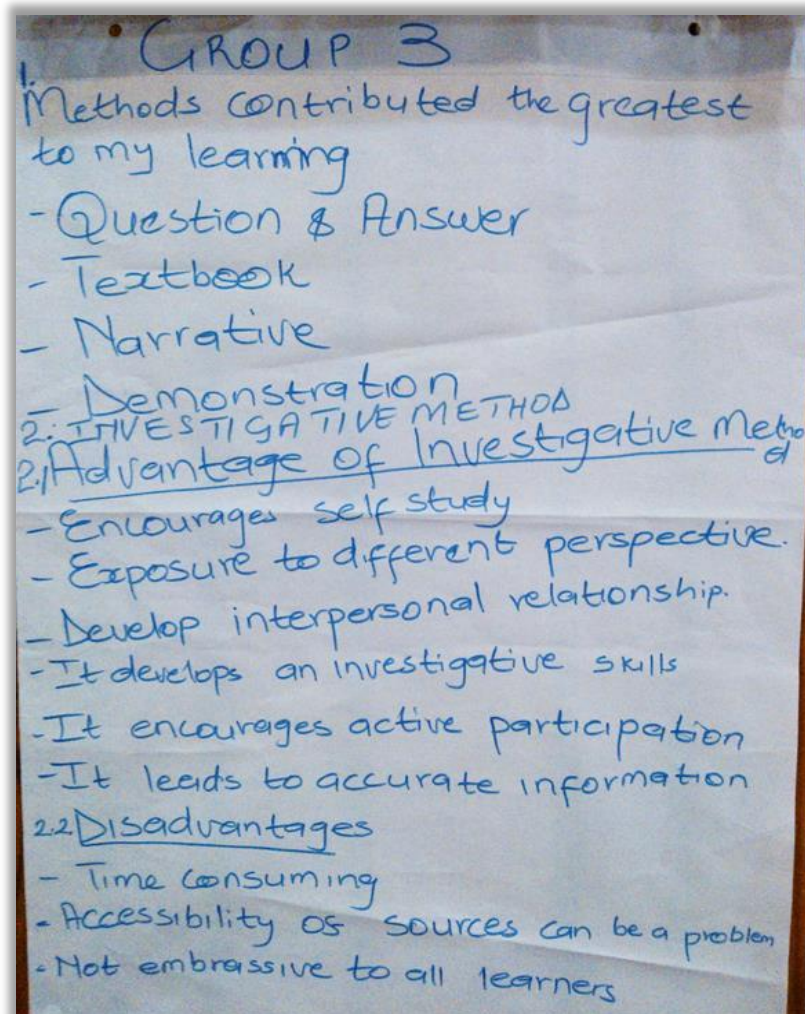


Figure 6.15 Participants' work on teaching methods

The facilitator encouraged participants to think about each method they use in teacher

development, “How is the method used and what is the purpose and intention? Think about how each of the methods can be used in the context of teaching Social Sciences” (S2F1).

The next two activities were hands-on to demonstrate how practical work can be used to teach concepts. In the first activity participants, in groups, had to create a water purification system. They were given the resources as well as the procedures to follow to create the system. Facilitators walked around observing and asking questions as groups worked (see Figure 6.16).



Figure 6.16 Participants building a water purification system

Additionally, participants were given a reflection worksheet based on the activity above and were asked to work individually to complete it, some of the questions they had to answer were:

- In what ways were the activities building new knowledge?
- Explain how knowledge is sequenced and supports progression.
- How is contextualization considered?
- Explain how action competence is encouraged.
- What methods were used and how do they encourage reading and writing?
- What methods were used to cater for participation, evaluation, synthesis and

innovation?

- Identify the teaching and learning support materials and how they enhanced learning.
- What was the role of the facilitator?

Participants indicated that they enjoyed the activity because it was hands-on. They also mentioned that they would have to consider resources if they wanted to use the method in their work contexts. They felt they learned as they participated and read the instructions.

One of the Fundisa for Change university partners presented on how group work can be used effectively for learning before participants continued with the next practical activity.

The next hands-on activity was also a group work task where participants had to develop a water distribution system. It was a problem solving activity as participants had to ensure that water was distributed equally to three water reservoirs. Instructions were read and explained to participants although the instructions were also given in written form to participants. All the resources and how they were to be used were also explained. The facilitator walked around the groups and interacted with them as they did the activity (see Figure 6.17).



Figure 6.17 Participants working on the water distribution system

In reflecting on the activity, participants contextualised the activity to a water protest that had

happened in the province a few weeks back due to people not being allocated enough water in their area as a result of poor maintenance by the municipality. The issue was discussed as being not only an environmental issue but also a social issue as everyone should have access to water as a basic human right. Additionally, they talked about lack of capacity at municipalities. Facilitators highlighted the importance of taking responsibility for one's learning, "It is about all of us taking ownership of our learning and professional development (F1), it is also about "the concept of lifelong learning (F2).

In linking the activity to the presentation on group work, participants reflected on how they worked as a group. Some of the participants indicated that some group members wanted only their ideas to be accepted and this led to delays in completing the task. One of the suggestions from participants was to allocate roles to group members. Groups shared what made them successful in accomplishing the task was that they worked well together and planned together. Another group mentioned they learned from trial and error: "We learned from doing and re-doing" (S2P).

In consolidating the activity, participants were asked the type of skills that could be developed through the activity. Some of the skills mentioned were critical thinking, creative, communication, problem-solving and mathematical skills.

Day 3

The day started with a reflection on the previous two days using O'Donoghue's *Active Teaching and Learning in CAPS* as guiding questions as reflected below:

- Which activities encouraged you to read?
 - Water purification, teaching methods and practices
 - Water distribution
 - Working with the curriculum documents and water cycle activity
- How did you learn concepts?
 - Reading
 - Experimenting
 - Participation and interaction, e.g. water distribution and purification
- Did you do any 'finding out more' activities?
 - Experiment
 - Reading
 - Asking questions
 - Deliberating

- In what way have you been encouraged to try out new ideas?
 - Experiments
 - Being asked how we would adapt activities here in our contexts
- How are you engaging in debate and dialogue?
 - Group work
 - Doing reflections
 - When questions are posed
- How is innovation encouraged, if at all?
 - Practical activities and problem-solving
- What is the purpose of you being here?
 - To develop each other
 - To find new strategies of doing our work

Having guiding questions allows participants to think about what they have been doing and gives them tools to reflect.

The next activity focused on the assessment component of the *Pedagogical Knowledge and learning* outcome. Participants worked with CAPS (Geography component of Social Sciences) to identify assessment requirements per term as well as cognitive weighting (Bloom's) in each grade. Some of the participants struggled with the differentiation between assessment 'of' and 'for' learning and some were able to differentiate, as reflected below:

Assessment of learning means what we assess and assessment for learning means the purpose of assessment.

Assessment of, assessing in an exam or test, for baseline assessment so we can teach more, assessing extent learners have information so we can see what learners know.

It is assessment of after teaching and learning and assessment for before teaching and learning.

Assessment for is developmental and wants learners to learn, assessment of wants to see what you have taught.

Although both assessment *of* and assessment *for* are defined in the curriculum document, it seems as if participants do not necessarily engage with the curriculum document as illustrated by how they struggled to define both concepts.

The main facilitator introduced summative and formative assessment, "knowing what the

purpose of the assessment is will determine whether it is summative or formative” (S2F1). The facilitator used examples to explain difference between assessment ‘of’ and ‘for’ learning and summative and formative assessment. She also talked about the importance of specific feedback so that learners can improve performance.

Day 3 was the last day of the first session. The last activity required that participants in groups use the concept of wetlands to think of assessment and content knowledge. The following questions guided the activity:

- Find out in which term it is taught
- Determine other concepts that are linked to the content
- What assessment is required in that concept?
- What knowledge is critical for understanding the sustainability of wetlands?
- What skills and values will you need to test for in terms of sustainability of wetlands?

As groups worked, the facilitator gave input. Using the Social Sciences curriculum document, the facilitator showed participants how the topic of wetlands is presented in the different grades.

Portfolio tasks were then discussed with the groups and they were told what parts of the tasks needed to have been completed when they came to the follow-up session.

Day 4

Day 4 was a follow-up session a month after the first session. Only the main facilitator was present for the two-day follow-up session. The day started with reflections from the last session. Participants had to reflect on any changes they had made since the last session. Responses from participants are noted below:

I developed an interest in wetlands and their importance; the way I used to see wetlands has shifted.

Since I went back to work, I am determined not to lose a drop of water I watch out for leaks.

I visited a wetland and took photos.

I introduced new hands-on teaching methods, and learners were enjoying and participating.

I advised teachers to cater for all learning styles in their teaching.

Changes that have taken place are both personal and professional and this speaks to the change-

oriented learning component of the Fundisa for Change programme.

Participants then shared a portfolio task activity that required them to research a particular water topic and to compare the information they had found with information on the topic from any of the textbooks they used. Some of the comments of participants are reflected below:

Textbook information does not explain what a wetland is but give bullet points.

Learners will not be interested to conserve wetlands if they do not have knowledge about them and their importance.

Water management: textbook has limited information on water management; it talks of uses of water and abuses but does not explain how water is abused. Conservation is clearly explained but only one example given about water reserves.

Knowledge in the textbook is not contextualised, it is generic.

Although concepts are specified in the curriculum document, there is limited information in the textbook. Some concepts are not mentioned in the curriculum e.g. effects of water pollution.

Participant responses prompted the facilitator to ask participants to think of the role they need to play when working with textbooks and curriculum documents. Although participants identified gaps in knowledge, it needs to be highlighted that textbooks are predominantly learner resources and that each teacher needs to have more knowledge than what is specified in the curriculum and presented in a textbook. No one textbook can cover all there is to cover on any topic.

The next activity focused on the assessment component. Participants were given tests, assignments and projects that had been developed by others and had to comment on their appropriateness. What I noted was that most of the comments on these tasks were more technical than what the assessment cognitively required of learners or as related to the appropriateness of the content covered.

The facilitator asked participants in groups to design a tool that could be used to moderate assessment tasks given to learners. The following question guided the development of the moderation tool: *What makes a good test, assignment and project?* Some of the responses were that the task should have accurate marks and time allocation and it must address all cognitive

levels. Figure 6.18 shows some of the responses from the groups with facilitator inputs.



Figure 6.18 Test moderation tool input from participants and facilitator

The facilitator gave a short presentation on what participants needed to consider when setting higher order questions. Some participants stated that they used suggested verbs when they set questions; others commented that they also used data sources. The facilitator encouraged participants to also use subject aims to develop assessment tasks “The aims of the subject should inform how we teach and assess, irrespective of the content that is specified” (S2F1).

The facilitator used the curriculum documents to read and explain the aims of Social Sciences for both the Geography and the History component.

An overnight task for participants was for them to set an assessment task, either a test or an assignment which they had to bring the next day.

Day 5

Participants had to exchange their set assessment tasks developed overnight and use the moderation tool that was developed the day before to moderate their colleagues' assessment task. They had to give their colleagues constructive feedback. This encouraged participants to think critically and reflexively in order to give constructive feedback to their colleagues. Participants appreciated receiving feedback from colleagues on the assessment tasks they had developed as reflected by one of the participants below:

This was a useful exercise. I set a project without looking at a textbook. Now I understand the content and how to set tasks that have all the cognitive levels because that one is a serious challenge for most of us. I was able to cover the transformative learning, which is a new concept I did not know and also reflexive learning. (S2P)

Other comments from participants were on transformative learning, building on the comment above:

For transformative learning, learners must be able to take action so our teaching must be contextualized.

It is unfortunate that we are only learning about transformative learning only now. We have the topic of pollution in the curriculum but when we go to the schools there is pollution in the school grounds. It is just taught but it is not addressed.

Participants recognised that environmental teaching and learning should go beyond simply covering what is in a textbook but must also bring visible change in how people act.

Although not much time was spent on the *Practical Knowledge and Experience (Work Experience)* outcome during the training, the bulk of this work was expected to be covered by participants as a 'work-away' task.

On discussing how participants planned to train teachers in their districts on the water content, teaching and assessment, the facilitator shared an example of a plan that was designed by one of the participants in site 1. Participants were then expected to design district teacher training workshops which they were to share with the rest of the participants. Participants also shared challenges they anticipated in implementing the plans in their districts. One of the main barriers is the number of schools that subject education specialists have to support, which makes it

difficult for them to support all the teachers when they go for site visits in schools. “I have a challenge with school visits. I have more than 7 circuits that I support and each circuit has more than 30 schools. A year passes without me having seen some of the schools”, stated one of the participants (S2P).

This is a systemic issue that requires that participants be creative in how they can support teachers, for example, they can use cluster meetings where possible to support teachers on content, teaching and assessment.

Participants were encouraged by the facilitator to complete all the portfolio tasks: “Do not see this [portfolio tasks] as an addition to what you do but see this [training and portfolio tasks] as supporting what you do. This work is supporting you to do what you are supposed to do, better. Try and make it what you do every day” (S2F1).

A completed portfolio was to be submitted four weeks after training. All three components of the Fundisa for Change training course were covered: subject content knowledge, teaching and assessment practice. These three components were also reinforced with the portfolio tasks that participants were expected to submit.

6.3.2.3 Post-training data and reflections

In analysing the questionnaires completed by participants (see section 4.5.2) at the end of the Fundisa for Change training short course. The following emerged:

- The general feeling was that the training was too short.
- Participants felt there were more things that needed to be learned, more time needed to familiarise themselves with content.
- They thought that some activities were not given sufficient time or covered adequately leading to some sessions being rushed.
- They stated that more time was needed to complete activities and for discussions.
- They felt a lot was done and there was a lot to learn in a short space of time.
- Some also stated there was insufficient time allocated to working with teaching methodologies.

The following table shows how participants rated different component of the training

Table 6.6 Participants’ rating of different aspects of the training

24 responses from 27 participants	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The content of the course was relevant to my needs as a curriculum advisor	46 %	54 %				
The course materials were used effectively to support my learning on the course	54 %	46 %				
Facilitators were knowledgeable	75 %	25 %				
The methods and approaches used on the course were appropriate	42 %	58 %				

Some subject education specialists reflected that facilitators were able to address their needs effectively and efficiently, they were knowledgeable, respectful and serious about their work. But they also stated that there is a need for more practical activities to be done; training should be continuous, it should be spread over the whole year; more knowledge on pollution, global warming and climate change would be appreciated. They would appreciate more teaching methods and practical activities being adapted to relevant content. Additionally, they mentioned there is a need for more thorough explanation of concepts.

Participants had mixed comments when asked to comment on the Fundisa for Change materials. Although most (67 %) of the participants indicated that the materials were excellent, some mentioned that they had not given much attention to the materials at the time of the evaluation, adding that enough time should be allocated for participants to go through the materials so they can ask questions if necessary. Participants said the following about the Fundisa for Change materials:

The materials were user-friendly, are linked with curriculum, easy to follow and relevant.

They give recent information and go beyond what current textbooks provide.

I will use the materials as a reference when I support teachers.

The materials contain too much information which is not necessary; I would have preferred them to be only CAPS aligned without the inclusion of extra environmental content.

The best part of the training for some was the involvement of all participants in discussions, the coverage of content, teaching methods and assessment and the practical activities. Participants stated that the Fundisa for Change programme would enable teachers to use a variety of teaching methods in their classrooms: “The information shared in the training is what has to be covered in the curriculum and it is important that learners learn about environmental studies” (S2P). They hoped for more courses of this nature throughout the year for all the grades.

At the end of the training, participants were positive about their abilities and what they had learned from the training and complemented the facilitation, as reflected below:

The presentations by facilitators were outstanding and course materials provided were adequate and appropriate for every presentation. Keep up the good work.

It will be possible for me to demonstrate to educators the need to involve learners in their teaching so that learners are also active.

I can develop teachers about what I have learnt.

With the acquired knowledge and skills I could be able to transfer what I have learnt to colleagues without hesitation.

The table below shares participants' rating of the relevance of the Fundisa for Change training to the work they do.

Table 6.7 Participants' rating of Fundisa for Change's relevance in their daily work

24 responses from 27 participants	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The Fundisa for Change course clearly relates to teacher training in South Africa	29%	71%				
Environmental learning is clearly part of the school curriculum	46%	54%				
Fundisa for Change can help me to better identify and explain key environmental concepts in the school curriculum	46%	54%				
Fundisa for Change can help me to better teach environmental content beyond the CAPS curriculum to teachers or student teachers	46%	50%	4%			
Fundisa for Change can help me to better explain the transformative nature of environmental learning to a colleague	38%	62%				
Fundisa for Change can help me to better demonstrate teaching methods for higher order environmental learning	46%	54%				
Fundisa for Change can help me to better demonstrate how to assess higher order environmental learning in the classroom	46%	54%				
Fundisa for Change can help me to link environmental learning in the classroom with whole school development	42%	54%	4%			
I would be able to use the Fundisa for Change materials to teach my own course	25%	75%				
I am able to identify additional teaching resources for environmental learning	34%	58%	8%			

For the Fundisa for Change programme to work for them in their work contexts, participants indicated they needed the following support:

- 88% need more resource materials
- 63 % need support from the Department of Basic Education
- 42% want to be in a Professional Learning Community
- 38% need opportunities to do research in EE/ESD
- 25% still need more training on environmental studies.

Although participants still need more support as indicated above, more than half (54%)

indicated that they are very likely to apply what they have learned. The rest of the participants (46%) said they would possibly apply it.

Generally, they found the Fundisa for Training to be “very good, wonderful, informative, empowering, excellent, useful, educating, outstanding, enlightening, inspiring, motivating, fruitful, relevant, well-organised and well-planned”. They also indicated that it “provided additional information for teaching, enabled integration of environmental education in the curriculum and enhances knowledge of environmental issues”.

Suggestions that participants mentioned for improving the training included increasing contact time so that more content could be given. Although some stated that they were confident to engage with environmental content knowledge after the training none of them shared what they had implemented when asked for an interview or to complete a questionnaire almost a year after the training.

6.3.2.4 Post-training reflections from the main facilitator

The main facilitator, who also assessed participants’ portfolio work shared the following reflection on the training:

Strengths:

- Involvement of the provincial curriculum education specialists in the training is a strength because it supports the institutionalisation of the programme!
- The redevelopment and critiquing of participant examples of different types of assessments e.g. assignments, texts and exam papers added great value to the discussions.
- Establishing a separate two-day session for the course participants to work on the assignments was very valuable and helped to draw the course knowledge and the workplace practice into tangible outcomes for participants.
- The various contextualised resources, posters and books on the topic of water added value to the course particularly for those participants who struggling to access relevant materials for their province.
- The practical hands-on activities provided ideas on how different methodologies that they read about could be put into action. Many found this interesting, exciting and challenging.

Challenges:

- Venues for training should be more conducive to training. There was a lot of distraction and noise during break times because the main training took place at a school.
- A planned excursion to the local water treatment plant didn't happen.
- Although we received the brief that the training was predominantly subject education specialists, there were teachers also present in the session and this required the facilitators to make alternate arrangements in terms of assignments etc.

Recommendations:

- There is a need to develop greater local partnerships to provide continuity, support and progression of the work done in the province. Current ones need to be strengthened and to support the Fundisa for Change programme. This can happen through meetings with key stakeholders in the province.

The successes, challenges and recommendations need to be shared with the programme stakeholders as they will affect the programmes' theory of change.

6.3.3 Site 3: Mpumalanga (*Teaching Water in Social Sciences in grade 4 – 9*)

6.3.3.1 Context

The first four-day water training session took place in Nelspruit in February 2015 and a one-day follow-up session on 6 May 2015. Fifteen subject education specialists from various districts in the Mpumalanga province attended the training. The participants were selected by the provincial Department of Basic Education. The participants were Social Sciences subject education specialists. There were five facilitators in the training, four of the facilitators were from three Fundisa for Change environmental sector partner organisations, and one was from one of the Fundisa for Change university partners. There were also two guest presenters invited from a local Catchment Management Agency.

Participants had varied reasons for attending the training, for some it was curiosity about the programme and for others it was an opportunity to learn, as reflected below:

To gain knowledge and develop teachers who will then teach learners in their classrooms.

I want to be able to integrate knowledge gained in the phase they are supporting.

I wanted to see how the Fundisa for Change programme linked with CAPS and what

change the programme was bringing to the curriculum.

I wanted to understand how I can care for the environment.

I want to have an impact when I facilitate environmental concepts and content with teachers.

I want to have more information on environmental learning to assist teachers in my district.

I'm interested in diverse teaching methods so I don't use the same method that might not work with some learners.

The table below shows participant' work experience and their familiarity with environmental learning in the school curriculum prior to attending the Fundisa for Change training.

Table 6.8 Participant profile questionnaire responses

Statements	Responses
Teaching experience	• 20% had been supporting teachers for a year • 13% had been supporting teachers for 2-5 years • 47% had been supporting teachers for 6-10 years • 20% had been supporting teachers for 10-20 years
Experience in engaging with environmental learning in the school curriculum	• 20% were very familiar • 26% were quite familiar with it • 47% had heard about it, but knew very little • 7% had not heard of environmental learning before the Fundisa for Change course

It was surprising to discover that there was a subject education specialist who has been supporting teachers for more than ten years who had never heard of environmental learning prior to the Fundisa for Change programme. It is more surprising as Mpumalanga has a departmental environmental educator in the Department of Basic Education provincial office. Quite a number (47%) indicated that they knew little of environmental learning in the curriculum. This raised the question of the extent to which teachers in some of the districts in the province were engaging with environmental learning if subject education specialists who are supposed to support them integrate environmental learning did not have the capacity to do so. The graph below (Figure 6.19) shows the relationship between years of experience in supporting teachers and experience in working with environmental learning in the school curriculum.

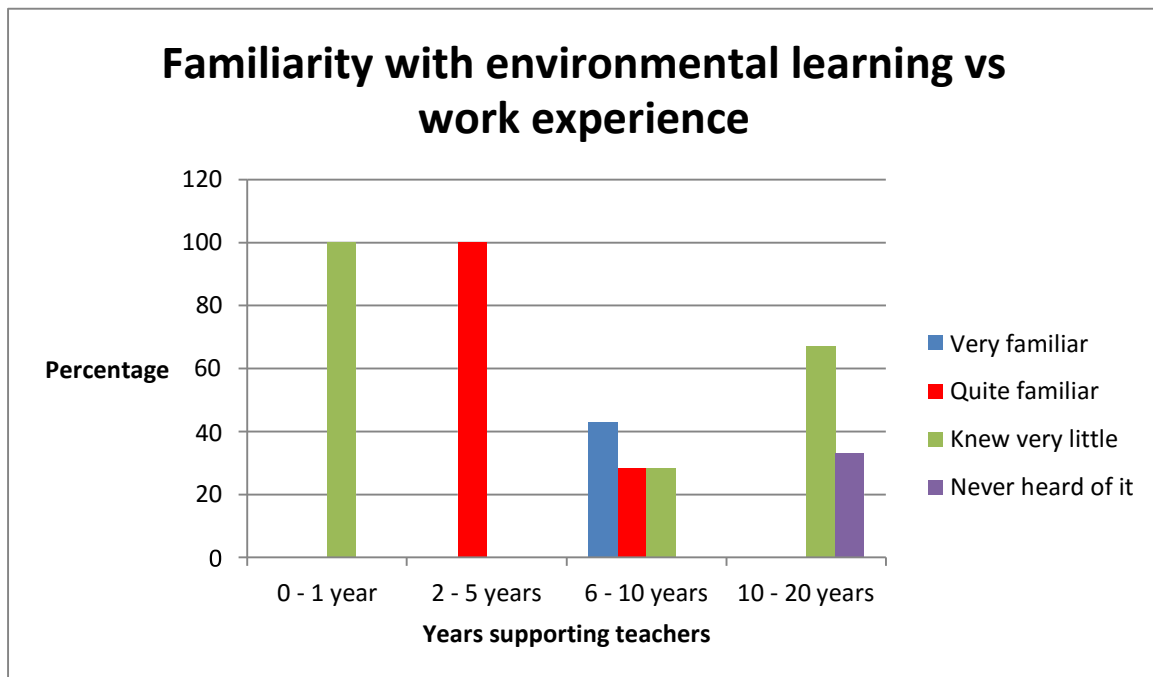


Figure 6.19 Familiarity with environmental learning in relation to work experience

I attended the first four days of training and missed the one-day follow-up session which was a support session for participants to work on their portfolio assessment task. The lead facilitator for the Mpumalanga training is the same facilitator who led the Gauteng and the Limpopo training. The main resources used in this training were the three Fundisa for Change generic modules and the two Fundisa for Change Social Sciences water modules for intermediate and senior phase (see Figure 6.2). Additional resources were also brought by facilitators during the training. The next section discusses how the training was implemented to achieve the aims of the Fundisa for Change short course training programme.

6.3.3.2 Delivery of Fundisa for Change programme to achieve programme outcomes

The training programme (Appendix 27) shows the three components of the Fundisa for Change course, content, teaching and assessment.

Day 1

For the first activity of the day, participants were given cards with years starting from 1992 until 2012. Participants said something about what was happening in their lives in the year indicated on their cards as well as what was happening in the education system and any environmental event that happened in that year. Participants were able to recall environmental events and curriculum changes that took place over the years. The facilitators and other participants could also add education and environmental events they remembered. The timeline was pasted chronologically on the wall with the events below each year card. The facilitator

consolidated by drawing the participants' attention to the times when environmental events that took place impacted what was happening in education in the school curriculum in particular.

One comment from the participants was that although environmental events may have influenced the school curriculum, the Department of Basic Education should "monitor the implementation of the environmental content that needs to be taught and to see how what has been taught is put into practice". It is possible to monitor the extent to which teachers teach environmental content as environmental content is also the subject content in some subjects (see Appendix 1). The practice aspect the participant refers to is a change-oriented learning process which could be demonstrated by a change to more sustainable practices. This kind of change might be possible depending on the teaching methods used to teach the content and the type of assessment given to learners. One of the participants suggested that they, as subject education specialists, should reflect on what they were currently doing with teachers so they can assist them in developing learners' competency to adopt sustainable practices.

Participants were given 15 minutes to work on the pre-course task (Appendix 16) that required them to reflect on environmental concepts they struggled with and which environmental concepts they supported teachers with. The following comments were made by participants:

Some of the concepts that are there are not in the phase I am supporting." [The training combined intermediate and senior phase Social Sciences subject education specialists hence some of the concepts may not be relevant to all].

We have neglected these particular environmental issues [water concepts], our focus has been on content.

The second comment highlighted the dichotomising of environmental concepts and subject content. The concepts in the task are concepts specified in the Social Sciences curriculum document. One of the participants commented that the subject content and environmental content are not necessarily different but that it is "a question of emphasis, CAPS is clear on the environmental content. It requires another approach to teach it". This comment seems to suggest that the participant recognised that environmental content is the subject content in Social Sciences and that the issue is more on how it should be taught.

In the next activity participants in groups worked with Social Sciences curriculum documents. Some groups worked with intermediate and others with senior phase curriculum documents. Participants were tasked to identify water related topics and concepts that are covered from grades 4 – 9. The figure below is an example of what participants produced from the activity.

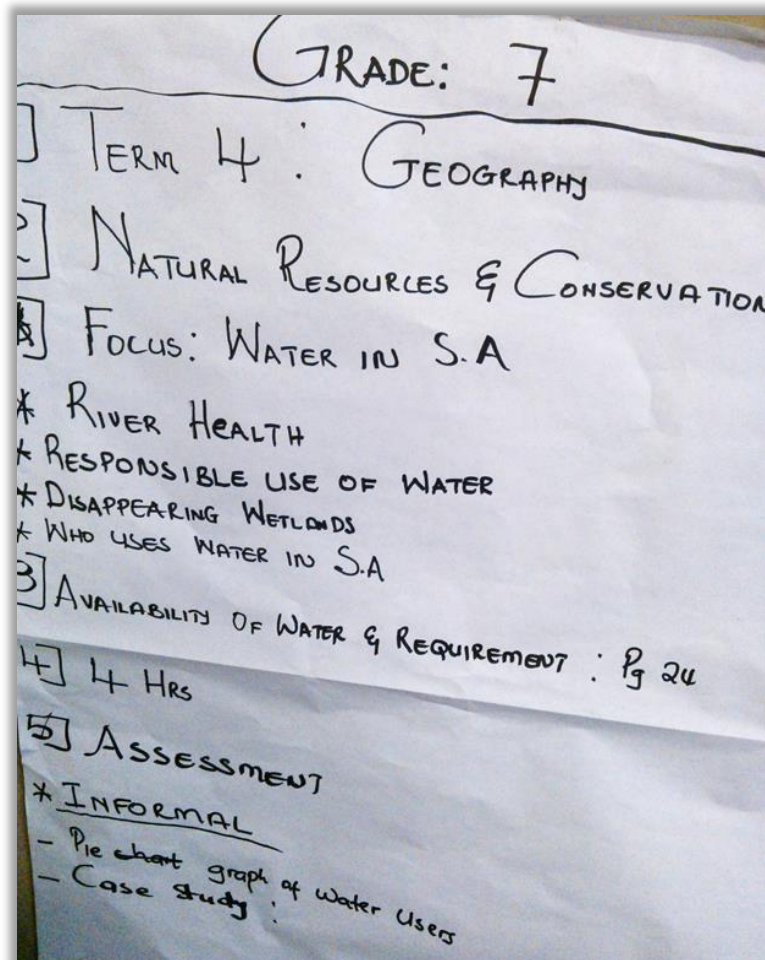


Figure 6.20 Example of work produced by groups in working with curriculum document

What emerged from this activity as groups presented their work was that water is covered in almost all the phases in all the terms. The water content was explicit in some phases and terms while it was implicit in others. Participants were also asked to think about how map-work skills could be used to teach about water.

Predominantly participants focused on the Geography component of the curriculum document for the activity. The facilitator encouraged participants to also look at the History component and gave them the following questions to work with: “How is water being used in this area

over time? How have those patterns changed? How have our needs changed in the passage of time?”

Two guests who work with water resource management in a local water catchment agency did a presentation for the group on water management, control and allocation. The presentation was contextualised for the local water catchments. To consolidate the presentation, participants were asked to reflect on how the knowledge gained from the presentation can be used in teaching about water in the Social Sciences curriculum. This required that they make links to the curriculum with what was presented. Other content knowledge that was covered was a water cycle and the concepts involved in teaching about a water cycle. Participants were given a poster showing a water cycle and a demonstration of how they can teach about a water cycle. Figure 6.21 below show participants making a model of a water cycle.



Figure 6.21 *Participants making a water cycle model*

The next content that was taught was on wetlands and participants were given a game to use to teach about wetlands, river systems and water catchments.

The facilitator shared an online resource from the South African National Biodiversity Institute (SANBI) website (Mpumalanga Biodiversity Conservation Plan Handbook) that participants can work with to contextualise the teaching of environmental topics. They were also given a

SANBI Biodiversity Handbook. The facilitator went through both resources to show participants what each book covered with regard to water related topics. She particularly focused on endangered water sources as one of the participant wanted an explanation on how rivers can be endangered.

Participants worked on part two of their portfolio tasks (see Appendix 28). They were expected to draw a mind map of concepts to teach a water topic then use resources received and a textbook they had brought to develop a summary of the information about that topic.

At the end of the day participants were given a fieldwork worksheet (see appendix 29) to prepare them for the excursions to the Nelspruit water purification plant and the Lowveld Botanical Gardens. The worksheet was in two parts: on the way to the purification plant participants were expected to observe and identify social practices, economic practices and primary agricultural practices happening in the area and what impact these may have on the water quality. The second part of the worksheet required that participants identified water purification processes.

The day predominantly foregrounded the *Subject Knowledge and Learning (Theory)* through content presentation and work with the curriculum documents. *Pedagogical Knowledge and Learning (Theory & Practice)* was engaged with through discussions and demonstrations of how content presented could be taught.

Day 2

The excursions focused on the *Situated Knowledge and Learning (Context)* component of the Fundisa for Change short course training programme which has a focus on specific environment and sustainability content knowledge in context.

Participants went to the water purification plant where the water purification process was explained to them. It was an interactive session as participants asked questions to complete their worksheets. The figure below shows participants at the water purification plant.



Figure 6.22 *Participants at the Nelspruit water purification plant*

After the water purification plant, participants went to the Lowveld Botanical Garden where they were taught about different biomes and how the amount of water available determines the vegetation that is found in each biome. During the walk in the Botanical Garden, participants were asked to identify human activities that had a negative impact in the garden and to suggest solutions to these actions. The two figures below show participants in the botanical gardens and one of the participants presenting on the task they were given.



Figure 6.23 A lecture on how the Botanical Garden is used to teach curriculum content



Figure 6.24 One of the participants presenting a group work activity

Day 3

The day started with reflections from participants. They were asked to reflect on what they had done in the past two days: “What has your learning journey been so far? What do you think you have learned and how do you think you have learned during the last two days?” (S3F1)

Responses from participants show that the experiences they had in previous two days have made a professional and personal impact on them. They have gained new knowledge as reflected below:

I feel I have learned a lot especially at the water purification plant. For us to have water to use it undergoes a lot of processes so it tells me as an individual that whenever I use water I should have that at the back of my mind that for me to use water I should use it sparingly and wisely because it has been gone through a process.

I have learned from observing.

I have learned there are many concepts involved in teaching about water.

It is very much important that we pay for the water services definitely, all the stages that the water that we drink, it undergoes several stages. To us it was just taking water from the river channelled to our homes.

I knew we received water from rain. I have always asked ‘why must we pay for the water when it comes from the rain?’ but yesterday I was like, wow.

I started to realise to purify water it takes a lot of steps and there are a lot of skills needed to purify water.

I did not know how much a river can be endangered by human activities.

I thought I knew something about wetlands, the way it was explained was good.

I was ignorant about wetlands until this workshop. Now I’m going to treat wetlands with all the respect it deserves.

After I have seen all the processes in the purification plant now I’ve got a different perspective on how to handle water as an individual and to teach people who are close to me who I have influence on to say we have to use water sparingly.

We believe that there is a lot of water but after the exercise on how much drinkable water is available in the world that is when we realised that there really is not enough water. So we need to deal with the ignorance that not every drop of water can be used so the little we have must be used sparingly.

The activity and the discussion afterwards seems to suggest that participants recognised that fieldwork when teaching about environmental issues can develop a deeper understanding of unsustainable practices and their associated risks. After the discussion participants were requested to locate water purification content in the curriculum from the posters they had developed on Day 1. This led to a discussion on how water purification can be taught. One of the comments from the participants was that, time allocated to teach water purification was not enough. “The time that is allocated does not really allow versus the experience we had yesterday; looking at how I have learned and the time allocation in the curriculum” (S3P).

Other comments were that it would be valuable for teachers to go to the water purification plant before they taught the topic to learners, especially if teachers cannot take learners to the plant. Another contextual issue that was discussed was that teachers have time constraints and teach for exams as learner performance is the determinant of success.

Participants were given a reading on transformative learning and in pairs had to discuss the paper using the following questions:

- What type of teaching supports transformative learning?
- What role would knowledge play in transformative learning?
- How can teaching methods support transformative learning and which methods are most appropriate and why?
- What should the nature of assessment be like to support transformative learning?
- How can we best achieve transformative learning in our current educational system with our current educational challenges?

The figure below shows some of the concepts participants came up with as they discussed the questions above.



Figure 6.25 Concepts on transformative teaching

What was critical from discussions on these questions was the realisation that participants needed to be co-teachers and co-learners when they engage with teachers in their districts. Additionally, they realised that they themselves needed to be transformed before they can talk about transformative teaching and learning with teachers, as reflected below:

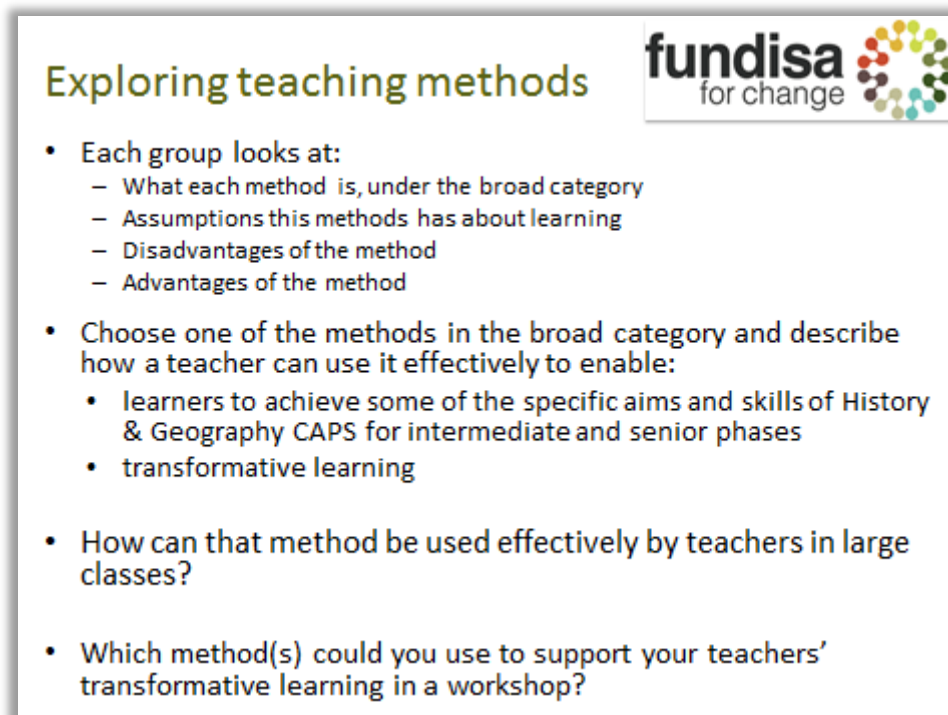
Is it okay for us to say we encourage the teachers to transform and not ourselves? It means we are showing them to cross the river but we are remaining on this side yet we are senior education specialist but we want teachers to be ahead of us.

We are talking transformation, is the transformer transformed? Are we, who are supposed to transform others, transformed? I'm talking transformation but how much am I transformed? I think the first thing is to transform the transformer.

If we want to encourage teachers to be researchers, it really starts with us. How best do we use the resources we have?

This discussion created a platform for participants to reflect on their practice and to think about how to do things differently when they return to their work contexts.

Participants were given a presentation on teaching methods and introduced to the Fundisa for Change Methods and Processes to Support Change-Oriented Learning module. Participants in groups had to read the module and respond to the following questions (Figure 6.26):



Exploring teaching methods 

- Each group looks at:
 - What each method is, under the broad category
 - Assumptions this methods has about learning
 - Disadvantages of the method
 - Advantages of the method
- Choose one of the methods in the broad category and describe how a teacher can use it effectively to enable:
 - learners to achieve some of the specific aims and skills of History & Geography CAPS for intermediate and senior phases
 - transformative learning
- How can that method be used effectively by teachers in large classes?
- Which method(s) could you use to support your teachers' transformative learning in a workshop?

Figure 6.26 Questions exploring teaching methods

Figure 6.27 below shows one group's work which was presented.

INVESTIGATIVE METHODS			
METHODS	ASSUMPTIONS	DISADVANTAGES	ADVANTAGES
<u>Participatory</u> Subjects are active participants in finding solutions.	- Have roots in diverse context	- Cannot participate meaningfully, & with little intention.	- Involvement of all learners in planning of curriculum
<u>Fieldwork & collaborative Research</u> To undertake an investigation in a field.	- Is a form of active and experiential learning involving "hands-on" activities.	- Much time and guidance is needed by learners.	- Enables learners to identify research questions.
<u>Exploring Indigenous ways of knowing.</u> Finding out about traditional practices	- Learners could be able to know their history/cultural context	- IK will be conflicting with scientific knowledge	- Will be more meaningful and effective

Figure 6.27 Example of participants' work on teaching methods

One of the discussion points was that participants felt that large classes limited the type of methods teachers can use in the classroom hence the default teaching method is always lecturing to transfer knowledge.

Participants were taken through an activity they could use in teacher training and one that teachers can use in class to teach about the water purification process. They were given resources and a worksheet detailing steps on how they can create their own water purification system. Apparatus used for this could be easily accessed in supermarkets and hardware stores so participants could improvise when they demonstrate the process if they cannot take teachers to a water purification plant. The figure below shows participants working together to create a water purification system.



Figure 6.28 *Participants working together to create a water purification system*

The participants worked well together: one person would read the instructions and the rest did the tasks.

Participants were given an overnight reading on assessment *for* learning and assessment *of* learning.

Day 4

The day started with a reflection on how participants had accessed knowledge concepts during the course. Some of the responses show that the methods used to teach the concepts worked well for participants. Some methods were mentioned, namely demonstration of water cycle, discussions, reading materials, field trips, presentations, probing, presenting, games and quizzes. One participant described having learned during the reflection: “For me given an opportunity to think and reflect on what I have learned I learn. Thinking back on what I have done I re-learn.”

Another participant mentioned that the training had made her think about how she needs to plan for class visit in her district:

All the materials we received here are important; they have value for when we prepare our planning [to support teachers]. When I received the email [to attend the training], I thought it was just water and I looked at water in term 4 in grade 4. But gradually as we are engaging and learning here, I realised that there is water in every grade. As I go back and start to do my school visits I need to think about how to plan them. In terms of content knowledge, I can say we are very rich. (S3P)

The participants were given an opportunity to critique the Fundisa for Change intermediate and senior phase Water modules. Participants noted how the modules were structured and they used the Social Sciences curriculum to critique the materials as noted below:

The modules show progression between intermediate phase and senior phase, grade 4 – grade 9. It is also arranged according to subject content knowledge, teaching practice and assessment.

Mining and how it impacts the environment has been omitted and it speaks directly to pollution and it was scarcely discussed. There is only one paragraph, there is a lot that has not been touched.

We have noticed that in grade 8 there are other concepts that have been left out, for an example, land use, farming, forestry and fishing.

With each and every concept they have given us different methods on how to transfer it and how to assess.

The facilitator indicated to participants that the Fundisa for Change materials were guides, “You need to contextualise it, situate it within your context. That is why it is not a thick manual; it is just to stimulate your thinking.” What participants noted resembles the guidelines authors were given in writing the materials (see section 5.6.1.1).

Despite the critique, participants felt they could work with the Fundisa for Change modules as a resource. For example, they indicated they could use the case studies to design projects and to train teachers. One aspect they felt needed to be included was more assessment tasks and map-work skills as noted below:

They [Fundisa for Change modules] need to include more assessment activities and integrate map-work skills as these are still a challenge for both educators and learners. If there could be more work on assessment related to map-work skills. For example, if we talk of a catchment, can a teacher identify that on a map? (S3P)

This is a valid critique that was also highlighted in the 2015 Department of Basic Education grade 12 examination diagnostic report: “When certain concepts are taught in the theory section of Geography, this knowledge must be applied in the map-work paper” (South Africa. DBE, 2015, p. 97).

The critique of materials has the potential to empower participants to critique materials and participants need to be given tools on how to critique resource materials so they can make informed choices when they choose teaching and learning support materials.

The next discussions were on assessment. Participants stated that assessment is used to determine if learning has happened and if learners are able to apply what they have learned. Participants also shared what they personally struggled with in terms of assessment;

I think for me it is balancing of questions using Blooms taxonomy [cognitive domain].

Sometimes I have not been able to determine the level of difficulty of the questions I set to see if learners will be able to respond to them. Sometimes I have found the questions are far above the level of the learners. My challenge is balancing the questions to the development level of the learners.

I struggle with mark allocation and time allocation for learners to complete a test.

When participants were asked what they had noted in terms of what teachers in their districts struggle with in assessing they mentioned the following:

Teachers struggle to set source-based questions.

Teachers struggle to develop high order questions. Most of the time they concentrate on the low order not even the middle order. They ask true or false or missing words.

Some struggle with structuring of questions and instructions are sometimes not clear.

Teachers always focus more on assessing learners using activities from the textbooks which are not always adequate.

Some of the challenges that participants noted were systemic as reflected below:

We don't have a section for assessment in the province, we have the exams section but when we compare ourselves to other provinces in terms of the structure and staff establishment they do have a section on assessment and they run workshops on assessment. I think some provinces are doing better than we do because of the structure. We do analyse learners' performance after a quarterly assessment and we have intervention workshops to discuss how learners have performed in each question. That is a full day's work and we just go through questions and identify those that were challenging but we never discuss how we will address those challenges. (S3P)

It is important that there are structures in place that will monitor these kinds of processes mentioned above if change is required. If there is no accountability, then some of the processes are completed so that a box can be ticked to say it was done.

After a brief discussion on the assessment reading, participants were asked to work in groups to define what identifies a test and an assignment as good. Some of the responses for a good quality assignment were that the assignment should be fair, reliable and valid; should cover that particular term's work; should have clear instructions; the due date should be aligned to the amount of work to be done; it must be relevant to content, grade, age, and diversity. It must have a purpose. It must have an assessment rubric. Some of the responses for a good quality test are shown in the figure that follows.

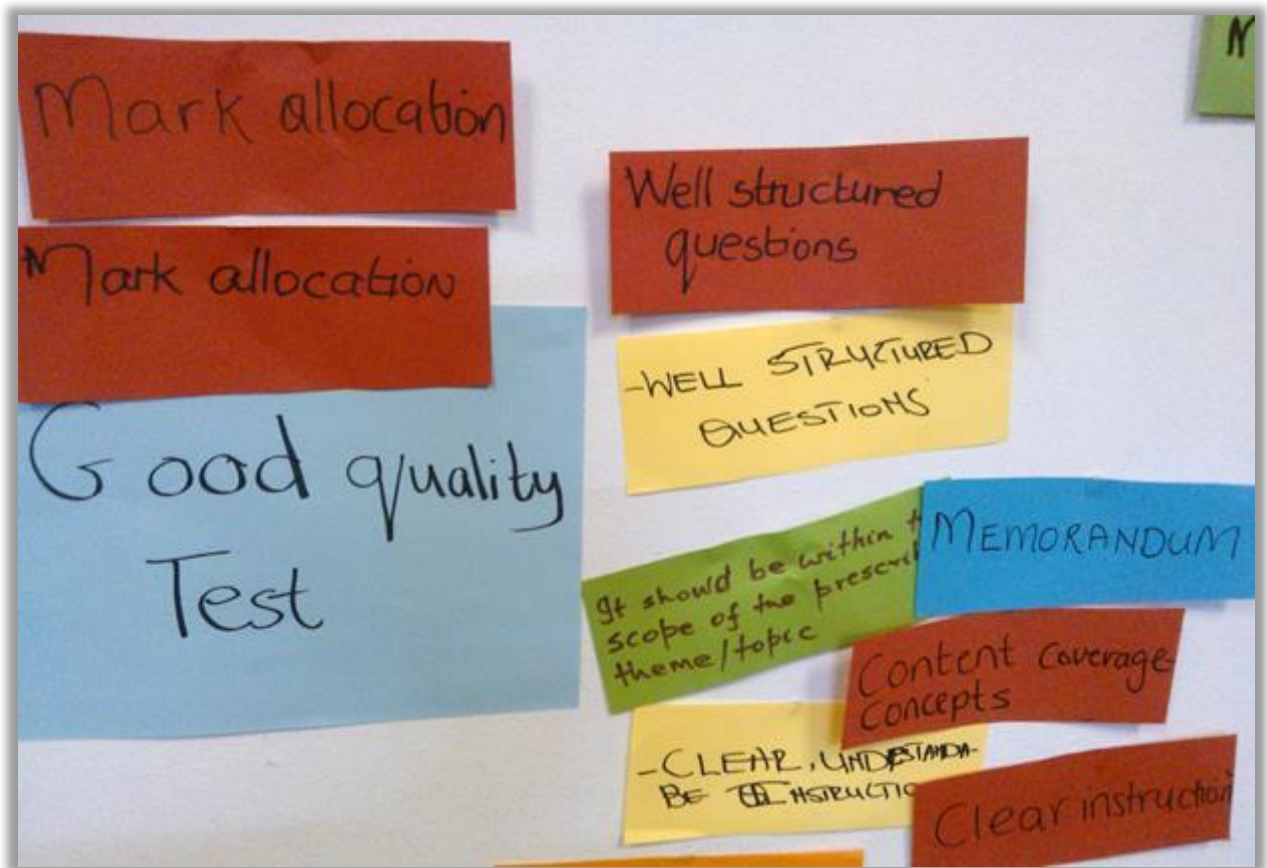


Figure 6.29 Participants' responses on a good quality test

Participants worked on their Part 3 portfolio tasks (see Appendix 23). First, they had to each design an assignment task using any of the water resource materials they had received on the course. The assignment task had to align with curriculum requirements on setting assignments and consider cognitive levels. Secondly, they had to share with a colleague their task for critique using the Active Teaching and Learning Framework booklet, some of the criteria identified in the discussion on what makes a good quality assignment and any other criteria they felt was important. Each participant had a designed assignment task as well as a report on a critique of a colleague's assignment task. The report had to include strengths and weaknesses of the assignment and justified suggestions for improving the task.

On sharing what they learned from the above activity participants mentioned the following about the assignments they had set:

Some of my questions were ambiguous.

My questions were not well structured.

An oversight on how to categorise questions according to low, middle and higher order questions. They are haphazard; I should start with low then to high order. I was unable to package the assignment or to break it down into sub questions. My instructions were unclear.

The process of designing a task and getting it critiqued by a colleague was an important learning process for participants. They were able to reflect on their work and learn how they can improve their assessment practice. They also shared the questions they set in the assignment to identify the cognitive level of the questions. Although some thought the action verb determined the cognitive level of a question, some were able to identify that it was the cognitive demand of the questions that determined its cognitive level.

Part 4 of the portfolio task, *‘improving your teaching and assessment practice’*, was explained to participants and they had to complete it as a ‘take home’ task that they were to present in the follow-up session. Reflections on the quality of the participants’ portfolio tasks are presented in next section.

At the end of the session one of the participants shared their appreciation of the training:

It was a really good and excellent programme, we have really changed. It made me realise I don’t do enough in terms of supporting teachers. We are going to take this programme and run with it. It was wonderful although it seemed very big but we had time to reflect. As officials when we have been to school visits we also need to reflect and think how we can support teachers better.

This seems to have been a sentiment that was shared by the colleagues as reflected in the section below from questionnaire data.

6.3.3.3 *Post-training data and reflections*

Analysis of participant questionnaires completed at the end of the Fundisa for Change training revealed the following:

- Participants felt the length of the training was too short, citing that they felt there were more concepts that needed to be clarified, a lot was done in a short space of time, an extra day or two would have been appreciated, for the amount of work and content delivered more time was needed, there was need for more time to focus on one aspect and to engage with resources. Although there was too much information for the time allocated, they still felt it was very important.

- They indicated that enough resources were given and that these were informative and that they would use them when they conduct their workshops for teachers. 53% said the materials were excellent resources; the rest stated that they had not really engaged with the materials to make a judgement. One stated that the materials are overloaded thus requiring ‘lengthy reading’ and that too many materials were given at once. They liked that the materials were aligned with the national school curriculum, were precise and to the point. They proposed that the Fundisa for Change materials become part of the national curriculum and that the materials become resources in local libraries. They would appreciate soft copies of all the materials given to them. They also wanted the materials to include more assessment activities and classroom activities.
- What stood out for them was the practical work done during the training and the focus on teaching and assessment practice. They also liked the linking of skills and values in Social Sciences with the content that was covered. They liked that the training was aligned with the school curriculum. They also enjoyed the field trip (water purification plant and Lowveld National Botanical garden both in Nelspruit). They valued the group discussions and felt the training gave them an opportunity to evaluate their knowledge on the content that needs to be covered across the grades. They also gained insights into how to support teachers and learners in their districts.
- To improve the training, they wanted map-work skills to be integrated. This is a valid point as none of the Social Sciences and Geography modules focus on map-work skills and activities. Map-work skills are a challenge both for teachers and learners. They also indicated a full five-day training session with follow-up would be more appropriate as more time is needed to cover everything and for participants to assimilate and understand what is covered. The table below shares how different aspects of the training were rated by participants.

Table 6.9 Participants’ rating of different aspects of the training

15 responses from 15 participants	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The content of the course was relevant to my needs as a teacher	80 %	20 %				
The course materials were used effectively to support my learning on the course	60 %	33 %	7 %			
Facilitators were knowledgeable	87 %	13 %				
The methods and approaches used on the course were appropriate	67 %	27 %	6 %			

Additionally, participants said they valued the use of different methods in facilitating the training although they gave this component one of the lowest ratings. Participants did not give any suggestion on other methods that could have been used to support their learning. They appreciated the facilitators' ability to give them new knowledge to open up the world for them, adding that the facilitators were excellent, well-prepared and very knowledgeable. They proposed similar courses on other environmental topics in the curriculum. Participants also rated the programme in terms of relevance to their work contexts (see Table 6.10)

Table 6.10 Participants' rating of Fundisa for Change's relevance to their daily work

15 responses from 15 participants	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The Fundisa for Change course clearly relates to teacher training in South Africa	53%	40%	7%			
Environmental learning is clearly part of the school curriculum	73%	20%	7%			
Fundisa for Change can help me to better identify and explain key environmental concepts in the school curriculum	73%	27%				
Fundisa for Change can help me to better teach environmental content beyond the CAPS curriculum to teachers or student teachers	93%	7%				
Fundisa for Change can help me to better explain the transformative nature of environmental learning to a colleague	73%	27%				
Fundisa for Change can help me to better demonstrate teaching methods for higher order environmental learning	53%	47%				
Fundisa for Change can help me to better demonstrate how to assess higher order environmental learning in the classroom	73%	27%				
Fundisa for Change can help me to link environmental learning in the classroom with whole school development	60%	40%				
I would be able to use the Fundisa for Change materials to teach my own course	47%	46%	7%			
I am able to identify additional teaching resources for environmental learning	47%	53%				

The rating above suggests that to some extent the programme gave participants confidence in engaging with environmental content knowledge around water but it seems they might still need support in using the Fundisa for Change materials to run training for teachers in their districts as well as support in accessing additional resources for environmental learning.

More than half (53%) of the participants indicated that they would very likely apply what they had learned; one went as far as saying the programme is what she had been looking for. Participants indicated that they needed further help in training teachers in their districts in the following areas:

- 60% keep in touch with a professional learning community
- 53% need support for the Department of Basic Education
- 47% need more resources
- 27% need opportunities to do research in environmental education and education for sustainable development
- More training on transformative learning and map-work skills

Participants mentioned that the partnership approach had a positive impact on the success of the training as they received valuable input from each of the partners.

Some of the views of the curriculum advisors are expressed below:

Fundisa for Change is a solution to our longstanding challenges in supporting teachers with environmental learning.

I'm now visualising where to start (mind-mapping my plan of action).

I have new ideas for my workshops.

Final comments on the Fundisa for Change training from participants were that the programme met their expectations. The training was labelled as good, fruitful, inspiring, transformative, enriching, helpful, excellent, brilliant, valuable, beneficial, informative and relevant.

One of the participants, instead of choosing to be interviewed, wrote an email of appreciation for the training as reflected below:

Thanks, it was really an eye-opening workshop. I personally learned a lot; method of presentation, caring about natural resources. The workshop has kindled a desire to change people's attitude about conservation and the preservation of our natural resources. (S3P)

There was a good return on the portfolio of evidence tasks (87%), 13 of the 15 participants submitted a Portfolio of Evidence but only 12 successfully achieved programme outcomes and received certificates. This may be because most of the tasks were done during the training as

on-course tasks, and participants submitted the drafts tasks for input during training. The follow-up session was an opportunity for participants to finalise the portfolio tasks.

6.3.3.4 Post-training reflections from main facilitator

The lead facilitator, who also assessed the participants' portfolios (see Appendix 30) reflected on the performance of the group. Her observations are noted below:

- Although the assignments were completed on course, participants took time to hand them in and required additional support.
- The quality of the task on researching an environmental issue was not well done by most of the participants. It was not completed in depth.
- Most of the participants did not do a critical review of the assessment tasks.
- Participants appeared to struggle to complete good quality mind maps on the water concepts and also in analysing questions.
- There still appears to be a challenge relating to the setting of quality tests and assignments. Very few of the participants used data sources e.g. photos, case studies, graphs, tables etc. to support the assessment tasks they set.
- Most of the participants developed a good plan to support teachers in their districts. The goals and objectives were well defined. Most incorporated the activities into their district activities for 2016.

The lead facilitator also reflected on the strengths and challenges experienced during training and gave recommendations for the future. These are noted below:

- Strengths:
 - Involvement of the provincial Social Science Curriculum Education Specialist supports the institutionalisation of the Fundisa for Change programme. The Curriculum Education Specialist contributed considerably to the sessions and thinking about how the programme can be taken up in the province.
 - The one-day follow-up session for participants to work on the assignments was very valuable and helped to draw the course knowledge and the workplace practice into concrete actions and showed the relevance of the programme to participants. Subsequent to the follow-up, participants met and worked on the assignments together with the support of the provincial Curriculum Education Specialist and the local Fundisa for Change environmental sector partners.

- The various provincially contextualised resources, posters and books on the topic of water added value to the course, particularly as the materials covered the concepts participants were struggling to access.
- Involvement of multiple Fundisa for Change partners in the training helped to bring balance between the theoretical and practical aspects of the training. The readings provided seemed to inspire some participants to read more and appeared to support their postgraduate studies. They requested more readings. The practical hands-on activities provided ideas on how different methodologies could be used.
- There was involvement of local partners and this made planning and support of the programme and of participants easier. Linking to local organisations helped the participants access contextualised local maps and information. The field trips undertaken were valuable.
- The Fundisa for Change modules were used as planning tools for the conceptualisation of the workshops.
- Fundisa for Change partners are challenged to develop new programmes in their centres based on the requests linked to the curriculum and Fundisa for Change training.
- The participants were highly motivated.

Some of the challenges noted by the facilitator are summarised below:

- Challenges:
 - Field trips were extremely valuable to the learning but are time-consuming.
 - Assessment content in the Fundisa for Change materials is limited and does not adequately support work on assessment (this was also noted by participants).
 - Social Science addresses a combination of two subjects namely History and Geography and participants need support on both subjects as some of the participants only support the History. The Fundisa for Change Social Science modules prioritises the Geography component.

Going forward, the facilitator gave the following recommendation:

- There is a need for the Fundisa for Change programme to develop a module on assessing environmental learning to enable a look at each of the forms of assessment in greater detail.

- The map-work aspect should be integrated into the Fundisa Module on Water.
- The Fundisa for Change should consider aspects of baseline assessments.
- Local partnerships and networks need to be strengthened and established to support the Fundisa for Change programme.
- The programme should work towards electronic versions of the materials that participants can have access from computers, laptops or tablets during and post-training.

What was also noted by the facilitator was that participants need adequate time to work on what and how they will implement what they have learned during training. More support is also needed to enable participants to complete portfolio tasks during training. One of the facilitators, however, pointed out that the quality of work submitted by participants who did most of the work after the training is better than the work submitted by participants who completed most of the work during training:

In Mpumalanga a lot of the work on the course, so less takeaway but quality was not as rich as what was handed in by the other provinces. But that does not mean they did not learn. It was not as well assimilated as it was done there compared to other sites. [interviewee had facilitated at sites 1 and 2 as well]

The facilitator, after assessing participants' work, stated that participants struggled to explain in the portfolio tasks what they had done to implement what they had learned but were able to do so in conversation. This indicates that it is not evident in the portfolio tasks how participants have implemented what they have learned but that does not necessarily mean no implementation has been done. The facilitator shared the following from participant conversations post training:

What participants learned from the training unfolded differently in different provinces [facilitator had led training in sites 1, 2 and 3]. Participants have become champions for environmental education. In Mpumalanga one started to work with assessment and conducted workshops and has included questions on climate change in their district papers. Another supported the provincial Department of Basic Education environmental education co-ordinator but I do not know to what extent. In Gauteng one had a competition in her district and got learners to make models and prepare

presentation with grade 7 teachers around water. She also organised a field trip with teachers to go to RandWater to give teachers an opportunity to see water purification rather than to rely only on textbook knowledge. Another created a moderation tool that included frameworks developed from the training. Participants tell you what they do but it does not come through in their portfolio tasks. It does not come through strongly in their reflection but when engaging in follow-up discussion you hear the extent to which they have carried what they learned into their practice.

One suggestion from the facilitator interviewed above was that she could observe participants implementing at their work contexts but that time constraints would not allow her to observe everyone as “participants implement it at different times”. “We can have local partners to support them and inform us what they have done and implemented” was another suggestion that could assist with participants sharing their work and minimise the risk of non-submission of portfolio tasks. Alternatively, post-course support for the successful completion of portfolio tasks should be offered to participants.

6.3.3.5 Summary of reflections

Reflections from the facilitator show more positives than challenges and the challenges and recommendations can contribute to improved delivery of the programme. It is also clear from the data above that the programme needs to find alternative ways of assessing how participants implement what has been gained from participating in the programme.

6.3.4 Site 4: Western Cape (Teaching Climate Change in Geography, grades 10 – 12)

6.3.4.1 Context

The FET climate change training course took place over three days (8-10 July 2015) at the Whalecoast Conservation Centre in Hermanus. It was facilitated by three teacher educators from two of the Fundisa for Change partner universities. The Department of Basic Education identified the participants who were going to attend the training. Participants were 24 Geography (FET) teachers from three Western Cape districts, Overberg Education District, the Metro East and the Metro South Districts. A Geography subject education specialist from one of the districts attended the training. Post-course, cluster-based follow-up sessions were conducted in the three districts.

The main facilitator has been involved in environmental programmes for the past 26 years. She became a Fundisa for Change partner in 2013 and has co-authored two of the Fundisa for Change training modules. She has been facilitating Fundisa for Change short courses since 2015 and has been

supporting teachers since 2013.

All the participants who attended the training taught Geography in grades 10 -12 and 61% of them also taught Social Sciences in Senior Phase. There was one teacher who also taught History, another who taught English and another who taught Tourism in FET. The majority of the participants (78%) teach in township schools, 17% are in rural schools and 5% are in peri-urban schools.

Reasons for attending the training varied amongst participants. Generally, reasons were about learning and teaching others, as reflected in the questionnaire data presented below:

I want to have more knowledge about environmental issues.

I need more teaching skills, equip myself and develop myself in order to bring change at my school.

I like to network for new ideas, Geography content and teaching approaches.

I wanted to learn how I can teach Climate Change.

I wanted to empower myself about Climate Change so I can empower learners and the community.

I wanted to update my skills and knowledge.

I wanted to know more about Climate Change and about recent and latest impacts of Climate Change.

Profile data from participant questionnaire (see section 4.6.2) is tabulated below and it gives an indication of the expertise and experience of participants. 89% of the participants have been in the teaching profession for more than five years. It is also evident from the data that most were quite familiar with engaging with the environmental teaching and learning specified in the national school curriculum.

Table 6.11 Participant profile questionnaire responses (site 4)

Statements	Responses
Teaching experience	• 11% had been teachers for 2-5 years • 22% had been teachers for 6-10 years • 39% had been teachers for 10-20 years • 28% had been teachers for 20+ years
Experience in engaging with environmental learning in the school curriculum	• 39% were very familiar • 50% were quite familiar with it • 11% had heard about it, but knew very little about it

Two of the participants, who have been teaching for between 10 – 20 years indicated on the questionnaire that they had heard of environmental learning in the curriculum but knew little about it. Participants may think they have not been engaging with environmental learning based on how they define environmental content. The Fundisa for Change programme works with the school curriculum to surface environment and sustainability concepts. This should enable both office-based and classroom-based educators to recognise that environment education is already in the national school curriculum. The figure below shows a breakdown of teaching experience in relation to experience in working with environmental content in the curriculum.

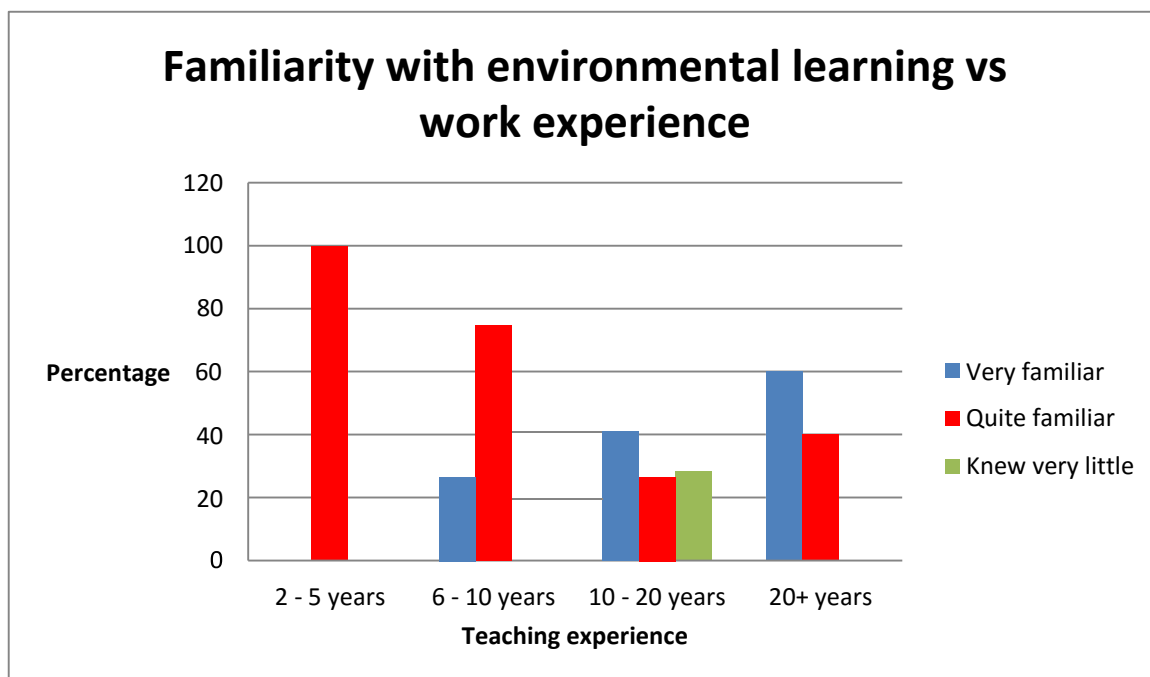


Figure 6.30 Familiarity with environmental learning in relation to work experience

I was on site for the duration of the three-day training. Four Fundisa for Change modules were used during the training sessions, the three generic Fundisa for Change modules and the Climate Change subject specific module for FET Geography (see Tables 5.1 and 5.2). Additional resources on renewable energy were used by the facilitators during the training.

The three-day training focused on the three components of the Fundisa for Change course structure; subject content knowledge, teaching practice and assessment practice. The next section focuses on the implementation of the Fundisa for Change training programme.

6.3.4.2 Delivery of Fundisa for Change programme to achieve programme outcomes

Day 1

The facilitator gave participants an orientation to the Fundisa for Change programme using the Fundisa for Change *Introductory Core Text*. She shared aspects of environmental degradation and the importance of teaching the current and next generation about sustainable living. The facilitator explained the CAPS⁺⁺ approach the programmes as follows: “We don’t just want to teach you what is in the curriculum but that you gave more knowledge than what you need to teach to your learners.”

The first activity of the day was aligned with both the *Subject Knowledge and Learning (Theory)*, and *Pedagogical Knowledge and Learning (Theory & Practice)* outcomes. Participants watched a 14-minute video clip on Climate Change. After the video clip they were asked to write down any information they could remember from the video clip which they then compared with colleagues in their groups so they could add to their notes.

Participants then shared their notes with the whole group. The facilitator explained some of the concepts and the causes of Climate Change that were introduced in the video clip. There was also a discussion on how scientists have been generating data on climatic changes over the years. The facilitator also mentioned that “we teach knowledge that is incomplete and that can be challenged”. This led one of the participants to make a comment that brought up some of the debates on the causes of climate change, highlighting the contested nature of environmental issues.

I’m not cynical about what I’m going to say now. To me climate change has always been there. The human’s need to survive has been accelerated. Aren’t we growing this thing too much, I mean with the bit of geological background I have the earth has a history of changing the climate all the time. Aren’t we just now in another sequence or cycle of climate change? I think the main thing is that we are hastening it a bit. (S4P)

I think that is the concern. It is not that the climate is changing; it is that it is changing very fast. The rapid rate is unprecedented. Normally habitats and the natural environment have a long time to adapt to climate changes. Now all of a sudden it’s happening very fast. The planet will carry on but will we carry on as a species? (S4F1)

The discussion focused on the current scientific predictions of human activities that speed up climate change. Participants were knowledgeable about what was happening with climate change and shared these insights with the group.

Participants were asked questions that provoked them to think about how they learn and the teaching methods they use to foster learning. See the dialogue below:

I would like you to think about how this activity [listening to a video clip and then after watching the video clip to write what they remembered from the video clip] we have just done was structured. The instructions I gave you before the video, telling you first not to write anything during the video but that you will have to write things down afterwards. How did those instructions influence the learning or the way in which you listened to the video and the learning from the video? (S4F1)

I felt like my learners. (S4P)

What I was doing in this activity was modelling a way of, a group of teaching strategies for listening with intent. We hope that our learners are listening with intent every day. The moment they walk into our classrooms they are supposed to listen with intent. Often just that little prompting that ‘we are going to do this and afterwards this is what will be expected of you’, might nudge them a bit to pay attention. We need to be aware that what we do or say as teachers influence learner behaviour. (S4F1)

I think something that also influenced me was the fact that I know something about it. I think many times when we do stuff in class with our learners they don’t know anything about that topic, so it’s totally new or fairly new. In my case I’m quite knowledgeable on climate change causes. It was easy for me to recall whatever I needed to recall because I know it and I saw it in the video clip. Although I think in many cases in our classrooms it is something we should keep in mind that climate change may be something totally new to our learners, they don’t know anything about it. (S4P)

What this discussion raised was that teachers have assumptions about the learners they teach and the prior knowledge they come with in the classroom. These assumptions influence the teaching methods they choose to use. Additionally, this discussion highlighted for teachers that what they do and say in class influences how and what learners in their classes learn.

The facilitator cautioned participants that “in response to these issues try not to prophesy gloom and doom, rather we will find a solution for these problems to build a better world together with learners, using problem solving skills and creativity”.

The next activity came from the Fundisa for Change *Introductory Core Text* that required participants to think about environment and sustainability in their subject, Geography. Participants worked in groups to write down their meaning of the following concepts: Equity, Sustainability, Resilience, Adaptation and Transformation. For each concept they were expected to give an example of a social practice that expressed the meaning of the concept and explain the relevance of each concept for education in general and in Geography.

Participants were able to give examples for education in general and for their subject in particular for each of the concepts. Some of the concepts were more adequately engaged with than others during group feedback. The figure below shows teachers working together on a group task.



Figure 6.31 Participants engaging with sustainability concepts

Participants worked with Geography curriculum documents to identify environment and sustainability content related to climate change that learners were expected to know. For some

of the participants it was easy to see the links but some could not identify the links. Some of the links were explicit while some were implicit and this was pointed out by the facilitator, as indicated below:

Some parts of the curriculum are easy to see the relationship to climate change and sustainability and the environment. It is less obvious in some parts but it is part of the bigger picture, and it is what we say in class that make those links obvious. We need to make those connections so learners understand that what is happening in one system affects what happens in another system. (S4F1)

A second facilitator asked the group if people would want to reduce their consumption as a solution to sustainability. Participants do see possibilities for sustainable lifestyles as reflected below:

We can make changes although it will be difficult. Our society has become so very lazy, we have machines for everything.

We can harvest rain water, we can use solar for energy, we can use farming practices which will be physical and eating organic food. We use home remedies when we are sick and live longer. Live in the village and be able to see animals freely and the nature without paying for it.

There needs to be green technology particularly in developed countries so they show their commitment to this. There should be a national policy that articulates with green technology and sustainable living as these issues cut across middle and working class. In poorer communities the issues are brown-driven, people need water and housing.

We should address these things in local contexts. Not all indigenous knowledge is sustainable. We have to look at morality, education, values, knowledge transfer and technology, appropriate technology, not this massive consumption. More income areas need more recycling of what they are consuming. But it is difficult, there is no clear path.

With the recent load shedding people are probably aware that they now need to change. People are moving from electricity to gas.

The second facilitator closed the discussion by stating that technology might not solve the problem of consumption as people with less may want to have more things and increase their consumption.

Participants were introduced to the Fundisa for Change Climate Change module. When asked if they used reading in their teaching, they indicated they did when they worked with case studies. One participant indicated that they had challenges when they asked learners to read in class, as reflected below:

The reading and writing ability of my grade 10 and 11 learners is not at the level it should be. In Geography we give resources and case studies, the answers are in the case studies but learner responses look as if they did not read or look at the case study. It's as if they are trying to answer the question from their head or using other information and obviously give wrong answers. You find that the reading ability is poor if you ask them to read out loud in class. Some of them even refuse to read because they can't read properly. When I ask learners a question in class, they know the answer but when I ask the same question in exams they can't write the answer down. So they know the answer, the problem is not that they don't know the answer, they can't write the answer or they can't read the question or a combination of both. It has become very frustrating to me at the moment. (S4P)

This issue is not an isolated case as it has been documented that South African learners are poor when it comes to literacy. Hence the Annual National Assessments were introduced in South Africa (see Chapter 1). Some of the issues were also captured in the 2015 grade 12 examination report (see section 5.6.1.3)

Other comments on learner reading challenges were:

A lot of the time a teacher is under pressure; it might be easier to just read it to them. But then they don't ever get to read for themselves. It is a case of a catch 22 kind of situation because you have no time and you want to get done with it so they can start with the task. Do you sit and let them battle with it or do you just do that part for them. It's a very difficult decision. (S4F1)

Our problem with our learners is that English is not their home language. If you are teaching using English throughout, learners want you to codeswitch. The moment you

codeswitch for them you are headed for disaster because now these learners will want to use their mother tongue to explain ... when they are writing examinations there is no paper in isiXhosa, so now when it comes to reading you find that it is difficult for them. Reading, speaking and writing must be covered everyday even if it's just instructions. That is the problem with our learners, they are unable to read. Grade 12 learners. (S4P)

Another issue that teachers are dealing with in schools is learners' poor numeracy skills as reflected below:

Most of the learners now do Mathematical Literacy and they interpret graphs. They can't draw graphs. They just don't have it. In Geography grade 12 you have data handling and analytical questions in exams. They lost that. They have no mathematical background because mathematical literacy does not do that.

It is surprising that learners who do Mathematical Literacy cannot interpret graphs as Mathematical Literacy includes data handling as a skill to be acquired.

To improve participants' teaching practice, they were introduced to different teaching methods using the Fundisa for Change *Methods and Processes to support Change-Oriented Learning* module. Participants had to identify teaching methods from the module that they used most often, sometimes and hardly ever. As they did that activity they had to reflect on a good lesson or lessons they had observed using a particular method or methods. Or a lesson they have taught and have observed learners had responded very well on it, because of method(s) used and share with colleagues in their group.

Participants in groups did an activity from the Fundisa for Change *Introductory Core text* (see Figure 6.32 below). Participants were asked to use an extract to identify and list a sequence of teaching methods used in the example. For each of the methods identified, they were expected to write the goal of the method and/or activity. Participants were also expected to think about how each method contributes to learners' understanding of water quality.

ACTIVITY 8

EVALUATING THE SEQUENCE OF METHODS USED IN A PROGRAMME OF LEARNING

Identify and list the sequence of teaching methods used in the following example. Which methods were essential to achieving the teacher's intention of teaching the learners about water quality?

A Grade 7 Geography teacher, teaching the topic of water quality, starts the lesson with a story of a polluted river, which tells how children in the area got sick from drinking polluted water. She then goes on to ask learners to read a section in their textbooks on water quality, as well as on water pollution and its effects. She also gives them an extract from a newspaper article on a pollution spill in the local river that was reported a year before. She then asks learners to read an aerial map showing the catchment to identify the source of the pollution. Following this, she takes learners to the local river and uses water quality test kits to test the quality of the water. After this, she asks learners to write down the results of their water quality testing, and to write a proposal on how the problem can be solved.

Figure 6.32 Teaching practice group activity

The facilitator walked around and asked questions and gave input to participants as they worked on the task. The facilitator encouraged participants to use a variety of teaching methods:

When teaching about environmental issues, use of a variety of teaching methods is most effective. It is important that teachers use a variety of methods when teaching to expand opportunities for learning. (S4F1)

A second facilitator introduced participants to the *Active Teaching and Learning framework* in CAPS module and that it works with Blooms taxonomy and the cognitive levels. He emphasised that teaching should not focus mainly on acquisition of knowledge at the expense of learners' participation in the learning.

It is a balanced approach, acquisition and participation of learning in knowledge about the environment with someone. Outcomes-Based Education came from a good paradigm but we were not prepared for it. CAPS's swing to content should not be at the expense of participation. (S4F2)

He urged participants to be “*current and relevant*” in their subject as no one knows what the future holds. He gave teachers the following questions to think about:

What is our role? How do we engage a learner to think about an uncertain future? What are the questions we ask learners to develop meta-cognition, for them to think about their thinking? How do we develop classroom talk and learning how to learn?

He presented research findings on reasons teachers give for using questioning as a teaching method. He also mentioned that teachers tended to answer their own questions adding that “*we need to be conscious of wait time*”. He added that teachers should not be quick to give answers to questions they have posed to learners. Teachers should not feel uncomfortable with the silence that follows when they have asked learners a question. The research he shared mentioned that mostly teachers ask recall questions.

He advised teachers not to write notes for learners on the board as this results in learners not reading the textbook. He asked teachers why they give learners textbooks if learners will not use them as textbooks have activities that mediate learning. He encouraged teachers to use more than one textbook to be better teachers.

The first facilitator gave a presentation on assessment as it is outlined in the Geography curriculum document. Participants did not respond when asked how informal learning can be used to improve learning. The facilitator explained by saying:

There are things that we do in the classroom all the time that we are now giving a name. We do informal assessment all the time. When I am walking around the class and listening to this group and thinking about what they are saying, I’m giving informal assessment. I’m listening to what they are saying: If it fits in with what I expect them to be doing for that particular activity then I may not feel the need to give any feedback. But if I’m hearing something that is off topic, I might give them feedback to get them back on the topic or to help them overcome a problem. That then is informal or a formative learning process. (S4F1)

Participants were given other strategies that improve learner performance, for example, giving learners feedback, asking learners questions, telling learners in advance how they are going to be assessed, or sharing the assessment criteria.

The facilitator further explained that:

If learners know how they will be assessed, when we give them feedback according to set criteria, they know what they need to do to improve their learning. Informal assessment is used to develop learning whereas formal learning is just taking a snapshot of what the learning is at that moment in time, in a test or exam. It is not often used as a teaching tool to develop the learner. One exception is when you give learners their test back and you go through it that is a big learning experience for learners. Often learners collect their scripts and file them and the opportunity gets lost. But going through tests can have an impact in making learning happen in the classroom. (S4F1)

Improving assessment practice is one of the components of the Fundisa for Change programme (see Chapter 5). Activities and discussions on assessment mentioned above were engaging with that component as well as focusing on the *Pedagogical Knowledge and Learning (Practice)* outcome.

Participants were given an overnight on-course task to be submitted the next day (see Appendix 31). The facilitator explained that the task was to enable facilitators to understand the different contexts where each of the participants taught.

Day 2

Participants were asked to share their responses to the over-night task of their context with colleagues in their groups. They also shared with the whole group. Some of the challenges participants mentioned are issues that they can solve but some are systemic as reflected below:

We start with geomorphology since our learners are not familiar with rivers.

All of us are struggling with the issue of landfills.

Learners don't do well with climatology.

When we take away the feeding scheme learners do not come to school.

I have 54 learners in my matric class. If I had not been teaching them since grade 10, I wouldn't know everybody - that's how many they are.

The issue of language is still a problem and then also ties this with the facilities in our schools. The computer lab was vandalized and we have a section where there is no

power, the department of public works takes their time to fix. Learners at times write in dark conditions during June exams and as an educator you can't even see the question paper. The Department [DBE] is trying their best. We are hopeful that we might have power.

The other challenge is the issue of learners who did not pass grade 11 but are now in grade 12. We had to promote them and this is affecting the whole performance of the school. It is quite a big challenge. All those that were promoted last year [2014] failed grade 12.

One of the solutions shared by a participant to address systemic issues was a teacher strike: "The next teacher strike should be about the numbers we have to teach. We are talking 55 in a class, the lack of toilets, the lack of security."

Some South African teachers belong to teacher unions and at times unions encourage their members to go on strike action when they are not satisfied with decisions made by the Department of Basic Education.

It seems that sharing the issues amongst themselves created an opportunity for them to share some solutions: "We have different problems in different areas. We tackled the problems we have so that when we leave here we know what we will do in our schools." The Fundisa for Change programme created a platform for participants to share their challenges as well as solutions to some of them. Some of the participants indicated in the evaluation questionnaire that what stood out for them during the three-day training was the interaction with colleagues and the sharing of experiences with peers.

After the feedback and discussion, the facilitator continued with a presentation on the differences between summative and formative assessment. Some of the key aspects she mentioned are reflected below:

The major difference is that in formative assessment the results from the observation will make you do things differently that will help learners learn and move on. The formative learning starts with goals for student learning, whatever the goals of the lesson might be. You collect evidence of student learning against that goal. That might be related to asking learners to establish base line or prior knowledge. Then you interpret that student thinking. You may then decide to go over that work if necessary so you may decide how you can help learners to take the next step. For an example,

give them another activity. If learners self-assess they can understand purposes of their learning and how to improve. (S4F1)

The facilitator shared a video clip on assessment and feedback, after which she shared how watching video clips on assessment and reading published work on assessment transformed how she assessed and gave feedback to learners. Her reflection is noted below:

I realised that for years I have given learners feedback that is not related to the task, what do learners do with that? If you give learners feedback that is related to the goals of the task and learning helps them understand where they have not done well and where they can improve. It also sends a message that they can improve. It is difficult to give individual feedback all the time because of class size but try to give some individual feedback over time to each learner. (S4F1)

The components that the facilitator mentioned when she engaged with assessment are aspects that the Fundisa for Change training programme have identified as being critical as they are explicitly stated in the Fundisa for Change *Introductory Core Text*. The Fundisa for Change *Introductory Core text* covers the following on assessment, Curriculum guidance for assessment, assessment ‘of’ and ‘for’ learning and giving feedback.

Participants were invited to share how they were currently dealing with assessment. Their responses are noted below:

After exams I sit with individual learners and give them feedback with a memo. They must get their papers back; you can’t just take and file them. I do the same with their parents, showing them this is where your child does well and this is where they struggle.

When learners get their text scripts papers back and question papers they compare their marks. Then they go to their books and use different colours to indicate the work they know, and the work they don’t know. They then have to figure out why they got low marks for that work. That’s self-assessment.

It is not easy with the numbers I have in class to give individual feedback but what sometimes helps is you recognize those top learners and those most improved. The minute you start recognising those who have improved and those who have gone down they will think that next time there is a need to improve.

I have a conversation with learners who perform not well and encourage them positively. The principal says we should encourage the learners and speak to them aside to improve how they can study instead of writing negative comments on the learners' report cards.

Comments from participants after the discussion show that it was a valuable session for participants as indicated below:

I think I've learnt something from these [discussions] and I think it is something I can implement in the future.

We cannot do magic but there are things we can apply from here.

Participants watched another video clip on learner and peer assessment and feedback. Some of the participants wrote notes while they watched video clips. The facilitator encouraged participants to use peer assessment in class, citing that "There is value in learners discussing how they get their answers with others in their table".

Two of the participants shared that they gave their learners an opportunity to teach each other in class. The facilitator encouraged participants to allow learners to teach each other as "explaining things to others is a learning experience".

The facilitator used the Geography curriculum document to discuss summative assessment. Her presentation was taken directly from the assessment section of the curriculum document which provides assessment guidelines for teachers. The facilitator went through the curriculum document because participants indicated that they hardly look at the assessment section of the curriculum document.

Participants worked in groups on an activity from the Fundisa for Change climate change module. They had to critique a test (see Appendix 32 and Figure 6.33 below).

Task for the teacher:**Reflecting on assessment**

1. What content area is this test set for?
2. What grade is this test for?
3. Discuss the range and type of questions asked. Is the range of question types varied enough?
4. Evaluate each question and what level of cognitive thinking was used
5. Complete the table below

	QUESTION NO.	LOW ORDER	MIDDLE ORDER	HIGH ORDER
	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
55 marks (Total marks divided into percentages)				

6. Was this test set at the correct cognitive level percentages?
7. How can you improve this test?
8. Reword questions, so that this test becomes a test set at the correct cognitive levels.

Figure 6.33 On-course task on assessment practice

Participants noted:

In Geography we use a lot of resources, e.g. maps which the test does not do. We would rephrase the questions and some questions do not have the required cognitive spread.

There are no diagrams visuals in the test.

The phrasing of the question is not clear.

There must be diagrams, data handling questions.

The activity enabled participants to critique the test against curriculum guidelines and to give examples of how some of the questions can be improved. Although participants did not necessarily set a test themselves, this activity could encourage them to critique their own tests.

The last activity of the day was a presentation by a third facilitator from one of the Fundisa for Change partner universities. Participants also received resources on the content, a module, posters and a CD. The presentation was linked to an activity in the Fundisa for Change Climate Change module that gave participants ideas on how they could teach about energy.

Day 3

The last day of training focused on outcome one, *Subject Knowledge and Learning (Theory)* and outcome four, *Practical Knowledge and Experience (Work Experience)*. The facilitator presented and explained a carbon cycle diagram and invited participants to identify human activities along the cycle that might have negative impacts on the carbon cycle. This was followed by a video clip on global warming, climate change and soil degradation.

For the last activity of the day, participants were grouped according to the districts from which they came. Participants were asked to choose a topic they would teach in term three. In their district groups they needed to decide on the grade and topic as well as activities and teaching methods. The groups had to plan a series of lessons for a particular topic but each person was expected to plan for activities they would use in their particular lesson. Each person used resources they would use when they planned for their individual lesson. Figure 6.36 below shows teachers working together to plan a series of lessons they would teach.

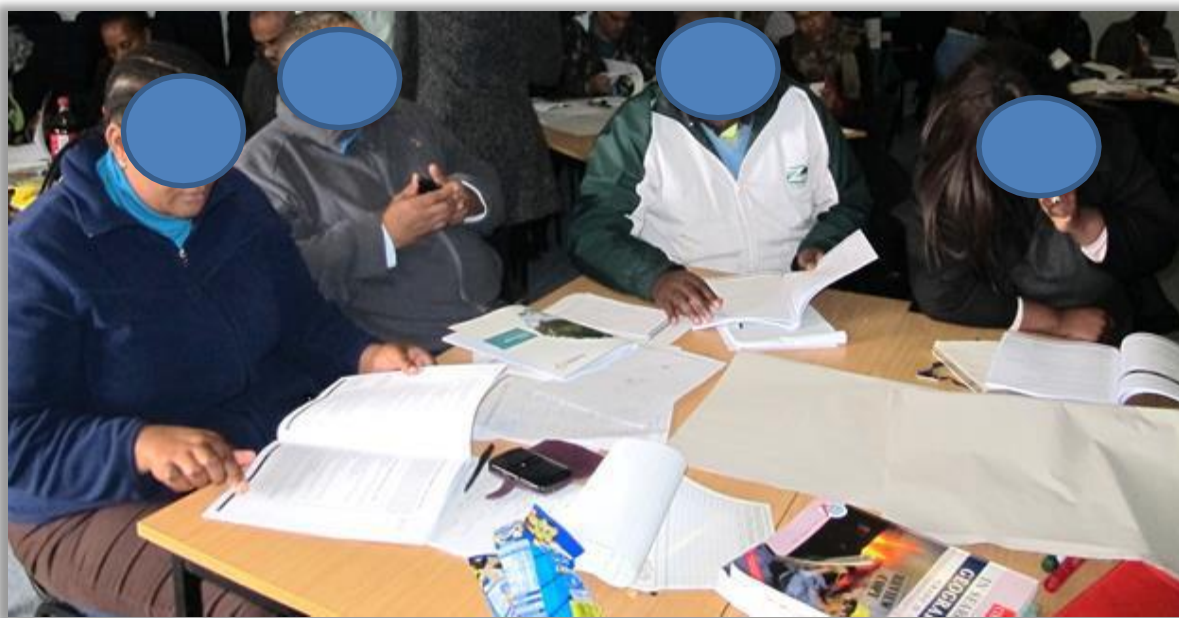


Figure 6.34 Participants planning together a series of lessons

Facilitators planned to visit participants in their schools to observe the implementation of the lessons. Participants were given a lesson plan template (Appendix 33) and a T-sheet template (see Figure 6.7) to plan their lessons. The rubric that would be used to assess the task was also explained to participants (Appendix 34).

Although participants would work on an individual lesson, it would be useful to discuss in their groups ideas for their lessons. The next session discusses participants' reflections of the training and reflections from the main facilitator.

6.3.4.3 Post-training data and reflections

Follow-up reflection and certificate handover sessions were held in all three districts in the Western Cape, namely the Overberg, Metro East and Metro South. Twenty-one participants from the 24 who attended the training received certificates. Figure 6.35 below shows teachers from the Metro South district proudly displaying their certificates after their reflection session.



Figure 6.35 Teachers showing their certificates

Analysis of the participant questionnaire, which they completed at the end of the programme, showed that most of the participants (78%) felt that the three days were sufficient for what was covered.

What needed to be considered in sustainable environment was touched on.

Everything was well-planned, well-presented and nothing was rushed.

There was enough time to capture relevant information.

Materials provided and the learning was enough while we still could concentrate.

17% of the participants felt the training was too short and that too much content was covered in a short space of time and more time was needed to adequately engage with everything. There was one participant (who had more than ten years teaching experience) who felt that the three-day training was too long, citing that less time should have been given to working with the curriculum document and its requirements.

Most of the participants (72%) stated that the content that was covered was enough although some of them mentioned that they would like additional content on GIS, geomorphology, case studies of climate change issues for Cape Town. One person requested electronic versions of all the materials so that they could use the resources in their classrooms. Another participant asked “Where to from here and how?” This was interesting; one would assume that participants would go back to their work contexts and adapt what they had learned into their contexts.

The table below presents participants’ rating of the different aspects of the training.

Table 6.12 Participants’ rating of the training (site 4)

18 responses from 24 participants	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The content of the course was relevant to my needs as a teacher	50%	50%				
The course materials were used effectively to support my learning on the course	44%	56%				
Trainers were knowledgeable	44%	50%	6%			
The methods and approaches used on the course were appropriate	38%	50%	6%	6%		

The rating suggests that content covered was relevant for the participants and that the materials and approaches used during the training as well as the facilitators enabled participant learning. Additional comments are noted below:

We need outdoor activities which we can do with our learners.

Facilitators were passionate about what they were presenting.

Course materials were spot on with regards to subject matter.

Participants reflected that the ‘take home’ lesson plan task was challenging but that it also contributed to their learning. The best aspects of the training for some of the participants are noted below:

- Energy resources, presentations and interactions with colleagues
- Ideas on how to teach energy and climate change in grade 11
- Up-to-date information on climate change and sustainability
- Renewable energy resources
- Learning something new every day
- Video clips and peer presentations
- Peers sharing experiences
- Group work and discussions

Although participants seem to have seen value in the training, they also gave suggestions on how the programme can be improved and these are shared below:

- The training should be done timeously and more resources should be provided
- There should be more hands-on activities we can use in class
- Add a day for practical tasks on climate change
- More on designing assessment tasks
- Outdoor activity and excursions
- Practical work and developing research assignment tasks
- Colleagues to present lesson on environmental learning
- Video clips to be relevant to South African context
- Follow-up by facilitators so they can see application of learning in our schools

The comments above show that participants would value practical work during training and assistance on developing assessment tasks for learners. These are valid comments as *the Geography curriculum aims to develop the following subject-specific skills; practising field observation and mapping, interviewing people, interpreting sources and working with statistics* (South Africa. DBE, 2011, p. 9).

One of the participants requested an on-site visit to see application of knowledge and skills learned. The table below shows how participants rated the applicability of the training in their work contexts.

Table 6.13 Participants' rating of the applicability of the training in their work contexts (site 4)

18 responses from 24 participants	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
I can see how environmental learning is part of the school curriculum	44%	50%	6%			
I can relate what I have learnt in the course, to one or more of the subjects I teach	44%	50%	6%			
I would be able to identify and explain key concepts related to environmental learning in the curriculum to a colleague	44%	56%				
I would be able to teach environmental content beyond the CAPS curriculum in my subject	28%	72%				
I can explain the transformative nature of environmental learning to a colleague	11%	89%				
I would be able to identify and use teaching methods appropriate for higher order environmental learning	22%	67%	11%			
I would be able to prepare tools for assessing higher order environmental learning	28%	61%	11%			
I can explain a link between environmental learning in the classroom and whole school development	28%	67%	5%			
I would be able to use the Fundisa for Change materials to prepare for my teaching	50%	50%				
I know where to find additional teaching resources for environmental learning	33%	50%	17%			

Although most of the participants found most of the learning applicable in their contexts, there were a number of participants who were neutral about:

- Their ability to identify and use teaching methods appropriate for higher order environmental learning (11%);
- Their ability to prepare tools for assessing higher order environmental learning (11%); and
- Knowing where to find additional teaching resources for environmental learning (17%).

This is something that the programme implementers need to consider as they review the programme.

Some of the participants (72%) stated that they would apply what they had learned in their classroom teaching, 78% (inclusive of the 72%) indicated that they would apply the way they have learned in how they assess learners. 44% of the participants said they would share what they had learned with colleagues in their schools and 7% said they would apply what they had learned in extra-mural activities. Additional comments included:

It is important to share with colleagues to improve the environment and this is also relevant for them.

I have a lot of resources that I will use in my teaching and assessment.

I have been encouraged to get involved in environmental activities with my learners as I used to.

When participants were asked what other assistance they required to be able to engage with environmental concepts in their classes, they mentioned the following:

- 78% – more teaching resource materials
- 22% – better textbooks
- 17% – support from my principal
- 22% – support from the Department of Basic Education
- 11% – support from the other teachers at school
- 50% – to keep in touch with a professional learning community
- 11% – more training on assessment

When asked how they would describe the Fundisa for Change short course to others, participants had the following to say:

Interesting, very powerful and relevant

Good and also would love to have more training and workshops in order to be fully equipped

Informative, spot on and could bring lots of change for the better in environmental education in schools

Fruitful, very informative, fantastic and applicable!

Splendid with resources, gaining knowledge etc.

There is a clear need for educators to gain extra training and to engage with professionals in the field.

What a wonderful course, I now understand climate change is a reality.

It was very fruitful for both personal development and enhancing my teaching. My approach will change for the better.

Challenging and well organised

Very effective for CAPS

An eye opener to environmental and climate change issues

One of the participants asked that this type of course be offered for all the subjects.

6.4.4.4 Post-training reflections from main facilitator

The main facilitator was given a questionnaire after the training to understand the choices she made in planning and implementing the Fundisa for Change programme. On being asked how she planned training programmes, she said:

Past experience plays a large part in how I plan to present the Fundisa for Change courses. I now shift the focus according to the time of year and what the teachers will still be teaching, according to what phase the teachers are teaching, and according to what aspects of the activities worked well the last time. Maintaining as much relevance as possible is the main motivation for these shifts. Other factors influencing my planning are the resources available at the venue, the duration of the course and total contact hours the budget allows for and the time I expect to be needed for the various activities. (S4F1)

On being asked specifically how she implemented the training, for example the on-course tasks, the facilitator reflected that:

I try to keep my introductions to topics as short as possible, as I want to give teachers as much opportunity as I can to engage actively in discussion, rather than listen passively to what I'm saying. Another reason for this is that I try to use the activities to model teaching strategies rather than describe them, so that I can engage teachers in reflecting on their experience of them. (S4F1)

The facilitator's use of a number of video clips during training was also interrogated. She argued that it was a teaching strategy: "I use video clips as an example of the type of resources available and model a way of using a movie as a teaching strategy i.e. 'listening with intent'." She also recognised that internet access is not always generally available in the training venues hence she downloads the videos. The facilitator noted that three days did not seem enough to also include other activities, for example, fieldwork.

6.4.4.5 Summary of reflections

Additional to programme outcomes and resources, facilitator expertise and assumptions about how others learn influences how programmes are implemented. The context where training occurs also has an influence on what is possible.

Although the focus of the study was on what was achieved during the training. Participants were invited to share what they had implemented in their school post training. Only one from 24 participants responded, her response is presented below:

I have learnt a lot especially on energy resource management. I have also gained more knowledge that has given me more confidence in terms of delivering my lessons. I have used the renewable energy posters during my lessons and I also gave my learners a research topic based on the materials received [Appendix 35]. I have also given the material to my ex-learner who is currently studying at CPUT for his research assignment and he got a 72% pass. The material is user-friendly and very clear which makes it easy for my learners to understand. I think Fundisa for Change needs to add more topics in Geography. After attending the workshop, I really found it easy to teach the topics addressed in the booklets.
(email response)

The relevance of the training to what teachers do has enabled an application of what was learned in the training. The materials given to participants also allows them to adapt them in their work contexts.

6.3.5 Site 5: KwaZulu-Natal (*Teaching Climate Change in Natural Sciences in grades 7–9*)

6.3.5.1 Context

The climate change senior phase training session was held from 18-20 August 2015 in Mariannhill, KwaZulu-Natal. Nineteen participants attended the course. This was a diverse group of teachers who taught different subjects, across all the four phases (grades R – 12). One of the teachers came from a special school. Participants who attended the training were identified by one of the Fundisa for Change environmental partner organisations. The teachers were involved in other environmental activities offered by the environmental organisation. Two of the three facilitators were from a Fundisa for Change partner university and the third was a Fundisa for Change environmental sector partner. Three of the schools received post- training support so they could showcase how they had implemented what they had learned, in their schools.

Facilitator one, who was the main facilitator in the training has been involved with teacher professional development for 11 years. The training was her first involvement with Fundisa for Change and she has been actively involved in the programme since.

The majority of the participants (78%) taught in rural schools and only 22% taught in peri-urban schools. The participants who attended the Senior Phase Natural Sciences Climate Change Fundisa for Change training were teaching different grades and subjects. 26% of participants were solely foundation phase teachers and 16% were intermediate phase teachers only while only 11% of the participants taught only in the senior phase. The rest taught across the phases. One of the participants, also a foundation phase teacher, taught in a special school. Only 42% of the participants were Natural Sciences teachers, which meant that the majority of the participants (58%) who attended the training were not the target group for the training.

The training was initiated by the KwaZulu-Natal provincial Department of Economic Development, Tourism and Environmental Affairs (see Appendix 36). The provincial Department therefore identified which participants would attend the training. What these participants had in common was that they were all involved in school environmental education programmes run by the Department of Environmental Affairs. Participants received an invitation to attend the training (Appendix 37).

The Fundisa for Change training programme has subject and phase specific training modules therefore training is targeted to specific subjects and grades.

Reasons for attending the training varied as indicated below:

I want to broaden my knowledge about environmental education.

I want to acquire information, knowledge, skills and methods to use at school for the benefit of learners and the community.

I want to know how to integrate environmental learning in the Natural Sciences curriculum.

I want to extend environmental learning at school.

I want to strengthen knowledge and teaching strategies for science and to share the knowledge with colleagues.

I want to learn more about climate change and conservation to educate learners (impart knowledge).

I realise that it is important for every citizen to have knowledge about global environmental issues.

I attended because I lead the school environmental education programmes in my school. I advocate for the environment and felt I needed new information, ideas, networks and motivation to continue with that work.

Profile data from participant questionnaires indicating participant teaching experience and expertise in environmental learning is tabulated below (Table 6.13). 89% of the participants have been in the teaching profession for more than five years. It is also evident from the data that most of them were quite familiar with engaging with the environmental teaching and learning specified in the national school curriculum.

Table 6.14 Participant profile questionnaire responses (site 5)

Statements	Responses
Teaching experience	• 22% had been teachers for 2-5 years • 22% had been teachers for 6-10 years • 28% had been teachers for 10-20 years • 28% had been teachers for 20+ years
Experience in engaging with environmental learning in the school curriculum	• 32% were very familiar • 32% were quite familiar with it • 36% had heard about it, but knew very little

One cannot assume that simply because environmental education is integrated in the curriculum that teachers are aware of it and/or are engaging with it. What was quite surprising with this group of participants though is that they were chosen to attend the training because of their involvement with the school environmental education programmes led by DEA.

One would assume that this programme would sensitise participants to how environmental education is engaged with in the national school curriculum. I did not establish though from the participants how long they had been involved in the school environmental education programme nor the nature of the programmes.

I noted that participants who indicated they knew little about environmental learning stated that they attended the training so they could extend their environmental education knowledge. The figure below shows a breakdown of teaching experience in relation to experience in working with environmental content in the curriculum.

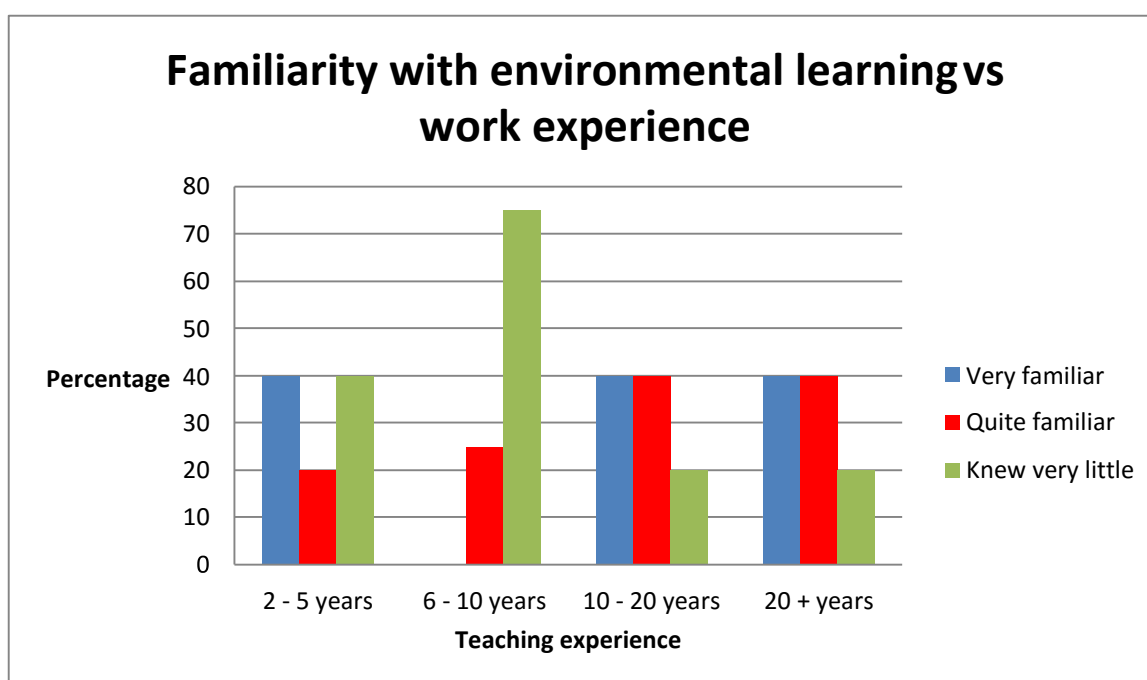


Figure 6.36 Familiarity with environmental learning in relation to work experience

I attended the three-day training but was unable to attend the post-course on-site visits. The Fundisa for Change Climate Change module was the main resource used during the training although other handouts were brought by the facilitators.

All three components of the Fundisa for Change training were covered in the three-day training although not all components are explicitly indicated in the training schedule programme (Appendix 38). Activities and presentations were aligned with the Fundisa for Change short course training outcomes and time was factored into the programme for on-course tasks that would be assessed for certification of the short course.

6.3.5.2 Delivery of Fundisa for Change programme to achieve programme outcomes

Day 1

Facilitator one welcomed participants saying if they wanted to change who they were as teachers; they were in the right place as the Fundisa for Change programme would help them to do that. She encouraged participants to “enjoy what you’ll be doing and think about how you can enrich yourself and very important enrich the lessons that you are going to go back to because that is critical.”

The scene was set for participants to think about the support they would get from the programme that would enable them to make changes in their teaching when they returned to their work contexts. Participants were invited to introduce themselves and to mention something they wanted everyone to know about their identities as teachers, for example their strengths and weaknesses and challenges they face in the schools. Some of the things mentioned by participants were:

I’m a hard-worker. I take extra hours to work with my learners but learners do not want to learn, they don’t want to listen.

Am still learning. I’ve been teaching Natural Sciences for 2 years with no textbooks, no technology, no lab and lack of resources. Learner absenteeism is a problem.

I teach in a deep rural area where learners do not want to do anything even the community.

I love teaching and have kept studying over the years. I’m a perfectionist and second guess myself. I worry about time constraints.

I’m very passionate about environmental education and have been involved in youth empowerment and empowering educators. My weaknesses are time management and impatience. My challenges are getting people focusing on environment in their teaching.

I ensure learners in my class understand concepts by using real life experiences. I teach a class with 75 learners and it becomes difficult to read comments and check assessments given. I have a challenge in assessing learners with special needs.

I like to do practical work and think learners learn better through practical work.

I like to see my learners' progress. I would like to learn from others.

I'm involved in Eco-Schools, when I am teaching I focus more on environmental issues than anything else. I don't like being absent from school.

I like networking. I don't know how to assist slow learners.

Some of the challenges teachers face are similar. Some of the issues they raised they could empower themselves to address. But others are systemic and require changes in the education system to address them. Most teach in rural schools which may exacerbate some of the issues they face.

The facilitator recognised that “teachers don't have enough spaces to talk about who they are and what they are experiencing. This is the key for us to move forward. We can learn from each other. She encouraged participants to network and build relationships with each other which they would sustain beyond the training. She was encouraging participants to form professional learning communities although she did not label them these: “We have to think creatively on how we can draw on each other's strengths and work collectively.”

She also discouraged participants from working from a deficit mentality: “We are going to shift from talking about deficit students to how we can talk about ourselves and how we can support those students.”

Introductions were followed by a brief introduction on climate change. The facilitator discussed the importance of focusing on climate change. She informed participants that the government was serious about addressing climate change and mentioned the 2011 White Paper that responds to climate change. She encouraged participants to have discussions with learners about climate change, “You have to teach your learners that climate change is not something that is out there, it is something that they can contribute to, that they have the ability to alter things in their own small way.” She explained to participants that when they teach about climate change, they should, “Ask your learners what they are experiencing in terms of climate change, draw on their experiences because your learners' experiences are the most important ways for them to understand what is happening in terms of climate change.”

A second facilitator gave a lecture on what climate change is and why it was important to teach about climate change. He shared current debates and contestations on climate change. He contextualised the issues to Africa and South Africa in terms of contribution to greenhouse

gases. As he talked he encouraged participants to write notes. One of the participants appreciated the presentation on climate change and made reference to a United Nations Climate Change Conference that was hosted in Durban in 2011 stating, “We have not paid attention to the science of climate change. We should have taken an opportunity to engage with it during COP 17 but it is not too late to have the conversation now.”

Both participants and other facilitators asked questions and contributed to the discussion during the presentation.

The first facilitator encouraged participants not only to talk the climate change talk but also to act, reiterating the value of working together:

We can start something at our own schools, generate some excitement around climate change and do projects in your own schools. We need to set up a website so you can start sharing with each other what you are doing and how you are doing it and network with each other, invite each other to your schools so you have greater collaboration with each other on climate change. What we don’t want is for you to go after this three-day workshop and then it dies. It would mean we have wasted our time. (S5F1)

Fundisa for Change already has a website that can be a platform for participants to continue sharing experiences and practices.

At the end of the climate change presentation, questions on the presentation were posed to participants. Participants were asked to work in groups to discuss the questions and give responses to the rest of the group. As they were giving feedback on the responses, the first facilitator was writing participant responses on the white board. The second facilitator, who had given the presentation, was elaborating on responses given by the groups. In some instances, participants were required to justify the answers they gave. This meant that some of the initial questions given to participants were changed from being low order to middle order and high order.

The next presentation by the second facilitator was on ocean currents. What I noted was that the presentations were drawing from content that was specified in the Fundisa for Change Climate Change module, although at this point participants had not worked with the module. The presentations extended what was specified in the module possibly from the links provided in the module.

The first facilitator alerted participants to the fact that how they had presented the programme till then was a strategy for them to model what they would like participants to do in their classrooms, as reflected below:

Ultimately we are all teachers here and you're going to go back and use what we have been doing. So, what is the range of teaching strategies we have used thus far from morning till now? Story-telling. The first presenter has told you lots of stories [recaps stories that were told]. He has been reading widely and he has kept abreast with the latest news and from his personal experiences. He has been pulling together this mix and created an analogy and story that he has interspersed with his knowledge on climate change. And that's what's made it exciting. It's not just the knowledge he presented. He has taken his experiences. He's taken what he has read. He's taken what he has seen on TV. He has taken every aspect that he can draw from whether newspapers, whether a pamphlet or an article he's read and he has pulled it together and that is what makes a difference. He also used demonstration, that's why he had globe. He's also used direct instruction; he has notes and PowerPoint. He teaches from his notes and gave you explanation and asked you questions and has allowed you to question him. It is a two-way process. We also did group work when I gave you the questions and you had to discuss and you also did some collaborative work so you can learn from each other. You can create in your class an exciting environment for climate change by using these different strategies. The trick is not to use one strategy for the entire lesson. Use multiple strategies to teach climate change. (S5F1)

Facilitator one was integrating the content taught with how it was taught thus introducing different teaching methodologies that participants can use when they teach. It was not only about telling participants about the different teaching methods but demonstrating how the methods can be used.

Participants then worked on an activity that was in the Fundisa for Change Climate Change module, where the task required them to look at a picture of the earth from space and identify the features of the earth that allow it to sustain life. They had to rely on their observation and recall skills from what was presented earlier to be able to look at the globe and identify features that allow the earth to sustain life and to discuss in their groups the importance of each feature. This was an activity that participants could also do with learners in their schools. This activity reinforced the content that was presented earlier and gave participants ideas on how they could teach that content.

The assessment component was introduced by drawing from participants' prior knowledge. Participants were asked to share two words that came to mind when they think of assessment. Participants had similar answers; some of the responses are noted below:

See if learners have achieved set outcomes

Find out how much learners know

Used to measure learners' ability to perform

Check understanding

Evaluate

Feedback

It is not only testing learners' knowledge; it is evaluating you as a teacher what you have taught

Recording learners' progress and performance

Assessment can be used to identify barriers, to understand why outcomes were not achieved.

Participant responses indicated that they have more than one perspective of what assessment is and they also mentioned some of the assessment tools they use, for an example, classwork exercises, tests, examinations, investigations, observations, projects and assignments. The facilitator stated that if assessment does not lead to learning then it is a waste of time for both teachers and learners. She also encouraged use of peer assessment, citing that "Learning does not only come from you interacting with learners but also from them interacting with peers who may already have knowledge and understanding on a particular content".

The first facilitator gave a presentation on assessment using literature written by researchers who have an interest in assessment. She also made reference to how assessment is presented in the Natural Sciences curriculum document. She distinguished between summative and formative assessment giving examples. Participants also gave examples of how they do formative assessment. The facilitator quoted from the 2015 Minimum Requirements for Teacher Education Qualifications policy that stated that newly qualified teachers must be able to assess learners in reliable and varied ways, as well as being able to use the results of assessment to improve teaching.

She made it clear that the quote applied to all teachers, as reflected below;

This obviously applies to all teachers. There are three aspects to this, it must be reliable, it must be varied and results should be used to improve teaching and learning. So there are three parts to it; first you must have a reliable method of assessment; two you can't use the same way to assess all the time. You have to alter your assessment methods all the time. You can't have a test all the time; use a project, an assignment, an experiment. And you must use the results from that assessment to improve teaching and learning. You use a variety of assessment methods but it doesn't stop just at that point, you utilise the information to enhance your teaching and the learning. So the implications are not just for learners but for the teacher as well. (S5F1)

Participants were asked to think about how assessment can lead to learner empowerment. One suggestion from participants was that teachers should teach learners to recognise their strengths and weaknesses and how to improve where they are lacking. Participants were encouraged to involve learners in taking responsibility for their learning.

The facilitator explained Bloom's Domain of cognitive levels giving examples of question on climate change that could be asked at each level. Participants individually were to use the content they had received on climate change to set a 10-mark test for a particular grade consisting of five questions, two low order, two middle order and one high order. Participants were expected to include a memo for the questions. This task was going to be used as an assessment towards certification for the short course. Figure 6.37 is an example of two participants' assessed responses.

Gr 5 Lesson

1. Name 2 elements of Earth that allow us to live on it.
 * water / sun's energy / vegetation ✓

2. List 3 effects of climate change.
 * increased flooding * melting glaciers ✓
 * decreased water availability ✓

3. Compare the amounts of waste created by families in a) rich / developed countries and (b) poor countries. How does it effect the environment?
 * lesser waste in poorer countries as compared to rich
 * This will/could mean more GHG emissions for (a) ✓

4. What is the difference in our weather patterns now and in the past?
 * Present - more erratic / 4 seasons in a day concept ✓
 * Past - fairly stable & predictable.

5. Do you agree : Climate change is the business of government and (other big industries). Justify your answer.
 * Personal choice eg No - every little action counts
 Think globally - act locally.

7/10

CLASSROOM ACTIVITY 2 DATE: 18 AUG. 2018
 NAME: _____ GRADE: FIVE
 EXAMINER: NOLANDWE L.G. MODERATOR: S.M. MARKS: 10
INSTRUCTIONS: WRITE NEATLY & LEGIBLY.
 : ANSWER ALL QUESTIONS.

QUESTION 1

1. LIST FOUR POSSIBLE CLIMATE IMPACT FOR SOUTH AFRICA ACCORDING TO GAUTENG? [10]
 (a) _____
 (b) _____
 (c) _____
 (d) _____

2. (WHAT) DOES THE (WORD) IPCC STAND FOR? [10]
 (answer!!)

QUESTION 2

1. (WHAT) IS A CLIMATE CHANGE? [10]
 2. (WHAT) CAUSES ACCELERATED CLIMATE CHANGE? [10]

QUESTION 3

1. DIFFERENTIATE BETWEEN HYPOTHESIS AND THEORY. [2x1]
 (signifier?)

Figure 6.37 Participants' assessed tasks

Analysis of participants' work showed that some of the participants were able to differentiate between low, middle and high order questions although some still struggled to do so. They could all formulate low order questions and challenges came when they had to formulate middle order and higher questions. Some of them did not attempt to set higher order questions. One other comment from the facilitator to some of the participants was that the questions were poorly constructed.

Day 2

The day started with the third facilitator giving a presentation on the greenhouse effect. It was an interactive session as questions were asked by both the facilitator and participants. Some of the participants took notes although they were informed that the presentation would be shared with them at the end of the training. The facilitator assumed that teachers knew some of the content that he was presenting. This could be because he thought all the teachers were Natural Sciences teachers who taught this content in the senior phase. I also only realised that there were foundation and intermediate phase teachers when I analysed the

evaluation questionnaire after the training. This is something the programme needs to monitor to ensure that the right participants attend training and to work with the Department of Basic Education to identify participants.

During the presentation participants kept asking each other what the facilitator was saying and they explained some of the concepts to each other. Examples given in the presentation was data from South African countries in order to enable teachers to use the information to contextualise the content for learners in their classrooms.

The next two activities were taken from the Fundisa for Change Climate Change module. One was a household electricity audit. Analysis of participants' work revealed that most of the participants were able to do the calculations correctly while others struggled with the calculations. More should be done to improve participants' mathematical skills as these are important in the Sciences. When teachers are confident in their mathematical skills they will in a better position to teach learners to acquire those skills as well. The Fundisa for Change *Introductory Core Text* emphasises the use of teaching methods that develop mathematical skills (see Chapter Five).

The second activity was a greenhouse game which participants could do with their learners. Participants were also given different readings on energy which they had to read in groups (see Figure 6.38) and share with the whole group. They were advised to read critically and cautioned that some readings are biased depending on the agenda of the author. Participants commented they would implement some of the energy saving tips suggested in the readings. Some of participants critiqued suggestions on the use of nuclear for energy generation.



Figure 6.38 Participants working with energy readings

The first facilitator did a presentation on renewable resources and sustainable living practices. She informed participants that at times people have contradictory practices to what they say they value in terms of sustainability practices. She indicated that sustainable living is a lifestyle. It is a lifestyle choice people make to reduce their ecological footprint. She encouraged participants to make changes in how they did things as reflected below:

Choose small things that you and your learners can try and they can take home to their parents. We need to make audit of ourselves as individuals if we want to make a change, minimise, maximise and prioritise. We need to make changes in everything that we do. We can all find more reasons why we should not have sustainable living than reasons why we should be. It is upon us to make that difference. We are agents of change whether we want to accept it or not. You want to have a better tomorrow, you want there to be a community you know you have invested in and you're going to be proud of ten years, 20 years down the line. (S4F1)

The facilitator was giving teachers a responsibility to be agents of change and not assume that environmental education is about covering only what is in the curriculum but should lead to change-oriented learning.

Participants were given an assessment task where they had to write five strategies they would implement in their schools to encourage sustainable lifestyles (Appendix 39).

At the end of the day, participants were given an overnight task. They worked in groups to plan a lesson on climate change for any grade. The lesson had to have tangible outcomes that could be assessed, content, methods, activities and assessment specified.

Day 3

The day started with groups finalising their lesson plans (see Figure 6.39) before they presented.

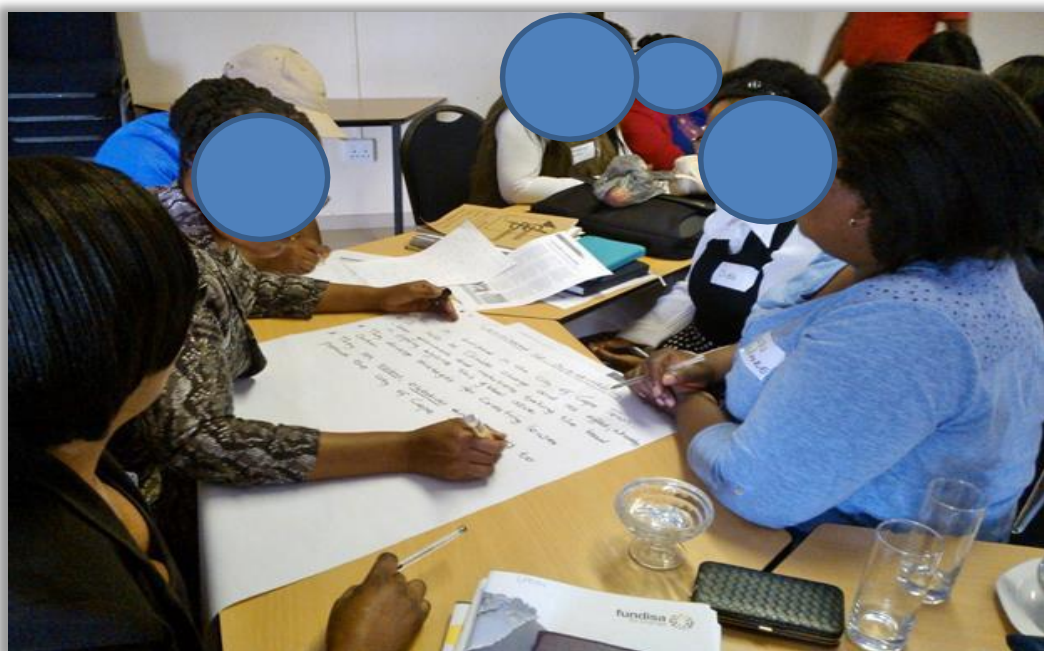


Figure 6.39 Participants planning a lesson

The facilitators and participants critiqued all the lesson plans. Questions were asked of each of the groups and comments given for the improvement of the lesson plans. All the groups produced good lessons. Figure 6.40 shows an example of one of the lesson plans presented.

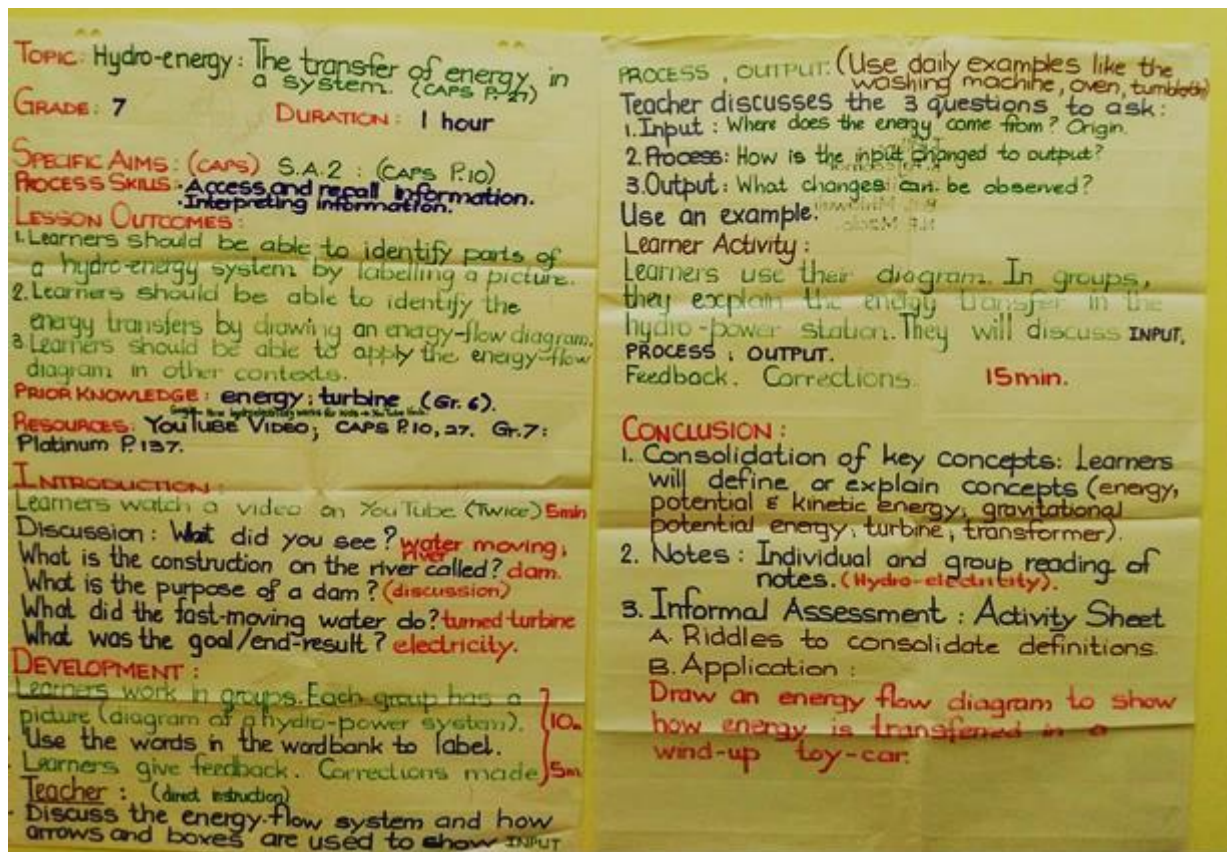


Figure 6.40 Participants' lesson plan

Some of the best practices that were noted by the first facilitator and some participants from the lesson plans were:

The group plans to take outside to look at the sun and feel its warmth to teach them about solar energy.

They made clear the links between lesson outcomes with skills in CAPS.

They used a variety of teaching strategies.

They provided the timeframes across the activities.

They ask learners' prior knowledge.

Learners were required to read.

Some comments made by the first facilitator to improve the lesson plans were;

There needs to be a direct correlation between your assessment and your outcomes.

In your assessment, assess what you taught.

You are teaching about geothermal energy. But it is clear that you don't know it yourself. Remember that as a teacher you can't expect your learners to know something if you don't know it. You need to go back and find out what geothermal energy is so you can give a nice explanation of what it is.

Participants were able to learn from each other through the presentations. Groups were able to reflect on their lesson plans and to share how they would improve them. Participants shared that they did not know some of the concepts as they are neither Geography nor Science teachers. Some of them did say they would share resources from the training with colleagues who teach senior phase Natural Sciences in their schools.

All the presentations, additional resources and a soft copy of the Natural Sciences curriculum document were saved onto flash sticks and given to all the participants. Participants were informed that they should bring flash stick for all the resources used during the training.

Teachers were given a 'take-away' task where they were required to write up a photo essay on the climate change mitigation and adaptation concrete steps they would undertake in their schools. The essay was part of their assessment activity and submission was four months after the training. Facilitators were scheduled to visit the schools in 2016 to see the steps teachers had taken and wrote about in their essays with regard to climate change mitigation and adaptation (see Figure 6.44). The essay shown in the figure shows that the participant read into the issues and implemented what she learned in her school.

Given the increases in extreme weather events projected to affect the Southern African region, it is essential to assess how household and community-level adaptations have been helped or hindered by institutional structures and national policy instruments (Dougill et al., 2003). This essay aims to highlight how the FUNDISA for change program, initiated by the national government, has inspired positive action for climate justice at Woodview primary school. The school as an academic institution has the ability to implement large scale change that will later 'trickle down' into the community. It also has the ability to bring about sustainable change by inspiring future generations. Climate change can be described as a long wave event since it is a disaster that is a long time in the making and in which the major effects have already begun to occur long before the magnitude of the crisis is recognized. Its impacts are thus always underestimated and 'full on' mitigation and adaptation measure may not be required at present however planning and implementation is integral to the success of strategies.

The two fundamental response options to the risks posed by anthropogenic climate change are mitigation of climate change and adaptation to climate change. Adaptation primarily aims at moderating the adverse effects of un-avoided climate change through a wide range of actions that are targeted at the vulnerable system (Klein et al., 2006). At the core of the ongoing debate regarding the implications of climate change in sub-Saharan Africa is the issue of food security (Di Falco et al., 2010). At Woodview primary I was able to initiate a food garden (5mX3m) to practically demonstrate (to its learners and the community) a method for ensuring sustainable food security at a local level. Many educators feel that they should not only teach the science, but also engage students and encourage positive responsiveness about the environment (i.e., Cross et al., 1999., Lester et al. 2006., Mason et al., 1998., Abellera et al., 2008).

The creation of this food garden involved not only teaching two educators and learners of two classes and in the school enviro-club about: creation of compost heaps, reel gardens but their practical involvement as well. I attained a sponsorship of a succulent garden at school from Ethekwini plants.

Mitigation refers to limiting global climate change through reducing the emissions of greenhouse gases (GHG's) and enhancing the sinks (Klein et al., 2006). Much of the emphasis in planning for climate change is, quite properly, focused on reducing or mitigating greenhouse gas emissions. Present day emissions will impact the severity of climate change in future years (Hulme et al., 2002). Mitigation measures, set in motion at present need to be more practical (than current adaptation processes) in order to impact change sooner and more efficiently. The focus of current mitigation efforts at Woodview primary school was waste management. As a developing country in the ongoing process of modernization, South Africa, due to globalization is able to follow developed countries. Large scale consumerism leads to large scale waste generation and thus a need for effective waste management. The environmental impacts of municipal solid waste (MSW) management have been highlighted in China, due the continually increasing amount of MSW being generated and the limited capacity of waste treatment facilities (Huppes et al., 2009). On a local level we too need to place more emphasis on waste management.

At Woodview primary, I co-ordinated a recycling day event together with DSW and a local radio station- Hlondvani. As project manager I engaged various staff and learners in recycling activities. Grade 2 art projects required learners to utilize majority waste materials in the construction of their projects. A fashion show was held to display the practical action undertaken by learners to re-use waste, thus assisting in effective waste management. Several other environmental items were performed by learners to create awareness on the importance of re-cycling. Education is key in driving sustainable environmental change. This event had a large outreach as it was broadcast on a local radio station and had many members of the community as attendees. A community cleanup, by the learners in collaboration with DSW was conducted in order to implement immediate reduction in waste within the Woodview

Figure 6.41 Participant mitigation and adaptation essay

Essay marks ranged from a highest of 63% and a lowest of 37%. Some of the participants wrote about activities that have been in the schools already prior to the Fundisa for Change training. They had not introduced anything new as per the requirement of the task.

6.3.5.3 Post-training data and reflections

Analysis of the questionnaire, which participants completed at the end of the programme shows that in terms of the length of the training, 28% of the participants said the course was just right as enough content was covered. Most of the participants (72%) felt that the course was too short, stating that some of the concepts covered were too complex and needed more time for

discussion and explanation. They also felt that the assessment aspect was rushed. Too much information was shared within a short space of time. This is understandable because most of the concepts were new to most of the participants as they were not Natural Sciences teachers. They also felt there was a need for more information and discussions on actions we can take to teach learners about sustainable development.

The amount of content covered was seen to be the right amount by half the participants (50%) as they received knowledge about climate change, some adding that they wanted more learner friendly games related to the topics and more content on historical development of astronomy. They also indicated they wanted additional content on renewable energy sources. 22% felt it was too much but added that they needed more content on plant and animal evolution and practical class activities, while 28% felt it was not enough as they still needed more content.

The table below shows participants' rating of different aspects of the training.

Table 6.15 Participants' rating of the training

19 responses from 19 participants	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The content of the course was relevant to my needs as a curriculum advisor	72%	17%			6%	5%
The course materials were used effectively to support my learning on the course	50%	39%			6%	5%
Facilitators were knowledgeable	89%	11%				
The methods and approaches used on the course were appropriate	44%	50%	6%			

Comments on the responses above were that the course was interesting, very good and well planned, and facilitators were knowledgeable. Participants indicated that they gained a lot but also that some of the topics were rushed and therefore more workshops are needed.

One of the challenges was that not all the participants were Natural Sciences teachers, therefore they needed more information to understand some of the concepts and at times the facilitators pitched the content knowledge at a higher level than participants felt they had the capacity to absorb.

Only 5% of the participants felt the assessment tasks were too difficult. 61% indicated that the tasks were challenging enough and 68% said the tasks would contribute to their further learning.

What stood out for participants during the training sessions were the following:

Orientation to Fundisa for Change.

Learning new exciting information.

Presentation on assessment.

Lesson preparation and presentation.

It was interactive, we were not just lectured to but were able to ask questions and debate some issues. Educators were also able to share their problems, concerns, short-comings and share their experiences.

To improve the course, most of the participants recommended that contact time should be extended. Some felt that more teachers need the course and it should be taken to schools. They also want assessment tasks and the course to be outlined from the outset and in the invitation letter so that learners can be better prepared for the course. They further asked for more practical activities, particularly ones they can do with learners in the classroom. The table below shows how participants rated the applicability of the training to their daily work.

Table 6.16 Participants' rating of Fundisa for Change's relevance in their daily work

19 responses from 19 participants	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
I can see how environmental learning is part of the school curriculum	83%	12%				5%
I can relate what I have learnt in the course, to one or more of the subjects I teach	72%	28%				
I would be able to identify and explain key concepts related to environmental learning in the curriculum to a colleague	62%	33%				5%
I would be able to teach environmental content beyond the CAPS curriculum in my subject	72%	23%			5%	
I can explain the transformative nature of environmental learning to a colleague	61%	39%				

I would be able to identify and use teaching methods appropriate for higher order environmental learning	57%	33%	5%			5%
I would be able to prepare tools for assessing higher order environmental learning	61%	34%				5%
I can explain a link between environmental learning in the classroom and whole school development	51%	39%	5%			5%
I would be able to use the Fundisa for Change materials to prepare for my teaching	61%	34%				5%
I know where to find additional teaching resources for environmental learning	50%	40%	5%			5%

72 % of the participants indicated that they would use what they learned from the training for their own teaching and 44% said they would use what they learned in their assessment. 32% of the teachers stated that they would share the information with colleagues and 11% indicated that they would apply the knowledge in extra-mural activities.

Participants added that the teaching techniques they learned were hands-on and as such would work in their classrooms. They mentioned that they would be able to apply what they learned as they had learned and understood what was covered during the course, having discovered new aspects and things they were not sure of. The relevance of the workshop to what they do in the classroom will enable them to apply what they have learned both in and outside the classroom. One participant mentioned that they have been having lessons that dealt with environmental learning but with no thorough knowledge. Now she will apply what she has learned. She added that she needed more workshops on environmental learning. Sharing with colleagues will help other learners as well as communities to understand issues of climate change.

Participants indicated that for them to be able to work with environmental content and concepts in the classroom they needed the following:

- 78% needed more resource materials,
- 22% needed better textbooks
- 11% needed support from their principals
- 33% needed support from the Department of Basic Education
- 22% needed support from their colleagues at school

- 17% needed to stay in touch with a professional learning community
- Some of the participants said that they needed more training on practical projects and action research, how volcanoes are formed, effects of earthquakes, life cycles of stars, sun, earth's ages and electricity use at home. One mentioned that as she is the only one at her school to do the course she would like to attend a 'training the trainer' workshop so she can train all her colleagues.

In describing the course, participants gave the following reflections; it was educational, fruitful and more teachers need to do it, gave more knowledge and information, informative and a lot has been gained, curriculum-related, enlightening, content specific and content intensive, beneficial for teaching, wonderful and everyone in the community needs it, worth attending, relevant to CAPS and will assist learners, all teachers need it to improve their standard of teaching and understanding of climate change, everyone needs to take up and start implementing, an essential programme enabling transformation in the classroom and empowering learners about sustainable living. One participant said they were grateful they were given an opportunity to attend.

Final comments were that:

There is a need for small school projects that can be monitored by Fundisa for Change partners.

Communities need to be made aware through campaigns so mind-sets can change.

More workshops are needed.

The facilitators were great.

We need a platform to share successful teaching resources.

Special schools need to be catered for.

6.3.5.4 Post-training reflections from two main facilitators

Two of the facilitators completed a questionnaire sharing their reflections of the training. The table is not used to compare the responses but for clear presentation of the data generated.

Table 6.17 Post-training reflections from facilitators

Respondents Focus areas	Facilitator 1	Facilitator 2
Considerations in terms of training methodologies, content and materials and participants assessment when planning for training	Multi-method and diverse, with a good mixture of theory and hands-on activities	• Using multiple teaching strategies that are interactive • Time frame per method and varying the method frequently for maximum participation by teachers • I also consider diversity in learning: speaking slowly and repeating myself and writing on the chalkboard key ideas and vocabulary • I don't take content knowledge for granted, that is assume that they all know nothing and then I start with simple concepts and then build on that. Again, frequently asking questions and explanations • Materials to use depend on the activities that I have planned
Reflections on the success of the training	I felt it was very successful and the participants genuinely interested.	I had so many teachers follow up with invitations to visit their school and do talks etc. so I'm assuming that it was positive. They also indicated that they would prefer more time, another follow up session for ongoing interaction between Fundisa trainers and themselves.
Insights gained from teachers' assessed work	• There was a problem in the teachers submitting work on time. • We need more motivated participants and a stronger motivation and preparedness to submit all due work.	The assignments were relatively well done but we also found that a few of the teachers tried to include what their schools were doing before the training and not what they had implemented as a result of the training. So some did exceptionally well with outlining their strategies on going forward and others tried to rig their answers. In the future, we would need to do more site visits to assess the teachers' efforts at making a difference in their schools.
Further support Fundisa for Change should provide facilitators	We need to get heads on board so that participating teachers are compelled to complete work that is given.	Perhaps resources for the teachers- writing material, CDs, flash drives for PowerPoint presentations and exercises.

6.3.5.5 *Summary of reflections*

Post the training, participants were invited to share what they had implemented. Only one participant out of 19 responded to a post training questionnaire. Her reflections almost a year after the training suggest that although she does not give any details in terms of what she has done in her work context, she learned the importance of working towards a more sustainable society.

On being asked to sum-up her experiences of the programme, she had this to say about the programme:

What was taught in the programme was easy to grasp and learn because the programme teaches things that we should live by on a daily basis. Activities that were given were challenging as we had to think out of the box. The materials used are easy to use because even the children I teach are able to use them. I now know that the little you do can help save and conserve our planet. Most importantly I know that I need to be the change that I want to see. I feel confident about the world we live in and have hope for a better and greener future. Working with the assessment task was very challenging due to that I had to split my time and make time for teaching and completing the assessment task. The resources were not always available and it was most difficult but I managed to finish the task in time for submission. I also had a very great support system from colleagues. Doing the assessment task was very demanding yet very educational. The manner in which I approach my students and my attitude towards the world has changed. (email response)

Of the 19 participants who attended the training only six submitted all six assessment tasks and of these, only four met the outcomes and received certificates. Three schools were visited by two of the facilitators to see how participants had implemented climate change adaptation and mitigation actions in their schools. The choice of which schools to visit was based on the best work had been produced and to see what teachers had done in their schools, as reflected below:

We did a site inspection of what these teachers had rolled out in their own contexts as per the assignment they were tasked to do. We were also keen to see if they were just doing it for the assignment and not in reality. We were so impressed with the schools' efforts. (S5F1)

It was very interesting being guided around the schools and seeing what the teachers and learners had done with respect to their photo-essay assignment. (S5F2)

Judging from observations made during training and reflections from the facilitators and data from participants' evaluations of the programme, the Fundisa for Change outcomes and course structure was operationalised and participants were able to achieve the set outcomes, some more than others. What still needs to be interrogated is the poor submission of 'take home' tasks.

6.4 Conclusion

This chapter presented an in-depth description of five case studies on the implementation of the Fundisa for Change programme in five provinces. The detailed descriptions of each case include the context in which it was implemented, the implementation process and the outcomes of the implementation. Data to provide descriptions was sourced from document analysis, observation, and interviews. This chapter shared how the Fundisa for Change development programme objectives were operationalised through supporting participants to identify and reflect on environment and sustainability content in the national school curriculum. In some cases, participants were supported to develop deeper knowledge of environment and sustainability issues through fieldwork in their contexts and through hands-on activities. Participants were also introduced to methods they could use to mediate learning on environment and sustainability content as well as how to assess that content. Participants were assisted to plan for what they would implement in their work environment; teachers planned lessons they could teach in their classrooms and subject education specialists planned teacher workshops. At some sites, participants were given readings to consolidate understanding of concepts. For example, assessment *of* and *for* learning and transformative learning. A supportive learning environment was created at all the sites through interactive learning activities, discussions, presentations and the portfolio of evidence that most participants submitted was intended to enhance conceptual understanding.

The next chapter used the CMO configurations to share what outcomes were achieved under what conditions and the mechanisms that were triggered at each site.

CHAPTER 7: THEORY OF CHANGE OF THE FUNDISA FOR CHANGE PROGRAMME

7.1 Introduction

Chapter Five presented data on the broad Fundisa for Change programme to give context for the Fundisa for Change professional development component of the programme. Chapter Six presented data generated from five sites where the Fundisa for Change professional development course was implemented. This chapter starts off with presenting the initial theory of Change of the Fundisa for Change professional development course. The initial theory of change is a combination of the programmes' implementation theory and programme theory. Data was generated from Fundisa for Change documents and programme stakeholders (see Chapter Five) to surface and make explicit the initial theory of change. This is followed by CMO configurations developed for each of the five sites. It concludes with a narrative of the CMO configurations and an overall refined theory of change for the professional development course of Fundisa for Change based on what was observed to work at the five sites.

According to Tikly (2015), the aim of research into learning in critical realist studies should be to understand what enables or hinders learning from occurring. The challenge is that it is difficult to determine causality in a system where a range of causes are at play in relation to the context where learning happens and to the individual learner. Attributing causality to a single intervention is difficult in open social systems (such as education) that are characterised by complexity and multi-causality. Assessing causality on which to base theories of learning and thus derive implications for policy and practice is a question of rationality which may prove to be ultimately fallible judgement. There is always a possibility that one has not taken into account all causal powers that may impact on observed outcomes. Paying attention to learning contexts may provide insights into some of the contextual factors that facilitate or hinder the learning process.

In presenting the refined initial theory of change for the Fundisa for Change professional development component of the programme, I am not providing a final theory of change for the training but rather a theory that will be refined as new evidence surfaces during further implementation of the Fundisa for Change training programme in other contexts.

7.2 Surfacing the Fundisa for Change training programme's theory of change

In order to surface an initial theory of change for the Fundisa for Change training programme, I asked the questions tabulated below.

Table 7.1 Questions asked to surface an initial theory of change of the Fundisa for Change professional development course

Goal	• <i>What is the goal and/or objective(s) of the professional development component of the Fundisa for Change programme?</i>
Assumptions	• <i>What is the issue that Fundisa for Change wants to address?</i> • <i>What does Fundisa for Change see as underlying causes of the issue?</i> • <i>What does Fundisa for Change see as a solution to the issue</i>
Target group	• <i>At what depth or level does Fundisa for Change want to work?</i> • <i>Who would be impacted?</i>
Strategies	• <i>How could the programme reach/influence/impact the identified groups/structures?</i> • <i>What tools or processes would Fundisa for Change need to impact/influence the identified groups/ structures?</i> • <i>What resources (financial, time, skills and knowledge) would Fundisa for Change need to employ these tools and processes to effectively influence the target groups?</i> • <i>Which resources do they already have?</i> • <i>What skills, knowledge and other resources do they need to develop?</i> • <i>How can Fundisa for Change capitalise on the resources of people who have/are involved in the issue or problem?</i> • <i>Who else is working in the field?</i> ○ <i>Are there opportunities for cooperation and partnerships?</i> ○ <i>Is there likely to be competition with others?</i>
Outcomes	• <i>How will Fundisa for Change know when you have succeeded?</i> • <i>What impact does Fundisa for Change want to achieve?</i> • <i>What would a solution to the issue/problem look like for Fundisa for Change?</i>

Adapted from Mackinnon, Amott and McGarvey (2006)

Figure 7.1 below is a visual depiction of the responses generated from Fundisa for Change documents and from interviews with key Fundisa for Change partners (see Chapter Five).

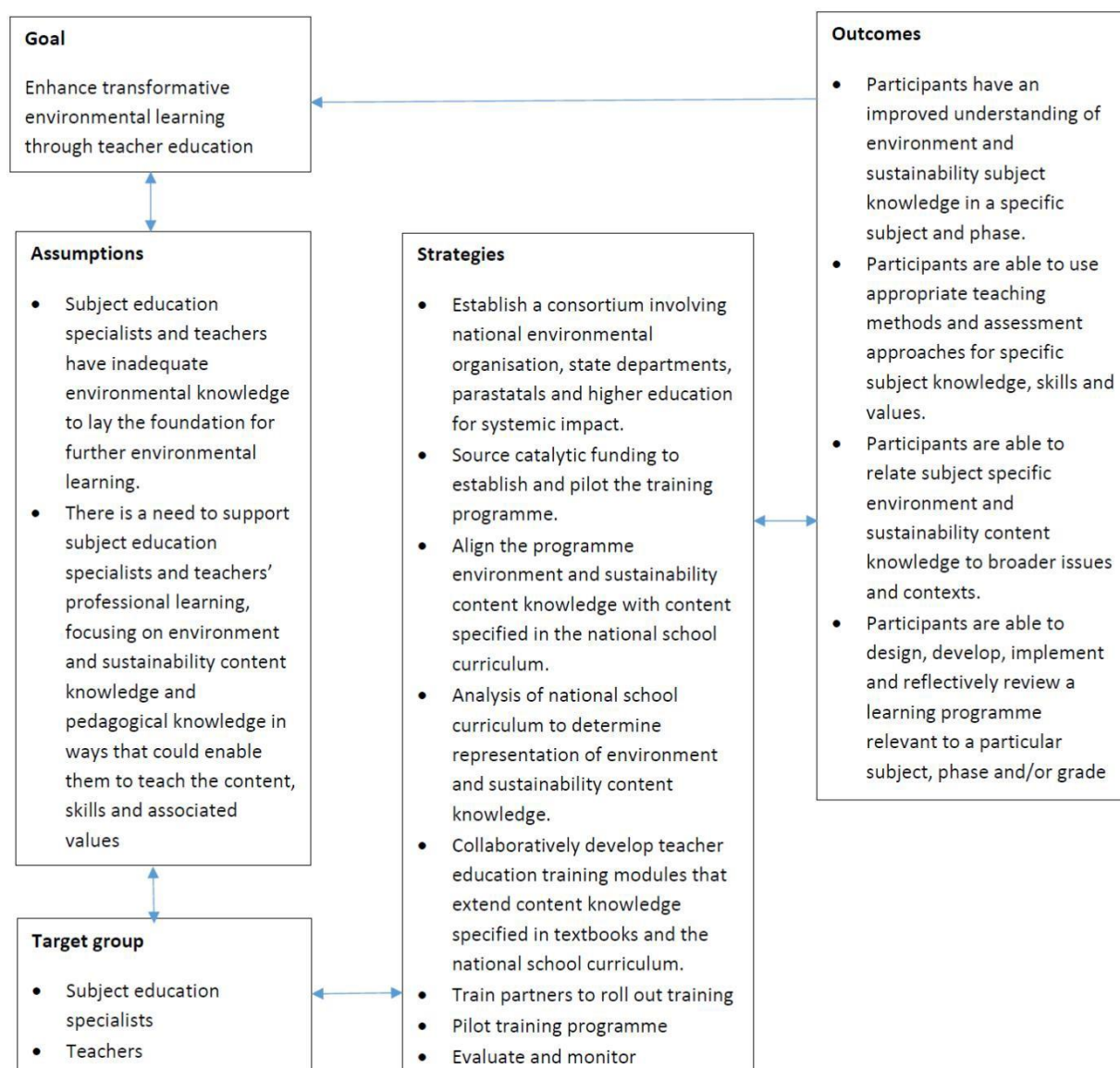


Figure 7.1 Initial theory of change for the Fundisa for Change professional development course

The Fundisa for Change theory of change, from the responses in Figure 7.1 is:

Senior education specialists and teachers can be supported to improve their environment and sustainability subject content knowledge, and the practice in teaching and assessing that knowledge. This can be achieved by bringing out the environment and sustainability subject content knowledge that is already specified in the subjects that senior education specialists and teachers teach. Resources needed are teacher education materials that extend the content knowledge specified in the national curriculum and textbooks as well as trainers with the capacity to support the professional development of subject education specialists and teachers.

In order to determine the training programme's programme theory and for whom the programme worked and under what conditions, a CMO configuration was generated from document analysis (Fundisa for Change documents) and interview data (key Fundisa for Change partners). The initial CMO was a hypothesis of how programme conceptualisers thought the training programme would work to achieve its objectives (see Table 7.2).

Table 7.2 Initial programme theory CMO configuration of the Fundisa for Change training course

Context (internal to Fundisa for Change programme)	Mechanisms		Outcomes (professional development course)
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: Partners are from different sectors, environment, government, parastatals and institutions of higher education	Redefining roles, introducing new practices and processes; introducing new resources	Participant preferences, beliefs, norms, values	• Participants have an improved understanding of environment and sustainability subject knowledge in a specific subject and phase. • Participants are able to use appropriate teaching methods and assessment approaches for specific subject knowledge, skills and values. • Participants are able to relate subject specific environment and sustainability content knowledge to broader issues and contexts. • Participants are able to design, develop, implement and reflectively review a learning programme relevant to a particular subject, phase and/or grade.
Culture: • Collaboration, research and learning	Introducing ESD discourse, ESD teaching strategies, documents, artefacts, symbols and representations internal and external to the context	Participant preferences, beliefs, norms, values	
Agency: • Partners voluntarily participate and attend training of trainers' workshop • Partners have flexibility to adapt training programme • Partners source external funding (guided by partnership protocol)	Creating a platform for participants to reflect on current practice and clarify their values	Participant preferences, beliefs, norms, values for action or non-action	
Relations: • Programme partners value collaboration • Commit to implement training with colleagues	Developing capacity of participants to perform redefined duties and responsibilities, establishing powers and rights participants have to implement new learning from training programme	Participant preferences, beliefs, norms, values	

The narrative below provides a brief explanation of Table 7.2. The Fundisa for Change programme aimed to activate pre-existing mechanisms in the structural context with regard to participants' roles, practices, processes and resources. Participants were already implementing or supporting the implementation of a curriculum that has integrated environment and sustainability content knowledge (see section 1.4.1). It aimed to redefine participants' roles to recognise themselves as agents of change for a more sustainable world. Additionally, it aimed to train participants to adopt new practices, for example, teachers to use change-oriented teaching methodologies in their classrooms and for subject education specialists to use change-oriented methodologies in facilitating teacher training workshops. Processes in the current structure would also be affected hence participants were also introduced to assessment practices that are aligned to the new content and teaching methodologies (Fundisa, 2013b). The Fundisa for Change programme also developed training materials to enable participants to have knowledge that goes beyond what is specified in the curriculum documents and textbooks they use (see Chapter Five and Appendix 13). Modifying one component in the contextual structure has a tendency to affect the others, as the relationships between the component elements are internal and necessary. For example, redefining participants' roles as agents of change for a more sustainable world required that they adapt new practices and processes in their current roles (De Souza, 2013).

Mechanisms that were introduced into the context were material, cognitive, social and emotional. For example, ESD discourses and strategies were intended to be shared with participants along with documents, artefacts, symbols and representations internal and external to the context. This would enable participants to achieve the *Situated Knowledge and Learning* objective (see section 6.2.2) of the Fundisa for Change training programme as it required that participants show evidence of being able to make situational connections between subject content knowledge, pedagogy, assessment and socio-ecological issues and contexts and educational contexts integrated and reflected in lesson plans. The Fundisa for Change guidelines for the writing of the Fundisa for Change teacher education materials (Appendix 13) used for training state that the materials will be used in conjunction with other resources that implementers bring into the training as well as point to other knowledge resources. Convincing ideas and arguments would be used to motivate for the importance of enhancing transformative environmental learning in the schooling system.

Giving participants a space to clarify their values and to reflect on current practice could enable them to justify action or non-action in a particular context. The Fundisa for Change training

objectives seem to suggest that participants would be empowered to achieve the training objectives and to implement in their work spaces. The training would give them the motivation and confidence to implement.

The CMO configuration focused on context internal to the Fundisa for Change programme, illustrating individual capacities (partners), interpersonal relations and programme settings that had the potential to enable the achievement of the training programme objectives (see section 2.5 and Table 2.6). In terms of structure, partners are from different sectors (government, environment and higher education) therefore they have individual capacities and diverse expertise they bring into the training programme. Partners play different but complementary roles in the programme as indicated in the excerpt from the Fundisa for Change implementation plan (Fundisa, 2013a):

Sector Partners

Higher Education Institutions: Contribute to conceptual guidance, materials development, training of trainers, and training of teachers; evaluation and research. Provide teacher education knowledge and system support.

State and parastatal partners (DEA, DBE, DHET, SANBI, SANParks): Policy sector engagement; funding of activities and support of training programmes; printing and distribution of materials (where possible); communication and network building support.

Environmental sector partners: Contribute to conceptual guidance, materials development, training of trainers, and training of teachers; evaluation and research. Provide relevant environmental sector networking support and environmental content knowledge. (p. 13)

The Fundisa for Change programme has a culture of collaboration, learning and research. As indicated above in the excerpt, some of the partners would and were involved in research (see section 5.6.4). Teacher education materials are co-authored (see section 5.6.1.1) and training is co-facilitated. Partners attend training of trainers' workshops to be empowered on how to implement the programme, that is, to train participants (see section 5.6.1.2). Partners also were expected to provide network support as indicated in the above excerpt for advocacy. In terms of programme settings, the Fundisa for Change co-ordination office was expected to provide

support to partners and to be a custodian of resources and rules of engagement (see section 5.3).

The Fundisa for Change training programme is implemented in systems that are external to itself, which could also play a role in the programme outcomes. These are infra-structural systems at the macro level which influenced the conceptualisation and implementation of the training programme. The Fundisa for Change programme was established as a consequence of a need that was identified in the environmental sector; to have a programme that would strengthen the foundations of environmental learning (Fundisa, 2013b). An enabling condition for the implementation of the programme was a perceived demand for a programme of this nature in the environment and education sectors (see section 5.1).

The Fundisa for Change training programme was implemented in an education sector that analyses how grade 12 learners perform in relation to environmental topics in the curriculum. There were challenges reported with regard to integration of environment and sustainability education in formal schooling (see Table 1.1). The relevance of the Fundisa for Change programme into government policy enabled the programme to receive national approval from the Department of Basic Education (Appendix 40).

The Fundisa for change programme is not only aligned with national imperatives but also with global imperatives as it is also responding to the Global Action Plan and Sustainable Development Goals (see Chapters One and Three).

The next section discusses site programme theories observed during the training of teachers and subject education specialists at the five sites presented in Chapter Six. The site programme CMO configurations provide an opportunity for the programme to refine the initial CMO configuration described above (see Table 7.2).

7.3 Fundisa for Change site programme theory – CMO configuration framework

Chapter Six provided a description of what the Fundisa for Change programme offered participants to support them to engage with environment and sustainability content knowledge in the national school curriculum. The resources that were offered may or may not lead to change in practice depending on participants' perceptions of the relevance of the training to their work and their capacity to make choices within their current work environments. Hence, programmes work for some but not for others. If changing participants' preferences, norms,

beliefs and values is critical to influencing their choices and ultimately their actions, what resources should teacher professional development programmes offer to participants? What programme mechanisms should be structured into these training programmes? Does the programme offer participants the tools to change their preferences, norms, beliefs and values as well as the capacity to enhance or change practice? According to Lacouture, Breton, Guichard and Ridde (2015), causal mechanisms exist prior to a programme being implemented and they are revealed during programme implementation in a given context producing expected or unexpected outcomes that may or may not be desirable. How should training programmes be conceptualised and implemented such that participants' pre-existing preferences, norms, beliefs and values are surfaced in order to challenge and change them?

The table below provides CMO configurations for each site using data generated during observation of programme implementation in five sites (see Chapter Six).

7.3.1 Site 1 CMO configuration (Gauteng)

During the implementation of the training programme, participants were expected to show evidence of their learning (see section 6.2.2). In some instances, the evidence of the learning and/or change of reasoning was shown during programme activities and in some instances post the training through the portfolio of evidence that participants submitted at the end of the training sessions. The table below provides a CMO configuration to show how programme outcomes were achieved.

Table 7.3 CMO configuration for Site 1

Context (internal to Fundisa for Change programme)	Mechanisms		Outcomes (professional development course)
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: There were multiple partners facilitating the training (environmental sector and universities) Participants were familiar with the schooling system and the curriculum Participants invited by the Department of Basic Education Culture: Collaboration amongst facilitators and participants (group work activities and peer assessment) Agency: • Partners have flexibility to adapt training programme • Partners source external funding to support fieldwork activities and extra resources Relations: • Programme partners value collaboration • Partners commit to implement training with colleagues	Redefining roles, introduction to new knowledge and resources Introduction of ESD discourse (systems thinking)	Discussions and how activities were mediated enabled participants to learn new content knowledge and to see value in supporting teachers with the topic and in teaching the topic	• Participants have an improved understanding of environment and sustainability subject knowledge in a specific subject and phase (Water in Social Sciences in grades 4 -9).
	Fieldwork, resources and hands-on activities Introduction of ESD teaching strategies	Reflecting on how fieldwork and hands-on activities enabled them to learn and made them aware of the value of ESD teaching methodologies Experience of how they learned during the training encouraged to think about how they can use new practices and processes modelled during training in teacher workshops	• Participants are able to use appropriate teaching methods and assessment approaches for specific subject knowledge, skills and values.
	Creating a platform for participants to reflect on current practice and relevance of fieldwork activities to curriculum and life in general	Participant preferences, beliefs, norms, values for action or non-action clarified through reflection questions	• Participants are able to relate subject specific environment and sustainability content knowledge to broader issues and contexts.

Participants already knew each other as they were part of the same provincial professional learning community	Developing capacity of participants to be able to perform redefined duties and responsibilities, as they plan and implement teacher training workshop	Perceived relevance of portfolio of evidence tasks to their everyday work	Participants re able to design, develop, implement and reflectively review a learning programme relevant to a particular subject, phase and/or grade
	Fieldwork and hands-on activities	Reflections on activities enabled clarification of personal values	Change-oriented learning

Some of the participants already had an assumption that they would learn something new when they attended the training (see section 6.3.1.1). The mechanism of confidence and respect was activated by the fact that there was a pre-existing positive relationship between the participants and the facilitator. The main facilitator had provided professional development support to the participants in the past thus participants had a positive attitude in how they received the training.

One of the tasks that participants completed for their portfolio of evidence required them to reflect on their practice in relation to the topic and of water and its associated concepts. It emerged that they had not supported teachers with this content because they struggled with some of the concepts (see section 6.3.1.2). What became evident for participants was that the topic of water was a big part of the Social Sciences subject they were supposed to support teachers with in their roles as subject education specialists. The mechanism that was used by the facilitator to influence participants to redefine their roles with regard to supporting teachers with the water content was to engage participants in an activity that would require them to use the curriculum documents to identify the water content that teachers are expected to teach. Additionally, they were given time to reflect on what they were currently doing to support teachers with this content and what they should be doing to support them in the future (see section 6.3.1.2). This task gave them an opportunity to think about how they needed to adapt their current practice when supporting teachers.

Content on water and its associated concepts was explicitly taught to participants by different facilitators both at the training venue (water cycle) and during fieldwork, for example, visit to Vaal Dam and RandWater water purification plant. Additionally, participants worked with the curriculum documents, textbooks they had brought and additional resources they had received to compare how the water topic was represented across the different resources. Their discovery that some of the textbook had inadequate content made them recognise that they had to redefine their roles and encourage teachers to use more than one resource and to encourage them to do research (see section 6.3.1.2) instead of only pointing them to the curriculum document and the prescribed textbooks. Working with curriculum documents enabled participants to see the relevance of the training to their everyday work.

Participants' pedagogical content knowledge was enhanced through engaging with the Fundisa for Change methods book, fieldwork and hands-on activities (practical work). Through reflecting on how they learned during fieldwork and hands-on activities, they were able to draw

on the Fundisa for Change methods books to identify some of the facilitation methods that were used by facilitators during those activities (see section 6.3.1.2). The assessment practice was enhanced by an activity that required participants to critique assessment questions in textbooks and in assessments they had set themselves. A discussion that ensued during this activity saw some of the participants change their perspectives in how they differentiated between low order, middle order and high order questions. Previously some of the participants assumed that an action verb determined the level of thinking but discussions convinced some of them that more was required (see section 6.3.1.2, day 4). Moreover, participants were given a reading on assessment.

Fieldwork and hands-on activities also required participants to link the activities to both the curriculum and the local context. Participants were made aware of the importance of making curriculum relevant to the everyday lives of both learners and teachers. Discussions and responses to questions regarding relevance of the content indicated that participants were able to make the links and to find relevance (see section 6.3.1.2). Evidence of their ability to design, develop and implement a training programme for teachers was generated through their portfolio task (see Appendices 19 and 20). There was a discussion on how others had already started to work on their plans.

Generally, participants from Site One seem to have achieved the stated training outcomes although the extent would be different for each participant. What was also evident was a change in attitude and values of participants after the excursion to Vaal Dam and the RandWater purification plant. This is evidenced by the comments they made on Day 3 when they reflected on the field trips (see section 6.3.1.2).

What enabled the outcomes to be achieved was that facilitators had the expertise and shared their knowledge with each other and the group. The way activities were mediated enabled participants to share their thoughts and to learn from each other. Resources brought into the training sessions enabled discussions and reflections to achieve the aims of the facilitator for the task and the aim of the programme. Since all the participants had some experience in the subject and in supporting teachers, they were all able to share experiences. The main facilitator and the participants had previous professional relations; there was therefore a good rapport during the training which was conducive to learning.

The pre-course task (Appendix 16) assumes that participants have supported teachers with the water content which they had not; as a result, some of the participants were not sure how to respond to the pre-course questions (see section 6.3.1.2, Day 1). Participants should be given an opportunity to share what and how they have supported teachers with content knowledge, teaching and assessment. Participants would then be given an opportunity to share how they think they would support teachers with the content knowledge that was the focus of the Fundisa for Change training course (if they were not already engaging with it).

The discussion on assessment (see section 6.3.1.2, Day 4) might have been enriched had the discussion started first with the facilitator determining what participants understood about the difference between low order, middle order and high order questions. Once this was clarified, participants would be in better position to know whether or not the curriculum policy was explicit in making the differentiation. Additionally, the discussion would have assisted subsequent activities where participants were expected to set up assessment tasks questions and to critique assessment tasks set by peers.

Another challenge experienced was delay in the submission of portfolio assessment tasks. This was due to time chosen to offer the training. The last training session was in the last quarter of the year which is a busy time for subject education specialists as they oversee examination preparations to round off the year. Training should rather be in the third quarter of the year at the latest.

7.3.2. Site 2 CMO configuration (Limpopo)

The table below shows the CMO configuration developed from observation data.

Table 7.4 CMO configuration for Site 2

Context (internal to Fundisa for Change programme)	Mechanisms		Outcomes (professional development course)
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: There were multiple partners facilitating the training (environmental sector and universities) Participants were familiar with the schooling system and the curriculum Culture: Collaboration amongst facilitators and participants (group work activities and peer assessment) Agency: Partners have flexibility to adapt training programme	Redefining roles, introduction to new knowledge and resources on water On-course tasks Content knowledge presentations by facilitators	Discussions and how activities were mediated enabled participants to learn new content knowledge	Participants have an improved understanding of environment and sustainability subject knowledge in a specific subject and phase (Water in Social Sciences in grades 4 -9).
	Introduced to ESD teaching strategies Hands-on activities Presentation on assessment Design and critique assessment tasks	Encouraged to think about how they can use new practices and processes in teacher workshops and to critique facilitation methods and hands-on activities in relation to how they supported their learning (if at all)	Participants are able to use appropriate teaching methods and assessment approaches for specific subject knowledge, skills and values.
	Water content taught was contextualised, references made to local rivers Resources used showed how local water sources were under threat	Participant could relate as they knew the water sources and human activities around the water sources that posed threats to the quality of the water	Participants are able to relate subject specific environment and sustainability content knowledge to broader issues and contexts.

Relations: • Programme partners value collaboration • Partners committed to implement training with colleagues • Participants knew each other as they belonged to the same provincial professional learning community			
	Developing capacity of participants to be able to perform redefined duties and responsibilities, as they plan and implement teacher training workshop	Perceived relevance of portfolio of evidence tasks to their everyday work	• Participants are able to design, develop, implement and reflectively review a learning programme relevant to a particular subject, phase and/or grade
	Explicit content knowledge input and reflection on knowledge	Enabled them to share values	• Change-oriented learning

Participants came to the training with the expectation that they would learn new knowledge that would enable them to do their work more effectively (see section 6.3.2.1, day 1). This attitude created a positive atmosphere that allowed participants to contribute to discussions and to actively participate in programme activities.

The first portfolio task required participants to identify concepts they struggled with in teaching and/or supporting teachers on the water content. They openly shared what the difficult concepts were (see section 6.3.2.2). Additionally, participants were required to identify other concepts related to the topic of water in the curriculum documents. Content and concepts that they identified as a challenge was explicitly taught to them. Moreover, the topic was contextualised to water sources in their local areas. Research on teaching about water as part of their portfolio tasks improved their understanding of the water topic as evidenced by the comment that textbooks have limited content knowledge. Textbooks were one of the resources they were expected to use to do their research on the topic of water.

Participants reflected that they had learned from designing their own assessment task and from having them critiqued by peers and from critiquing tasks designed by peers (see section 6.3.2.2, day 3). An example of a training workshop plan was shared with participants to inspire them to develop their own. In addition to presentation on the content, the training offered on-course activities to enable participants to achieve programme outcomes.

It is important that there is clear communication between the Fundisa for Change co-ordinating office, the Fundisa for Change partners, particularly with the Department of Basic Education. There participants who attended the training were not all subject education specialists; some of the participants were teachers. The training was planned for subject education specialists, the on-course activities and assessment tasks for the PoE was tailor-made for subject education specialists. It was a challenge to run the same training at the same time for the two different groups of participants.

Communication will also assist with getting local (provincial) Fundisa for Change partners to participate in training participants as facilitators for this training were all from another province. Having local partners taking a key role in facilitating also assists with post-training support.

Communication is also critical between facilitators and participants at the start of the training. It is important that facilitators explain to participants the aims and outcomes of the training and

how participants will be supported to achieve training outcomes. It would also be important to explain what will be expected from participants during and after the training. One of the participants at the end of Day 1 (see section 6.3.2.2, Day 1) commented that he struggled with the approach that was used to run the training as he could not see how the approach was going to help him in his work place. He felt more was expected of him than what he was receiving from the training.

7.3.3 Site 3 CMO configuration (Mpumalanga)

Observation data was used to develop the CMO configuration for site. Table 7.5 below gives an indication of what led to the achievement of programme outcomes.

Table 7.5 CMO configuration for Site 3

Context (internal to Fundisa for Change programme)	Mechanisms		Outcomes (professional development course)
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: There were multiple partners facilitating the training (environmental sector) Participants were familiar with the schooling system and the curriculum Participants invited by the Department of Basic Education Culture: Collaboration amongst facilitators and participants (group work activities and peer assessment) Agency: - Partners have flexibility to adapt training programme - Partners source external funding to support fieldwork activities and extra resources Relations: - Programme partners value collaboration - Partners commit to implement training with colleagues	Redefining roles, introduction to new knowledge and resources on water On-course tasks Content knowledge presentations by facilitators	Discussions and how activities were mediated enabled participants to learn new content knowledge	Participants have an improved understanding of environment and sustainability subject knowledge in a specific subject and phase (Water in Social Sciences in grades 4 -9).
	Introduced to ESD teaching strategies Hands-on activities On-course tasks Teaching method resource Article on assessment Modelling of teaching strategies Design and critique assessment tasks	Encouraged to think about how they can use new practices and processes in teacher workshops Peer assessment enabled them to change their perceptions on their ability to assess adequately	Participants are able to use appropriate teaching methods and assessment approaches for specific subject knowledge, skills and values.
	Water content taught was contextualised, references made to local rivers Resources used provided knowledge on local water sources Fieldtrip and worksheets Introduced to ESD discourses	Participant could relate to local examples	Participants are able to relate subject specific environment and sustainability content knowledge to broader issues and contexts.

Participants already had a professional relationship as they belonged to the same provincial professional learning community	Developing capacity of participants to be able to perform redefined duties and responsibilities, as they plan and implement teacher training workshop	Perceived relevance of portfolio of evidence tasks to their everyday work	Participants are able to design, develop, implement and reflectively review a learning programme relevant to a particular subject, phase and/or grade
	Explicit content knowledge input and reflection on knowledge taught and field trip	Enabled them to share values	Change-oriented learning

Participants learned new concepts on the water topic as they identified water concepts in the Social Sciences curriculum documents (see section 6.3.3.2, Day 3). Conceptual understating of content knowledge was enhanced during the water purification field trip. The field trip to the water purification plant and the botanical garden also created opportunities for participants to situate their knowledge and learning (see section 6.3.3.2, day 2). The trip also influenced some of the participants to adopt new attitudes regarding water use. They used their experiences of the field trip to plan on how they would support teachers to teach about water purification thus enhancing their teaching and/or facilitation methods.

A discussion about an article on transformative learning enabled participants to recognise they had a new role to play in their districts (see section 6.3.3.2, Day 3). Participants learned about ESD teaching methods by engaging with the Fundisa for Change methods book. Participants were given an opportunity to share struggles they had with assessment (see section 6.3.3.2, Day 4) which created an opportunity for share provincial and district systemic issues related to assessment. Their assessment practice was enhanced when they developed assessment task and had colleagues critique them (see section 6.3.3.2, Day 4). Feedback from peers made them realise that their assessment practices were not as good as they had thought – see section 6.3.3.2, Day 4) and they realised they needed to adapt their assessment practice.

Participants seem to have benefitted from the training through the mechanisms that were introduced into the training by facilitators. The context was also conducive to them achieving the outcomes that were observed.

The pre-course task (Appendix 16) given to participants assumes that participants understand the meaning of environmental content, which is not necessarily the case. One of the participants assumed that environmental content knowledge was different to the subject content knowledge with which they were expected to engage (see section 6.3.3.2, Day 1). It might work better if the concept of environmental content is discussed first so participants can make informed judgements on whether or not they have been engaging with this kind of content when supporting teachers with subject content knowledge.

Participants need to be assisted with completing the portfolio assessment tasks. It is not enough to explain the tasks and to do some of the assessment tasks during training sessions. The assessment of participants' work post training revealed that their work lacked depth (see section

6.3.3.3). Working closely with local Fundisa for Change partners might assist in providing on-site support for participants.

7.3.4 Site 4 CMO configuration (Western Cape)

The table below shows the mechanisms and the context that enabled the achievement of programme outcomes.

Table 7.6 CMO configuration for Site 4

Context (internal to Fundisa for Change programme)	Mechanisms		Outcomes (professional development course)
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: There were three partners facilitating the training (2 universities) Participants were familiar with the schooling system and the curriculum Participants invited by the Department of Basic Education Culture: Collaboration amongst facilitators and participants (group work activities and peer assessment) Agency: - Partners have flexibility to adapt training programme - Partners source external funding to support fieldwork activities and extra resources Relations: - Programme partners value collaboration	Redefining roles, introduction to new knowledge and resources on climate change Video clips Discussions On-course tasks Content knowledge presentations by facilitators Cellphones	Discussions, reflections and activities enabled participants to learn new content knowledge	Participants have an improved understanding of environment and sustainability subject knowledge in a specific subject and phase (Climate Change in grades 10 - 12).
	Introduced to ESD teaching strategies On-course tasks Teaching method resource Modelling of teaching strategies Presentation and video clip on assessment Critique of assessment task	Discussions to influence participants to reflect on current practice	Participants are able to use appropriate teaching methods and assessment approaches for specific subject knowledge, skills and values.
	On course task engaging with climate change concepts	Group discussions enabled other to understand other perspectives on the topic	Participants are able to relate subject specific environment and sustainability content knowledge to broader issues and contexts.
	Developing capacity of participants to be able to perform redefined duties and responsibilities, as they plan and implement and teach lessons Group task to plan series of lesson	Perceived relevance of portfolio of evidence tasks to their everyday work Discussing lesson planning	Participants are able to design, develop, implement and reflectively review a learning programme

- Partners commit to implement training with colleagues - Some of the participants already had a professional relationship as they belonged to the same district and professional learning community			relevant to a particular subject, phase and/or grade.
	Explicit discussion on personal choices	Enabled them to share values	Change-oriented learning

Participants came to the training expecting to learn as evidenced by the reasons they gave for attending the workshop (see section 6.3.4.1, context). Already their assumption was that they would learn and this would create a conducive atmosphere for learning to happen. Video clips and discussions after the video clips enabled participants to learn new concepts and knowledge from each other. Reflecting on the experience of the facilitation enabled participants to think of their own teaching methods and to think about adapting their practice (see section 6.3.4.2, Day 1).

To enable participants to achieve situated knowledge and learning, an activity required them to make links between climate change concepts and the content in the curriculum. Discussions among the groups enabled participants to learn from each other. They understood and were able to identify conceptual progression by discussing it with colleagues when they worked with curriculum documents.

Personal sustainability lifestyle choices were explicitly discussed so participants had an opportunity to clarify their values and decide to make better choices if they wanted to (see section 6.3.4.2, Day 1). Teaching methods were introduced through an activity. Sharing challenges and best practices enabled participants to reflect on current practice and decide on how they may want to modify it (see section 6.3.4.2, Day 2).

Group discussions on lesson planning enabled participants to learn from each other. This was also one of the portfolio of assessment task. Achievement of this aim would be assessed in the portfolio.

The mechanisms brought into the sessions enabled the achievement of programme aims as the context was conducive for learning to happen. Participants were experienced Geography teachers and the facilitators were knowledgeable about the subject and the climate change content which was the focus of the training. Facilitators were therefore able to mediate activities in ways that would provoke participants to reflect on their practice and to share their experiences.

Fieldwork is one of the skills learners are expected to develop in the study of Geography. The Fundisa for Change training programme, in its endeavour to assist participants with the teaching of Geography, should model for participants how to do fieldwork. One of the Fundisa for Change training outcomes is to support participants to use appropriate teaching methods specific for the subject that participants teach. This was not fully supported during the training,

in relation to fieldwork, and participants commented on this (see section 6.3.4.3) and suggested that there was a need to have a day for practical work.

7.3.5 Site 5 CMO configuration (KwaZulu-Natal)

A CMO configuration tabulated below was developed for Site 5 based on what was observed during the training session.

Table 7.7 CMO configuration for Site 5

Context (internal to Fundisa for Change programme)	Mechanisms		Outcomes (professional development course)
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: There were two partners facilitating the training (same university) Participants were familiar with the schooling system and the curriculum Majority of the participants (58%) were not the target group Participants invited by the Department of Environmental Affairs Culture: Collaboration amongst facilitators and participants (group work activities and peer assessment) Agency: - Partners have flexibility to adapt training programme - Partners source external funding to support fieldwork activities and extra resources	Redefining roles, Introduction to new knowledge and resources on climate change On-course tasks and assessments Content knowledge presentations by facilitators	Discussions, questions, reflections and activities enabled participants to learn new content knowledge	Participants have an improved understanding of environment and sustainability subject knowledge in a specific subject and phase (Climate Change in grade 7 – 9).
	Introduced to ESD teaching strategies through modelling Presentation on assessment On course task to set assessment task	Discussions on teaching practice and assessment to influence participants to reflect on current practice	Participants are able to use appropriate teaching methods and assessment approaches for specific subject knowledge, skills and values.
	Discussion on climate change as a priority in the country	Group discussions enabled other to understand other perspectives on the topic	Participants are able to relate subject specific environment and sustainability content knowledge to broader issues and contexts.
	Developing capacity of participants to be able to perform redefined duties and responsibilities, as they plan and share lesson plan on climate change Peer assessment of lesson plan	Perceived relevance of portfolio of evidence tasks to their everyday work Discussing lesson planning Critique lesson plan	Participants are able to design, develop, implement and reflectively review a learning programme relevant to a particular subject, phase and/or grade
	Explicit discussion on sustainable lifestyles choices	Enabled them to share values Take action in schools	Change-oriented learning

Relations: • Programme partners value collaboration • Partners commit to implement training with colleagues • Only a few participants already knew each other	Resources on sustainable lifestyle choices Task on how they would encourage sustainable lifestyle at school Assessed on-course task Portfolio assessment task		

Content knowledge was learned through presentations and participants asked questions to assess understanding of content knowledge. Teaching methodology was modelled that explicitly taught. Participants were expected to work with learners to take action in school on climate change adaptation and mitigation as a portfolio task (see Figure 6.44). A critique of group lesson plans enabled participants to think about how they could improve their lesson plans (see section 3.5.2, Day 3).

There was a communication breakdown between Fundisa for Change implementing partners and the Department of Basic Education. Participants who came to the training were not all Natural Sciences teachers in the Senior Phase, which was the target group. As a result, some of the participants felt that the content that was covered during the training was complex and irrelevant for them and they did not see how they would implement knowledge gained in their work environments (see section 6.3.5.3). During training, group activities were dominated by the target group as other teachers were not familiar with the concepts because they did not teach the subject and/or the phase.

When facilitators planned the training they planned it for a specific target group. Having participants who were not the target group affected the implementation of the portfolio assessment tasks. Most of the participants (68%) did not submit the portfolio task. Programme outcomes were achieved by a few of the target group (21%) judging by those who received certificates at the end of the training.

The next section provides a refined CMO configuration for the Fundisa for Change professional development component of the programme.

7.4 Refined CMO configuration of the Fundisa for Change professional development course

According to Pawson and Tilley (1997), programmes are implemented in order to bring about change which is a process or reasoning that influences participants to make different choices. They acknowledge that this process involves negotiation, persuasion and a battle of wills as participants' choice-making powers either increase or decrease in light of what the programme offers. Pawson and Tilley argued that the existence and success of programmes depends on the participants whom the programme seeks to change. It is therefore important to surface the liabilities, powers, and potentialities of programmes and those of programme beneficiaries. The core of their argument is that programmes do not work but that programme beneficiaries co-

operate and choose to make programmes work. Programmes therefore work through participants' liabilities, powers and potentialities. People's choices are the conditions for social change and most people attend programmes voluntarily due to a perceived value and benefits of a programme: this was evident in the reasons that Fundisa for Change participants gave for attending the Fundisa for Change training (see sections 6.3.2.1; 6.3.3.1; 6.3.4.1 and 6.3.5.1). Participants may be changed by the experience of a programme if it resonates with what they value. Although programmes may offer opportunities for change, participants' choices are what enable or hinder change in social programmes (ibid.). This reinforces literature discussed in Chapter Two on professional development that states that teachers need to be encouraged to be actively involved during teacher professional development so that the support they receive also gives them opportunities to challenge their current practice and to improve and/or change it (Simmie, 2007; Webster-Wright, 2009; Herbert & Rainford, 2013 and Winch et al., 2015) (see section 3.2).

Additionally, participants are encouraged to learn when they see relevance in what the training is providing to what they do and need in their work (Clarke & Hollingsworth, 2002; Dunne, 2002; Wayne et al., 2008; Hunzicker, 2011 & Marrongelle, Sztajn & Smith, 2013) (see section 3.2). Judging from participant responses post training, the Fundisa for Change training programme provided what participants required in their work environments (see Tables 6.3, 6.6, 6.9, 6.12 and 6.15).

A cross-analysis of the five sites was done to develop a refined CMO configuration as the initial CMO configuration (see Table 7.1) had not been tested. According to Yin (2009, p.156), "cross-case analysis is the process of comparing and contrasting across case study analysis". This was done to determine what was common at all the sites which was an indicator of the necessary conditions for achievement of training objectives.

The table below (Table 7.8) provides a refined Fundisa for Change professional development CMO configuration.

Table 7.8 Refined CMO configuration for Fundisa for Change professional development course

Context (internal to Fundisa for Change programme)	Mechanisms		Outcomes (professional development course)
	Resources (material, cognitive, social & emotional)	Reasoning	
Structure: - Multiple partners facilitating training from diverse sectors (environment, government and universities) - Participants and facilitators familiar with the schooling system and the curriculum - Participants were target group in terms of their work and content covered - Department of Basic Education involved in choosing theme of training and participants to be trained Culture: - Facilitators value collaboration in implementing training - Participants value collaboration, learning with and from each other (group work activities and peer assessment)	Redefining roles, Introduction to new knowledge and resources On-course tasks and assessments Content knowledge presentations by facilitators	Discussions, questions, reflections and how activities were mediated enabled participants to learn new content knowledge and to see value and relevance to what they currently do and are expected to do	Participants have an improved understanding of environment and sustainability subject knowledge in a specific subject and phase.
	Introduced to ESD teaching strategies through modelling Teaching method resource book Presentation on assessment On course task to set assessment task Fieldwork and hands-on activities	Discussions on teaching practice and assessment to influence participants to reflect on current practice Modelled teaching strategies encouraged reflection on current practice and motivated adoption of new teaching strategies Critique of assessment practice enabled reflection and opportunities for change of assessment of practice	Participants are able to use appropriate teaching methods and assessment approaches for specific subject knowledge, skills and values.
	Contextualising training content to local environment	Group discussions on topic and its relevance in everyday life and in the curriculum enabled participants to understand other perspectives on the topic	Participants are able to relate subject specific environment and sustainability content knowledge to broader

Agency: - Facilitators have flexibility to use own expertise to adapt training programme - Participants attend voluntarily and actively participate Relations: - Facilitators commit to implement training with colleagues - Participants belong to same professional learning community			issues and contexts.
	Developing capacity of participants to be able to perform redefined duties and responsibilities, as they plan to implement at work Peer assessment	Perceived relevance of on-course activities and portfolio of evidence tasks to their everyday work	Participants are able to design, develop, implement and reflectively review a learning programme relevant to a particular subject, phase and/or grade.
	Fieldwork and hands-on activities	Discussions and reflections on personal values and choices	Change-oriented learning

There were specific factors which were important features of the implementation process across all the five sites where the Fundisa for Change training programme was implemented. The context internal to the Fundisa for Change training programme and mechanisms that enabled achievement of programme aims.

A raised profile of the Fundisa for Change programme through the launch of the Fundisa for Change training materials (see section 5.6.1.1) led to influential Fundisa for Change stakeholders and/or sponsors to promote the sustainability of the programme through providing ongoing financial support for a national implementation of the training component of the programme. Additionally, appointing a designated co-ordinator who provided support and organised Training of Trainer workshops enabled facilitators to have time to plan how they would collaboratively implement the training in their provinces (see section 5.6.1.2). Moreover, facilitators have the freedom to adapt the training based on context (see section 5.6.1.1).

The facilitators had experience in environmental education and in supporting teachers and therefore were familiar with the schooling system, the curriculum and environmental education (see sections 6.3.1.1, 6.3.4.1 and 6.3.5.1). Participants indicated on their feedback of the training that facilitators were well-prepared and knowledgeable (see Tables 6.5; 6.8; 6.11 and 6.14). Some of the facilitators were also co-authors of the Fundisa for Change training materials.

The Fundisa for Change training programme is building on and integrating the programme within existing national policies and frameworks, supporting participants to engage with environment and sustainability concepts already integrated in the national school curriculum (see Appendix 1). This made it possible for the programme to receive approval from the Department of Basic Education and subsidised funding at provincial level (see Appendix 26). This also meant that participants would see the relevance of the programme to their everyday work. Participants attended the training anticipating they would learn something that would improve their practice as discussed in section 7.4. Literature discussed in Chapter Three (see section 3.2) indicated that teachers find relevance in teacher professional activities that are linked to their professional work since they gain knowledge they need in their profession (Dunne, 2002; Marrongelle et al., 2013). This was also confirmed when participants completed the questionnaire giving feedback on the relevance of the programme (see Tables 6.3; 6.6; 6.9; 6.12 and 6.15).

The involvement of the Department of Basic Education at provincial level ensured that the target group attended the training. Office-based Department of Basic Education district officials at provincial level decided on which curriculum content needed to be covered during the training and selected the participants based on their district needs. In Sites 1 to 4 the immediate supervisors of the participants attended the training sessions, which legitimises the relevance of the programme for the participants. Two key Fundisa for Change partners commented on the importance of having district officials supporting the training (see section 5.6.2) to also unlock provincial funding for the programme.

Apart from the internal programme context, material, cognitive, social and emotional mechanisms were introduced into the sites. Material resources were brought into all the training sites, for example readings, books and handouts, sites for fieldwork and equipment for activities (see Chapter Six). Participants were expected to completed individual and group work on-course tasks and received feedback from peers and facilitators. Facilitators at all five sites explicitly engaged with content knowledge, teaching methods and assessment the three components of the Fundisa for Change training course (see Figure 5.5). Researchers in teacher professional development argue that teachers' practice might be improved if professional development programmes focus on subject content teaching and assessment strategies (Clarke & Hollingsworth, 2002; Wayne et al., 2008; Hunzicker, 2011).

Participants in all the sites actively participated during the training through asking questions, discussions, reflections, sharing own experiences and giving feedback to colleagues (see Chapter Six). In all the sites participants indicated that they would be able to use resources received and ideas gained in the training to improve their practice (see Tables 6.3; 6.6; 6.9; 6.12 and 6.15). Although participants indicated in the training evaluation questionnaires they had learned, they still wanted additional support to be able to implement in their work places. In Site 1 (50%), 2 (88%) 4 (78%) and 5 (78%), participants indicated that they needed more resource materials (see sections 6.1.1.3; 6.3.2.3; 6.3.4.3 and 6.3.5.3). In site 3 most participants (60%) wanted to keep in touch with a professional learning community (see section 6.3.3.3). Other support that was needed in varying degrees across the sites was support for the Department of Basic Education and from colleagues. There was a recognition that there were still factors and a context outside of the Fundisa for Change programme that could either enhance or constrain what participants could implement from what they learned during the training. Social programmes are not research laboratories, and as such they may be influenced

by forces and events outside their control (Rossi et al., 2004). Hence it was important to identify the wider infrastructural systems into which the Fundisa for Change programme was introduced.

Moreover, all social programmes occur in open systems where a number of mechanisms are operating. Collier (1994), drawing on the work of Bhaskar, explained that in open systems "...a multiplicity of mechanisms is operating, conjointly bringing about a series of events, which would not have been brought about by any proper subset of those mechanisms" (pp. 43-44). He further stated that objects have powers that are not exercised and if exercised may not be realised and if realised, may either be observed or not observed. He added that generative mechanisms only operate when they have been triggered. He further argued that in open systems, triggered mechanisms operate in conjunction with other mechanisms resulting in complex outcomes. Reality, according to Danermark et al. (2002), consists of observable events produced by mechanisms that are often not directly visible. To acquire knowledge thus requires that the focus be on the underlying mechanisms that produce the observable events. Although in this chapter, materials, cognitive, social and emotional mechanisms were identified, and participants' reasoning deduced from observation data and questionnaires, it was not easy to attribute a single mechanism as the only causal factor for the achievement of programme outcomes.

In the case of the SADC REEP (see Chapter Two, Table 2.4), for example, environmental education and education for sustainable development is supported for sustainable living through building the capacity of participants in 15 SADC member states. The evaluation of the programme showed that success was enabled by a multiple programme mechanisms, for example, building communities of practice, designing change projects, responding to diversity, regional integration and multiple-stakeholder social learning (SADC REEP, 2012). On their own, each of these mechanisms might not have led to the success that the SADC REEP programme achieved.

It was evident from data presented in Chapters Five and Six that programme stakeholders influence programme outcomes. Assumptions that programme conceptualisers have about how programmes will work, determines the systems they will put in place to ensure a programme will achieve set outcomes. Programme implementers have assumptions that influence their reasoning in what they bring and the mechanisms that are introduced in the implementation of

a programme. Participants ultimately decide how they want the programme to work for them based on what the programme offered to influence and change current practice.

A realist evaluation of the programme enabled a surfacing of those assumptions and mechanisms and the context under which the mechanisms would be activated. The surfacing is at the core of the realist approach to evaluation as stated below by Pawson and Tilley (2001):

The realistic explanation of programs involves an understanding of their mechanisms, contexts and outcomes, and so requires asking questions about the reasoning and resources of those involved in the initiative, the social and cultural conditions necessary to sustain change, and the extent to which one behavioural regularity is exchanged for another (p.154).

7.5 Conclusion

This chapter used a CMO configuration to surface the initial programme theory of the Fundisa for Change's training programme as well as CMO configurations from five sites where the initial programme theory was tested. A refined CMO configuration for the Fundisa for Change programme theory based on what was observed at the five sites was also generated.

Although programme objectives were achieved, the extent to which they were achieved by individual participants was not determined. The achievement of programme outcomes was determined for the group at each site. Factors that enabled the achievement of the outcomes were similar across the sites but there were also different mechanisms that were introduced in some sites. Post-training reflections also indicated that participants needed more support to implement what they had learned at their work places and in some cases even to complete portfolio tasks. The next chapter provides a summary of the study and the findings as well as recommendations for conceptualisation and evaluation of professional development programmes.

CHAPTER 8: CONCLUSION AND RECOMMENDATIONS

8.1 Summary of the study

There is a rationale in how programmes are conceptualised and implemented. The rationale determines to some extent the programme outcomes. Programme rationale in some cases, as discussed in Chapter Two, is hidden from programme stakeholders; that is, it is not explicit but rather implied in programme objectives.

The study sought to use a theory-based approach to evaluating a professional development programme aimed at strengthening environment and sustainability education. The study also came when world nations were transiting from millennium development goals to sustainable development goals. The study was introduced in a South African context where environment and sustainability education is an integral part of the national school curriculum. In spite of the integration of environment and sustainability in the curriculum, grade 12 examination reports indicate that learners struggle to engage with concepts related to environment and sustainability (see Chapter One). Two projects, the *Learning for Sustainability* and *NEEP-GET* were initiated in South Africa to support teachers to engage with environment and sustainability content knowledge in their classrooms. Challenges were experienced when teachers were introduced to environment and sustainability content knowledge and processes. The challenges ranged from participants' negative perspectives of environmental learning, limited materials resources for environmental learning, timing of training, and lack of adequate support for environmental learning in schools at the end of project initiatives (discussed in Chapter Three).

As discussed in Chapter One, research in teacher education has showed that professional development programmes had limited impact in improving the quality of teaching and learning in South African schools. This highlighted the importance of evaluating professional development programmes in ways that would provide insights into how and why programmes work. The study argued for a theory-based approach to evaluating professional development programmes as this approach promised to enable an in-depth look into assumptions held by programme stakeholders, that is, programme conceptualisers, implementers and beneficiaries as these assumptions influence how programmes are designed, delivered and embraced by beneficiaries.

The study used the theory of change and realist approach to evaluating the Fundisa for Change programme, a national programme aimed at enhancing transformative environmental learning through teacher education.

The theory of change and realist approach together focused on four key elements that Borko (2004) argued are key to understanding professional development programmes. These are: the professional development programme, participants who are the beneficiaries of the programme, the programme facilitators, and the context in which the professional development occurs.

Although the theory of change is comprised of an implementation theory and a programme theory, it tends to foreground programme implementation and the theory that underpins it. The theory of change approach was therefore used to surface the Fundisa for Change's implementation theory. The framework considers steps and resources needed to achieve expected change. Data to surface the programmes' implementation theory was generated through document analysis and interviews and is presented in Chapter Five.

The realist evaluation framework focuses on for whom the programme works and under what circumstances. The framework explicitly uncovers a programme theory by exploring the interaction between programme contexts, mechanisms and outcomes using the context, mechanism and outcome configuration (CMO). The realist approach was used to identify the mechanisms that the programme offered participants in a particular context to influence them in ways that would lead to achievement of programme outcomes. An initial programme theory and a refined programme theory for the Fundisa for Change programme is presented in Chapter 7 (see Tables 7.2 & 7.8). Observation data used to generate the initial and refined programme theory for Fundisa for Change is presented in Chapter 6. Analysis of participants' questionnaires was also used to determine participants' perception of programme outcomes.

8.2 Summary of findings

The main objective of the capacity development component of the Fundisa for Change teacher education programme is to support teachers and subject education specialists to engage with environment and sustainability concepts specified in the national school curriculum. Key findings summarised below provide insights into assumptions that were embedded in the conceptualisation and implementation of the Fundisa for Change training programme.

The aim of the study was to surface the theory of change that shaped the conceptualisation and implementation of the Fundisa for Change training programme. Findings below summarises the Fundisa for Change implementation and programme theory discussed in Chapter Five, Six and Seven.

8.2.1 Fundisa for Change implementation theory

The conceptualisers of the Fundisa for Change training programme had assumptions about programme beneficiaries. These assumptions influenced how the programme was conceptualised and implemented. The assumption was that participants had inadequate environment and sustainability content knowledge to strengthen the teaching and learning of environment and sustainability content knowledge specified in the national school curriculum. The implementation theory was that in order to make systemic impact, collaboration between stakeholders involved in teacher professional development was imperative (see section 5.2 & 5.3).

A partnership model for professional development was viewed as important for capitalising on available expertise and resources. The Fundisa for Change partners brought different resources to achieve training programme outcomes. Resources were funding, time, skills and knowledge. Fundisa for Change partners from different sectors collaborated in developing the training programme outcomes, co-authoring training resource materials and facilitating the training of programme participants (see sections 5.3 and 5.6).

Additionally, the Fundisa for Change stakeholders recognised that they needed to get buy-in from the Department of Basic Education for access to the programme's target group. The Department of Basic Education has the mandate of supporting curriculum delivery in the schooling system. The programme stakeholders therefore aligned the training programme objectives with the needs of the target group. This was achieved by analysing the national school curriculum to identify the environment and sustainability content knowledge specified in the curriculum. Results from the analysis were used to develop training programme materials that expanded content knowledge specified in the curriculum (see section 5.6.1.1). A partnership protocol was established to provide a guide on the implementation of the programme so facilitators would work within the training course framework (see section 5.6.1.1).

8.2.2 Fundisa for Change programme theory

8.2.2.1 Context

There were structural, cultural, agential and relational contexts that were conducive for the achievement of programme outcomes and the collaborative nature of the programme. Fundisa for Change partners are from diverse sectors and worked together to develop training materials,

plan and facilitate training. Partners' had knowledge of the national school curriculum and experience in environmental education. This experience and knowledge enabled them to adapt the training to meet the needs of the participants. In adapting the programme, facilitators maintained the course structure of the training framework with a focus on subject content knowledge, teaching practice and assessment practice (see Chapter Six).

The Department of Basic Education was involved in choosing the topic to be engaged with during training and in selecting programme participants. This ensured that the training would be relevant to the target group. Additionally, participants in four of the sites were from the same district and therefore were used to working together in their professional contexts. Participants attended the training voluntarily, expected to learn and actively participated during training (see chapter 6).

8.2.2.2 Mechanisms

Supportive mechanisms were materials, and cognitive, social and emotional support. Facilitators provided participants with resources, engaged them cognitively through presentations and on-course tasks. Content shared with participants was contextualised and aligned with the curriculum that participants were expected to implement. Relevance of the topic shared with participants enabled participants to see the value of the training in terms of supporting them with the professional work they do.

Varied facilitation strategies catered for participants' diverse learning styles. Although implementation of the short course training varied from context to context in the five sites, participants were given tangible knowledge and skills they could apply in their work contexts.

Participants also had opportunities to work together in groups to share experiences and give each other feedback. Participants were further given time to reflect on their values and perspectives as well as to demonstrate their learning through presentations.

Discussions, critique of and reflection on current practice enabled participants to redefine their roles in relation to environmental teaching and learning. They considered how they would do things differently in light of what they had learned during the training (see Table 7.8).

The Department of Basic Education and the Department of Higher Education and Training (2011b) seem to support the importance of creating spaces for professional to reflect on their practice, share experiences, critique and receive critique from colleagues (as was the case in

the Fundisa for Change training programme) as evident in the extract below;

Teacher development works well when teachers fully engage in learning and actively direct which learning opportunities they wish to engage in and when; but it works even better when they are provided with positive reinforcement, a range of alternative visions and new opportunities, when they are able to interact with other professionals, including outside experts who can both acknowledge teachers' best practices and criticise their misconceptions, and when all these interventions are consistent with the broader policy environment. (p. 76)

The value of engaging with others to change current practice is supported by Danermark et al., (2002),

As human beings, 'knowing' and reflecting subjects, we continually evaluate the experiences we are making, which may lead to changing our actions and practices in various respects. Since we have language, this can happen just by our partaking in and discussing other people's experiences and notions. (p. 35)

Participants had an opportunity to share experiences that enabled them to reflect on current practice.

8.2.2.3 Outcomes

The training component of the Fundisa for Change training programme focuses on developing participants' subject content knowledge in relation to environment and sustainability content knowledge and the teaching and assessment of that knowledge. The focus was translated into programme objectives that participants need to demonstrate. Participants demonstrated achievement of programme outcomes in various ways (see Chapter 6).

Facilitators assessed achievement of programme outcomes through question and answer method during training. Participants completed on-course tasks which they either submitted or presented for feedback from either facilitators and/or colleagues. During reflections and discussions, participants shared what and how they had learned and what changes they would make in their professional practice. Participants also completed a questionnaire at the end of the training where they rated what they would be able to do in their work contexts as a result of what they had learned during the training. Additionally, participants submitted a portfolio of evidence which was assessed by facilitators (see Appendices 16, 19, 25 and 30).

An additional outcome that was achieved by participants, although not made explicit in the training objectives, was change-oriented learning. How on-course tasks were mediated challenged participants to think deeply about the values they hold, and how they relate to their actions and choices (Rosenberg et al., 2008, p.21). Participants shared how they would do things differently in their personal lives demonstrating how what is valued influences actions (see section 6.3.1.1, Day 3). Participants shared what and how they learned; this created opportunities for transformative learning which is significant for a programme like Fundisa for Change that is aimed at enhancing transformative environmental learning through teacher education (see Section 5.2 & Figure 5.1). The Fundisa for Change programme seems to have responded to the 1998 UNESCO call as it has addressed most of the recommendations (see 3.4.2).

8.3 Implications and recommendations for teacher professional development

Programme success can be achieved if what needs to be changed is identified and steps to address it are clearly defined. In the Fundisa for Change case, research on environmental education in the schooling system informed programme stakeholders on the gaps in the system, for example, lack of adequate environment and sustainability content knowledge and insufficient skills to teach and assess that content as well as insufficient resources for teaching the content. The critical components of what is at the core of a professional development programme must be made explicit to all programme stakeholders. This will enable a flexible adaptation and contextualisation of the programme in diverse contexts. In the case of the capacity building component of the Fundisa for Change programme, stakeholders need to know what makes the short courses distinctive, that is, makes them Fundisa for Change short courses. From the analysis of the Fundisa for Change documents and what was observed at all the sites, what is core to the short courses is the engagement with environment and sustainability content knowledge, how the content can be taught and assessed.

Moreover, programme implementers need to share how they have implemented and adapted the programme to address local needs. How programme mechanisms are enacted in the various contexts needs to be shared and reflected upon. Any adaptation of the short course training in different contexts needs to be explained and justified. This will lead to an accumulation of knowledge about a programme's theory of change and how it needs to be refined for future training in diverse contexts.

There were quite a few mechanisms that enabled participants to reflect on their practice and to acquire new knowledge and skills and new attitudes toward the environment (see Table 7.8). Outcomes for the groups at each site were similar. It needs to be recognised that programmes will have multiple outcomes because multiple mechanisms are fired which have a different effect on different programme participants in different situations due to multiple contexts. Figure 8.1 below shows a visual representation of the CMO configuration.

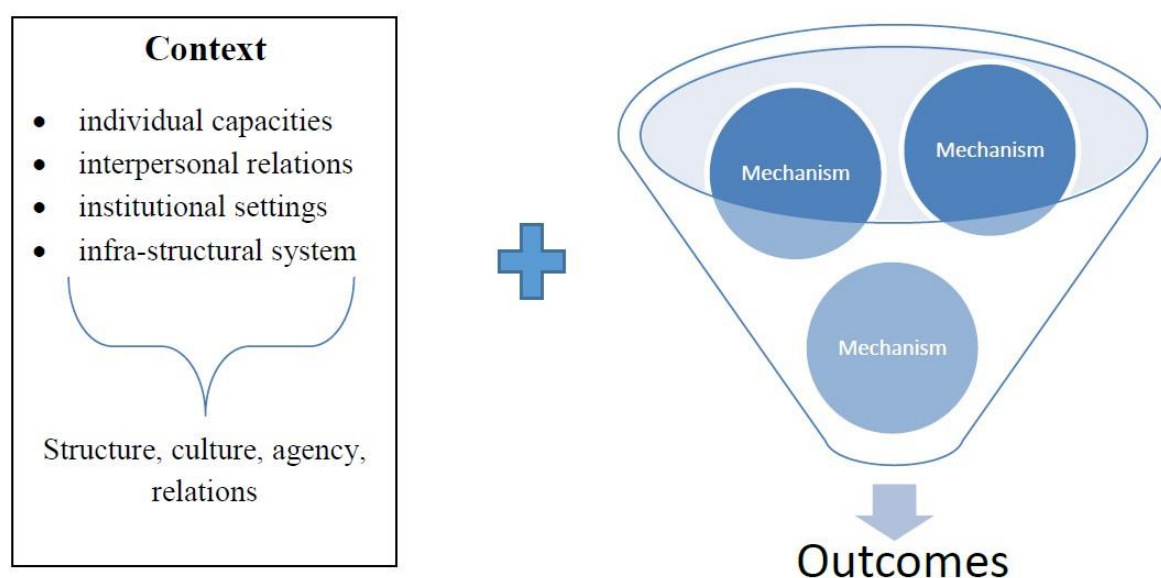


Figure 8.1 CMO configuration

“There will always be contextual variation within and between programmes, a corresponding variation in the effectiveness of causal mechanisms triggered, and a consequential variation in patterns of outcomes” (Pawson & Tilley, 1997, p. 77), therefore professional development programmes need to provide support to participants during and post programme delivery.

Although a programme has a structure and pre-determined objectives, it must be flexible enough to take into account the context and needs of the participants as each context has its own enabling and constraining factors that have an influence on programme outcomes for programme participants. When participants attend training they should share their reasons for attending and what they hope to gain from the training. These need to be revisited when the training ends to see to what extent the training met participant expectations and needs. Additionally, participants should be challenged to think critically about their roles and whether or not their capacity matches the roles and responsibility of their work contexts.

Programme conceptualisers and implementers need to provide participants with knowledge resources they could use to acquire knowledge content required. The Fundisa for Change programme developed training materials that were shared with participants but additional resources were brought by facilitators during training. The materials were appreciated by participants as some indicated that they struggled to get access to good quality resources. Additionally, facilitators need to model the teaching strategies and assessment skills that they want participants to acquire. This allows participants to see how the strategies work in practice and it gives them an opportunity to reflect on how the methods modelled and assessment tasks can be used in their own contexts.

In teacher professional development, training should be subject and phase specific. This will increase chances of the programme being applied by participants in their work contexts. Professional development programmes have a better chance of being successful when they resonate with what professionals need to do immediately in their work contexts.

According to Sorinola (2014) participants may not always be aware of their lack of capacity in relation to their work and even of the benefits of professional development programmes. Even so participants can change ‘as an unintentional result of new experiences’ (Danermark et al., 2002, p.68). Therefore, programmes need to make explicit the relevance and benefits of the programme to participants from the onset. The Fundisa for Change programme provides an orientation of the programme to participants to share the history and context of why the programme was established.

Change envisaged by teacher professional development programmes needs to be supported by education policies if the change in professionals is to be embedded and sustained. The establishment of the Fundisa for Change programme drew on a number of policies (see section 5.2) which made it relevant in teacher education and in the schooling sector. Programme stakeholders should position the programme in policy context in order to facilitate participant buy-in. To support this, the Fundisa for Change programme analysed the school curriculum to identify the content knowledge that teachers need to have and produced materials that would support the content, teaching and assessment of that content. How participants and facilitators understand policy documents is also important as different policy interpretations may lead to different policy enactments.

Programme stakeholders need to be aware that even though they may use the realist CMO configuration to develop programmes that consider contextual factors and mechanisms to achieve programme outcomes, change will depend on the choices that programme participants make from opportunities provided by the programme. Individuals have the ability to reproduce or change society ‘by virtue of conscious and intentional action’ (Danermark et al., 2002, p. 186). Additionally, Dobson et al. (n.d), argued that participants’ practice may change when they attend a programme but only when they adopt what the programme brings and see value in it. The programme works for participants when they realise why a change in current practice is necessary. There is no blueprint for professional development; participants will choose to attend a programme, learn from it and apply it or make different choices based on their circumstances (Sorinola, 2014).

It is important for governments, funders, accrediting bodies and professional bodies to support teacher professional development programmes and to provide the necessary funding and resources required to implement those programmes. The Fundisa for Change programme required catalytic funding to pilot, and sustained funding for the national rollout of the programme and this was made possible through the support of the Fundisa for Change partners. Without the funding support the programme could not be offered. Professional development programmes need to be institutionalised within professional development directorates so that funding can be made available for the delivery of the programmes on a more sustainable basis.

8.4 Implications and recommendations for programme evaluation

Programme conceptualisers and implementers always have an underlying theory about how things should work when setting out to develop and implement a programme (Porter, 2015). These theories are what need to be surfaced during programme evaluation. The importance of a programme specifying a theory of change is that it enables programme stakeholders to use data from an evaluation of a programme to improve programme conceptualisation and its implementation. In order to develop transferable and cumulative knowledge about professional development programmes, both a programme’s implementation theory and programme theory need to be made explicit. Programmes should provide knowledge that will make new kinds of praxis possible in order to change the world rather than to only interpret it (Dean, Joseph, Roberts & Wight, 2006). Findings should promote reflection on practice and stimulate critical thinking on the conceptualisation, implementation and evaluation of professional development programmes.

Programme mechanisms are consciously introduced by programme designers and implementers with the aim of altering the interpretations and actions of participants. Understanding resources that are introduced into pre-existing contexts with the aim of influencing participants' reasoning, allows evaluators to explain outcomes (Dalkin et al., 2015).

According to De Souza (2013), evaluators need to determine mechanisms currently operating in a context that have a tendency of reproducing the existing social structures that may be problematic and which social programmes, when introduced, aim to change. Having gained some understanding of operating mechanisms gives insights into what programme input needs to be introduced. The programme input would aim to reconfigure or activate the existing contextual mechanisms differently so as to transform (rather than reproduce) the action context.

Programme evaluation should lead to an understanding of the mechanisms that translate intention into action as well as surface programme mechanisms and contextual factors that could lead to programme outcomes. The same mechanism can have different degrees of responses with participants. This does not necessarily mean the desired outcomes are not achieved but they are achieved at varying degrees by different participants. It is therefore critical to identify supportive mechanisms and contexts for various groups and individuals. The aim is to develop a body of theory about what works for whom in what conditions, in order to provide an organising framework which abstracts a particular set of conditions from a programme (in this case, Fundisa for Change), which can then be applied to new programmes, and the theory of change further developed. Through this process, a progressive understanding can be developed, and transferable knowledge achieved.

Moreover, the same programme may work in different ways in different contexts, therefore the construction of context-mechanism-outcome configurations generates propositions on what it is about the programme which works for whom in what circumstances (Pawson & Tilley, 1997) (see Chapter 7). Additionally, programme outcomes are at multiple levels and may have different timeframes. Programmes may have short-term, intermediate and long-term outcomes. How and when outcomes are achieved will depend on the mechanisms of change triggered by the programme in conducive conditions and how these mechanisms interact with existing social processes.

For programme evaluators, the evaluation process never ends. Pawson and Tilley (1997) argued that;

It is, or should be, in a state of perpetual motion up and down the ladder of abstraction/specification. The practitioner's efforts, by contrast, are likely to be much more finite and come, at least, to a temporary resting place in the process of specification. (p. 126)

Findings from programme evaluation are therefore acceptable in the absence of other evidence to contradict them. It is when programmes continue to be evaluated that new evidence may emerge that leads to a refinement of programme theory of change and an accumulation of knowledge about programmes. Pawson and Tilley (1997) also added that

Evaluation and social science generally only ever come to temporary resting places, and that 'findings' take the form of specifying those 'regularities' or 'outcome patterns' which the present state of our understanding of 'mechanisms' and 'contexts' is able to sustain (p. 86).

8.5 Limitations and further research

I did not observe participants implementing the knowledge and skills acquired during the training into their work contexts. I could to some extent infer from the lesson plans and workshop plans shared during training and produced for the portfolio of evidence that some of the participants would be able to successfully transfer their learning. Ideas shared during training on how participants would teach certain topics or conduct fieldwork indicated how learning could be applied in work contexts. Moreover, participants received feedback during the training on the plans they had developed which would have given them confidence to trial them in their districts. It was only in one site (KwaZulu-Natal) that a follow-up to the schools was done by facilitators to see how participants had implemented climate change mitigation and adaptation practices (see Chapter Six, Site 5).

In light of Evans' (2014) argument that professional learning is not necessarily immediately evident, the time frame for data generation shortly after the training to get participants to reflect further on the training and what they had managed to implement was short. The cognitive processes that occur in participants during programme implementation may take time to get to a point where programme developmental activities are assimilated into practice. Having said that, it is not easy to determine what timeframe would be appropriate to get feedback from

participants as timeframes may differ from for each participant based on their agency in the face of enabling and constraining factors in their work contexts. Hence programmes need to consider having short-term, intermediary and long-term programme outcomes.

Some of the data presented on outcomes achieved was derived from participants' perceptions of what they would be able to do after the training. For further research, it would be valuable to observe participants' changed practice or implementation of the knowledge acquired as opposed to only accepting their self-reported change and/or developed implementation plans. This would also allow opportunities to identify factors that constrain or enable implementation of skills learned. This would give programme conceptualisers and implementers insights into what programme stakeholders can include or introduce in their programmes during training to minimise the effect of constraining factors and to strengthen factors that enable application of skills learned by participants.

Participants themselves, who are beneficiaries of programmes, may also have their own theories about a programme which may be different to that of the conceptualisers and facilitators. People's ultimate concerns influence how they do things the way they do them or how they respond to programmes. Programme beneficiaries enter a programme at different levels of development and make choices based on their presumed needs. They will therefore make personal choices in terms of how they want to make a programme work for them and these also need to be interrogated. A study by Tshiningayamwe (2016) revealed that professional development programmes can enable professionals to expand their capabilities and provide what they value with regards to their professional work. It is therefore important to determine what professionals value and want to gain from attending professional development programmes.

There is a need to shed light on the cognitive process that occurs during individuals' professional development. This might be a key to understanding and explaining the disparity and variance in people's responses to professional development stimuli and cues that have the potential to lead to their professional development (Evans, 2014). It may not be easy to measure changes in people's way of thinking but the 'aha' moments may give insights into how to stimulate more of them in professional development programmes.

8.6 Conclusion

Although a theory-based approach to evaluation enables evaluators to not only answer whether a programme has worked or not but also why, it is important to identify contexts that condition the operation of programme theories. A theory of change which provides insights into a programme's implementation theory and programme theory contribute to accumulating theoretical knowledge on transferrable lessons about programmes' theories of change.

Programme outcomes for participants will vary based on their beliefs, personal concerns, degree of commitment in the face of structural hindrances. Additionally, they will vary with participants' readiness to avail themselves of enablements provided by programmes. Programmes should therefore respond adequately by addressing participants' subjectivities. Participants' personal liabilities and powers need to be acknowledged, in particular their power of reflexivity to think about themselves in relation to their contexts so that they are able to make programmes work for them (Archer, 2007). Teacher professional development programmes should help participants to do their job better and enable participants to meet the requirements of their roles and responsibilities.

In evaluating programmes, Borko's (2004) assertion that evaluators identify key elements that make up any professional development system is important. In evaluating the Fundisa for Change training programme I focused on:

- The Fundisa for Change teacher education programme and programme mechanisms (financial and human resources etc.),
- The capacity building component of the programme (training of participants),
- The participants who were the direct beneficiaries of the training,
- The facilitators who delivered the training and guided participants in acquiring new knowledge and practices, and
- The context in which the professional development was implemented (global, regional, national and provincial imperatives that influenced development and implementation of the programme).

An elaborated CMO configuration was used because context is critical to the success or failure of a programme. It was therefore important to define context in terms of structure, culture, agency and relations as these have the potential to activate programme mechanisms differently. Pawson and Tilley (1997) defined resources and reasons as mechanisms, for this study it was

important to disaggregate them to differentiate between a mechanism and context (Dalkin et al., 2015).

Assumptions that underpin a programme should be made explicit prior to its implementation because these assumptions will influence decisions that programme stakeholders make about how the programme will work and influence how a programme is implemented. Making the assumptions explicit early on will identify possible flaws and unrealistic expectations. Evaluating a programme that has not articulated assumptions upon which it is based is challenging (Morrow & Nkwake, 2016).

Even with an explicit theory of change, Danermark et al., (2002) argued that

... we will never be able to predict accurately concrete social events, for example exactly how people are going to act in a particular situation neither can we anticipate situations. This does not mean, however, that social scientific knowledge is useless for social planning. If we have knowledge of the mechanisms of social structures, we can identify the driving forces behind the events we are observing. Doing so we can also in a more qualified manner estimate the possibilities, deficiencies and limitations of the actions we plan. Without this kind of knowledge, the analysis of a phenomenon will always be superficial or even incorrect... (pp. 187-188)

This study aimed to understand and generate knowledge about a teacher professional development programme that aimed to strengthen environmental learning through teacher education. A theory-based approach to evaluation, combined with realist evaluation methodology was used as it promised to give in-depth insights into what and how programmes are structured, designed and work. Knowledge gained on how this programme was designed and worked is valuable to other professional development programmes and to environmental education programmes in particular. The evaluation approach chosen for the study was particularly valuable in surfacing the assumptions that underpinned the conceptualisation and implementation of the Fundisa for Change training programme. The study is relevant in teacher education as it provides a research methodology that enables programme evaluators to ask questions that could provide answers that can be used to improve design and implementation of professional development programmes.

Sayer (1992) claimed that:

[T]he point of all science, indeed all learning and reflection, is to change and develop our understandings and reduce illusion. This is not just an external and contingent sociological condition of learning but its constitutive force, which not only drives it but shapes its form. Without this universal necessary condition, none of the particular methodological and ethical norms of science and learning in general has any point. Learning, as the reduction of illusion and ignorance, can help to free us from domination by hitherto unacknowledged constraints, dogmas and falsehoods. (p. 252)

Research in social sciences should enable us to make sense of our world in order to make informed and rational changes (Huckle, 2004).

As discussed in Chapter Two, many earlier approaches used to evaluate environmental education programmes (see section 2.4.1 and Table 2.3) were more concerned with impact than on why programmes worked or not or how they worked differently for different beneficiaries, and were essentially ‘black-box’ evaluations. In general they lacked an explicit realist or ontological foundation, and were therefore not able to link the ontological dynamic of programmes to epistemological assumptions which are reflected in how programmes are designed. Making such a relation more explicit in this study, allowed this study to add knowledge on how evaluation of environmental programmes can be made more systematic through surfacing a programme theory and evaluating a programme using the surfaced programme theory via realist evaluation methodology, connecting the epistemology and ontology of programmes as they are conceptualised, designed, and implemented.

The history of environmental education evaluations in South Africa shows that evaluation approaches were implicitly working with a realist approach (see section 2.4.2 and Table 2.4), this study offers the first substantive professional learning evaluation that develops this approach **explicitly** using Theory of Change and Realist Evaluation in combination. This has not been done to date in environmental education research in South Africa. Additionally, the study offers insights into the professional learning of teachers grappling with new content and pedagogical content knowledges related to environment in the context of recent curriculum changes where the CAPS curriculum has come into focus. The study’s contribution is therefore both methodological as well as practical.

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APPENDICES

Appendix 1

Environment and sustainability content knowledge in CAPS, FET (grade 10 – 12)

Environment and sustainability	Content	Specific aim(s)	Purpose
Economics	- Environmental deterioration (problem, protecting the environment, approaches to sustainability, the global and local impact on South Africa) - Environmental Sustainability - state of the environment, measures to ensure sustainability, major international agreements (Rio de Janeiro and Johannesburg summits)		Study of how individuals, businesses, governments and other organisations within our society choose to use scarce resources to satisfy their numerous needs and wants in a manner that is efficient, equitable and sustainable, p. 8.
Life Sciences	Human Impact on the Environment: Current crises for human survival, problems to be solved within the next generation, p. 51.	- Lays the basis of further studies in science and prepares learners for active participation in a democratic society that values human rights and promotes acting responsibly towards the environment. - Helps learners to understand the contribution of science to social justice and societal development as well as the need for using scientific knowledge responsibly in the interest of	An awareness of what it means to be a responsible citizen in terms of the environment and life-style choices that they make, p 8.

		ourselves, society and the environment, p. 12.	
Geography	• Effect of development on the environment Using Resources (resources and economic development, exploitation and depletion of resources, concepts of sustainability and sustainable use of resources) • Urban Settlement Issues (how selected urban areas in South Africa are managing urban challenges, handling environmental, economic, and social justice concerns)	• Describing and explaining the dynamic interrelationship between the physical and human worlds; • Developing a commitment towards sustainable development; • Making and justifying informed decisions and judgements about social and environmental issues; • Foster a concern for the sustainable and fair use of resources for the benefit of all. p.8-9.	• In Physical Geography, we examine natural processes and features, including the atmosphere, landforms and ecosystems. In Human Geography, we investigate the activities and impact of people on Earth, p. 8.
Physical Sciences	• Explain how the building of dams affects the lives of the people and the ecology in the region, p. 60. • Exploiting the lithosphere or earth's crust - sustainable energy, our responsibility towards future generations, p. 95. • Old mining methods and the impact on the environment of such methods, p. 97	• Promotes knowledge and skills in scientific inquiry and problem solving; the construction and application of scientific and technological knowledge; an understanding of the nature of science and its relationships to technology, society and the environment, p. 8.	• Deals with society's need to understand how the physical environment works in order to benefit from it and responsibly care for it, p. 8.

The table is not comprehensive. Other content from the subjects chosen are not included. Other subjects are also not included.

Appendix 2

Correlation between SDGs and Fundisa for Change training modules

Sustainable Development Goals (SDGs)	Fundisa for Change modules
<u>SDG 3</u>: Good health & Well-being Suggested topics: • Healthy food & unhealthy food • Reduction of pollution and contamination of air water and soil • Road traffic accidents	<u>Life and Living</u>: grade R – 3 Units: • Healthy eating and Healthy body • Healthy habits and healthy environment (hygiene, taking care of the environment, understanding pollution) • Personal safety and healthy relationships (road safety)
<u>SDG 6</u>: Clean water and sanitation Suggested topics: • Water cycle and water distribution • Impacts of pollution • Water quality • Global water cycle and water distribution • Human right to water • Impacts of water pollution • Water scarcity and water use efficiency • Importance of water-related ecosystems • Waste water treatment & integrated water resource management • Water and sustainable development (water and food security, energy, climate change)	<u>Water</u>: grade 4-9 • The hydrological cycle or water cycle • Measuring your daily water use • Water pollution • Water supply is a closed system • Access to fresh water • Water, development and sustainability • Integrated Catchment Management • Water availability in South Africa <u>Water</u>: grade 10 - 12 • Water availability (quality & security) • Water resources and development • Impact of climate change on water, food and energy nexus • Action taking for water management
<u>SDG 7</u>: Affordable and clean energy • Different energy types (renewable energies) • Energy sufficiency and efficiency • Environmental impacts and issues of energy production, supply and usage	<u>Climate Change</u>: grade 7 – 12 • Energy and carbon dioxide • Energy exchange • Energy resource use and change • Responses to energy exchange and climate change
<u>SDG 13</u>: Climate Action • Greenhouse gases and their emission	<u>Climate Change</u>: grade 7 – 12 • Energy and carbon dioxide

• Climate change-related hazards • Prevention, mitigation and adaptation • Impacts of climate change on ecosystems	• Energy exchange • Energy resource use and change • Responses to energy exchange and climate change
<u>SDG 14: Life below Water</u> • The hydrosphere • Management and use of marine resources • Marine ecology • Oceans and laws • Ocean pollution • Cultural relationship to the sea	<u>Marine Biodiversity: grade 10 -12</u> • What is marine biodiversity • The roles of marine biodiversity • Causes of marine biodiversity loss and responses
<u>SDG 15: Life on Land</u> • Ecology • Threats to biodiversity • Ecosystem services • Restoration • Human connection with nature • Desertification, deforestation, and efforts to compact them • Dangers of extinction • Biodiversity and climate change	<u>Biodiversity: grade 10 -12</u> • What is biodiversity • The roles of biodiversity • Causes of biodiversity loss • Emerging human responses to biodiversity loss

Appendix 3

Fundisa for Change Tool for Evaluation

1. COURSE EVALUATION – TRAINING OF TRAINERS COURSES

Teacher trainers, please complete this questionnaire once you have completed a Fundisa for Change Training of Trainers course. The results will help course facilitators and the FfC coordinator to continue to improve their courses and the programme overall. The aim is also to gain an overview of responses to the course, to give stakeholders a quantitative sense of the value of FfC. The responses will be aggregated before being reported anonymously, and each individual response will always be treated as confidential.

Part 1: Trainers' Profile

1.1 Your name:

1.2 Your contact details: e-mail or phone:

1.3 Name of the course you attended:

1.4 Date of the course you attended:

1.5 Province where you are based:

1.6 I have been training teachers (conducting teacher professional development) for:

- ☐ 0-1 years
- ☐ 2-5 years
- ☐ 6-10 years
- ☐ 10-20 years
- ☐ 20+ years
- ☐ I have not (yet) conducted any teacher training

1.7 I am most likely to conduct teacher training in the following context(s):

- ☐ University – Education faculty or centre
- ☐ University – another faculty or centre
- ☐ Environmental NGO
- ☐ Government department
- ☐ Other: (Please specify)

1.8 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
- ┘ I have not heard of it before I heard about the course

1.9 Please complete: I attended the Fundisa for Change Training of Trainers Course because

Part 2: Response to Training

2.1 The length of the course was ...

- ┘ Too long
- ┘ Too short
- ┘ Just right

Reason for your answer:

2.2 The amount of content provided in the course was ...

- ┘ Too much
- ┘ Not enough
- ┘ The right amount
- ┘ What additional content would you have liked to have included, if any?

2.3 Please rate the following aspects of the course you attended:

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The content of the course was relevant to my needs as a teacher educator						
The course materials were used effectively to support my learning on the course						
Facilitators were knowledgeable						
The methods and approaches used on the course were appropriate						

Comment on any of the above:

2.4 Please comment on 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
- ┘ The best aspect of the materials seem to be

- ☐ I have noticed some problems in the materials
☐ The materials could be improved by

2.5 Please complete: The best aspect of the course was

2.6 To improve the course, I would suggest that

Part 3: Application

3.1 Please consider the application of Fundisa for Change in your own profession and rate the following statements:

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The Fundisa for Change course clearly relates to teacher training in South Africa						
Environmental learning is clearly part of the school curriculum						
Fundisa for Change can help me to better identify and explain key environmental concepts in the school curriculum						
Fundisa for Change can help me to better teach environmental content beyond the CAPS curriculum to teachers or student teachers						
Fundisa for Change can help me to better explain the transformative nature of environmental learning to a colleague						
Fundisa for Change can help me to better demonstrate teaching methods for higher order environmental learning						
Fundisa for Change can help me to better demonstrate how to assess higher order environmental learning in the classroom						
Fundisa for Change can help me to link environmental learning in the classroom with whole school development						
I would be able to use the Fundisa for Change materials to teach my own course						
I am able to identify additional teaching resources for environmental learning						

Comment on any of the above:

3.2 How likely are you to apply what you have learnt, in your own courses?

- ☐ Very likely
☐ Not likely

☐ I may possibly apply what I have learnt

☐ Unsure

Explanation of your answer:

3.3 To further help me in training teachers in environmental education and ESD, I need ... (you may choose more than one)

☐ More resource materials

☐ Support from my institution

☐ I have everything I need

☐ To keep in touch with a professional learning community

☐ Opportunities to do research and/or publish my work in EE/ESD

☐ More training on (please specify)

☐ Other: (please explain)

3.4 If you were to describe the Fundisa for Change ToT course to a relevant authority (e.g. the DBE, DHET or your institution), what words would you use?

3.5 Please feel free to make any other comment on any aspect of the course or Fundisa for Change programme:

Thank you for your input!

Appendix 4

Fundisa for Change Course Evaluation – Teachers Course

Teachers, please complete this questionnaire after you have completed a Fundisa for Change teachers' course. In this way you will help the Fundisa for Change coordinator and course facilitators to continue to improve the programme. The aim is also to get an overview of responses to the course, to give stakeholders a quantitative sense of the value of Fundisa for Change. The responses will be aggregated before being reported anonymously, and each individual response will always be treated as confidential.

Part 1: Teacher's Profile

1.1 Your name:

1.2 Your contact details (e-mail or phone):

1.3 Name of the course you attended:

1.4 Date of the course you attended:

1.5 Province where you are based:

1.6 I have been teaching in schools for:

- ☐ 0-1 years
- ☐ 2-5 years
- ☐ 6-10 years
- ☐ 10-20 years
- ☐ 20+ years
- ☐ I am not a school teacher

1.7 The school where I most recently taught is best described as a ...

- ☐ Rural school
- ☐ Township school

- ☐ Peri-urban school
- ☐ Model C school
- ☐ Private school
- ☐ Home school
- ☐ Other: (Please specify)

1.8 I teach the following Grades:

- ☐ Grades 1-3
- ☐ Grades 4-6
- ☐ Grades 7-9
- ☐ Grades 10-12

1.9 I teach the following Subjects:

Foundation Phase

- ☐ Literacy
- ☐ Numeracy
- ☐ Life skills

Intermediate Phase

- ☐ Social Sciences
- ☐ Natural Sciences and Technology
- ☐ Mathematics
- ☐ Life Skills
- ☐ Languages (home and first additional)

Senior Phase and FET

- ☐ Technology
- ☐ Social Sciences
- ☐ Physical Sciences
- ☐ Natural Sciences
- ☐ Mathematics
- ☐ Mathematical Literacy
- ☐ Life Sciences
- ☐ Life Orientation
- ☐ Languages (home and additional)

- ☐ History
- ☐ Geography
- ☐ Economics and Management Sciences
- ☐ Economics
- ☐ Business Studies
- ☐ Creative arts
- ☐ Agricultural Sciences
- ☐ Accounting
- ☐ Other: (Please Specify)

1.10 Before the course, my experience of environmental learning in the 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
- ☐ I have not heard of it before I heard about the course

1.11 Please complete: I attended the Fundisa for Change Teachers Course because

.....

Part 2: Response to Training

2.1 The length of the course was ...

- ☐ Too long
- ☐ Too short
- ☐ Just right

Reason for your answer:

2.2 The amount of content provided in the course was ...

- ☐ Too much
- ☐ The right amount
- ☐ Not enough

What additional content would you have liked to have included, if any?

.....

2.3 Please rate the following aspects of the course you attended:

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
The content of the course was relevant to my needs as a teacher						
The course materials were used effectively to support my learning on the course						
Trainers were knowledgeable						
The methods and approaches used on the course were appropriate						

Comment on any of the above:

2.4 The course assignment is ... (you may choose more than one answer)

- ☐ Too difficult
- ☐ Not very challenging
- ☐ Just challenging enough
- ☐ Not really helpful in strengthening my learning
- ☐ Contributes to my further learning
- ☐ I did not get a course assignment

2.5 Please complete: The best aspect of the course was

.....

.....

2.6 To improve the course, I would suggest that

Part 3: Application

3.1 Please consider the application of what you have learned on the course to your own teaching:

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Unsure
I can see how environmental learning is part of the school curriculum						
I can relate what I have learnt in the course, to one or more of the subjects I teach						

I would be able to identify and explain key concepts related to environmental learning in the curriculum to a colleague						
I would be able to teach environmental content beyond the CAPS curriculum in my subject						
I can explain the transformative nature of environmental learning to a colleague						
I would be able to identify and use teaching methods appropriate for higher order environmental learning						
I would be able to prepare tools for assessing higher order environmental learning						
I can explain a link between environmental learning in the classroom and whole school development						
I would be able to use the Fundisa for Change materials to prepare for my teaching						
I know where to find additional teaching resources for environmental learning						

3.2 How likely are you to apply what you have learnt, at school? (You may choose more than one)

- ☐ Very likely to apply it in my own teaching
- ☐ Very likely to apply it in my assessments
- ☐ Unlikely to apply it in my own teaching
- ☐ Unlikely to apply it in my assessments
- ☐ More likely to share it with a colleague, than to use it myself
- ☐ More likely to apply it in extra-murals, rather than in the classroom
- ☐ Unsure if I will apply anything.

Please explain your answers:

3.3 To further help me in teaching environmental content and concepts in the classroom, I need the following (you may choose more than one)

- ☐ More teaching resource materials

- ┘ Better text books
- ┘ I have most of what I need
- ┘ Support from my principal
- ┘ Support from the Department of Basic Education
- ┘ Support from the other teachers at school
- ┘ To keep in touch with a professional learning community
- ☐ More training on (please specify)
- ☐ Other: (please explain)

3.4 If you were to describe the course you attended to a relevant authority (e.g. the Department or your principal) what words would you use?

.....

3.14 Please feel free to comment further on any aspect of the course or the Fundisa for Change programme:

.....

Thank you for your input!

Appendix 5

Facilitator interview questions – Gauteng water training

General

1. How long have you been involved with professional development in the education sector?
2. How did you get to support professionals in their work?
3. Why do you do this work?
4. What challenges have you encountered in this kind of work?
5. What makes this kind of work worth it (worth doing) for you (if it is)?
6. How long have you been in the environmental sector?
7. How do you plan for a training session, what do you consider?
8. Do you ask participants what support they need before you train them?
9. How do you know what your participants need?
10. How do you decide on which methods to use when you facilitate?
11. How do you think people learn?
12. How should people's learning be supported?
13. What do you think people need so they can display/show their learning?

Water training session

Part 1

1. What were the objectives of the training session?
2. Were those objectives met?
3. What evidence do you have?
4. How did you prepare for the session to ensure that the objectives you had for the session were going to be met?

Part 2

1. Why did you start the session by asking the participants to draw their environment as they saw it currently and as they would like to see it in the future?
2. You asked them how education should look like if they wanted to move from their current view of the environment to their envisaged future environment. What was it important to ask this?
3. One of the activities that the participants did was to work with the current documents to find topics on water and to make links within and across the grades and terms. Why did you want them to do this activity?
4. During the session you talked about foundational knowledge to the group. What is foundational knowledge? Why is it something that the group needed to know?
5. You gave the participants some resources to work with during the session. What influences your choice of resources for a training session?

6. Three reading were shared with participants, a) teaching for relevance, b) transformative learning, & c) scaffolding & ZPD. What was the significance of theses readings for the group and the session?
7. How did you decide on which activities to do with the participants?
8. Why were participants taken on a fieldtrip (Vaal dam & Rand Water)?
9. Why were participants given a PoE?
10. Could you reflect on the participants' performance in their PoE work?
11. Have you had any contact with the participants since they submitted their PoE?
12. Have they implemented any of the knowledge and skills and/or tasks from the training & PoE?
13. Anything else?

Appendix 6

Facilitator interview questions

These questions are based on the training sessions you facilitated in KwaZulu-Natal. Your input will be highly appreciated.

1. How long have you been involved in teacher professional development?
2. How do you generally plan for a teacher training session/short course, what do you consider in terms of;
 - training methods
 - content
 - assessment of participants?
3. What are your reflections on the success of the training?
4. I know you had follow up sessions with three of the teachers? Please reflect on what you did.
5. Please reflect on insights gained from assessing teachers' work (this can include how they performed, what further support teachers need and what you might do differently in future).
6. What further support should Fundisa for Change provide facilitators to prepare them for teacher or subject advisor training, i.e. what should be included in ToTs (Training of Trainers') workshops?

Appendix 7

Fundisa for Change key partners interview questions

1. When was the Fundisa for Change programme conceptualised?
2. From which sector (s) were the contributors to the conceptualisation process?
3. What was your role (s) in this process?
4. Why was the programme designed?
5. Was a needs analysis performed before the programme was developed?
6. What was/is the issue that the programme wants to address (is addressing)?
7. What did the programme see as the underlying causes of the issue?
8. What do you think a solution to the issue would look like for the programme?
9. What were the programme outcomes?
10. What impact did the programme want to achieve?
11. What indicators do or did the programme use to measure achievement/impact?
12. How would the programme know when they have succeeded?
13. What would count as progress/success after 1 year, 2 years, 3 years, 5 years etc.?
14. What strategies have the programme employed to achieve its intended outcomes/ address the issue identified?
15. Were there risks that the programme had to consider that would have undermined the success of the programme?
16. What successes has the programme achieved so far from your observation and experience?
17. What challenges has the programme faced (and currently facing) since its inception?
18. Have there been unintended outcomes (positive and negative) since the programme has been implemented?
19. What is or has been your role in the programme since its implementation to date?
20. Is the programme being implemented as planned or has it evolved?
21. Is there anything else that the programme needs to consider to achieve greater impact in addressing the issue identified?
22. Anything else you want to share, e.g. what you've learned because of your involvement in the programme (and through working with other partners and participants):
 - a. About yourself?
 - b. About the professional development and/or professional development programmes?
 - c. About how people learn?

Appendix 8

Participants post-training questions

Dear Colleagues,

Thank you very much for the responses to the questionnaire. Some have requested I streamline the interview questions. For those who still want to give some insights, please respond to the questions six questions below.

1. What have you taken away from the Fundisa for Change training into your professional work?
2. Have you used any of the things you have learned from the training in your work environment?
 - 2.1 What had enables you to do that?
 - 2.2 If you haven't, what have been your challenges?
3. What can Fundisa for Change do to enable you to implement?
4. Please comment on what you might implement in the future

Appendix 9

Focus group interview questions

1. When was the Fundisa for Change programme conceptualised?
2. Why was the programme conceptualised?
3. What did the programme see as the underlying causes of the issue (s) it wanted to address?
4. Who were the main actors in its conceptualisation?
5. What impact does the programme want to achieve?
6. What indicators does the programme use to measure achievement/impact?
7. How will the programme know when they have succeeded?
8. What would count as progress/success after 1 year, 2 years, 3 years, 5 years etc.?
9. What strategies have the programme employed to achieve its intended outcomes/ address the issue (s) identified?
10. Were there risks that the programme had to consider that would have undermined the success of the programme?
11. What successes has the programme achieved so far?
12. What challenges has the programme faced (and currently facing) since its inception?
13. Have there been unintended outcomes (positive and negative) since the programme has been implemented?
14. Is the programme being implemented as planned or has it evolved?
15. Is there anything else that the programme needs to consider to achieve greater impact in addressing the issue identified?
16. Anything else you want to share, e.g. what has been learned since implementation?

Appendix 10

Approval letter (DBE)



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Private Bag X895, Pretoria, 0001, Sol Plaatje House, 222 Struben Street, Pretoria, 0002, South Africa
Tel.: (012) 357 3000, Fax: (012) 323 0601, www.education.gov.za

Ref no: ODG-3359\17-31\10\2017
Enquires: Mr AT Tshirado
Tel: 012 357 3656
Email: Tshirado.T@dbe.gov.za

Ms NZ Songqwaru
P O Box 94
GRAHAMSTOWN
6140

By email: Z.Songqwaru@ru.ac.za

Dear Ms Songqwaru

RESPONSE TO A RESEARCH REQUEST TO USE DATA THAT WAS GENERATED DURING TEACHER PROFESSIONAL DEVELOPMENT PROGRAMMES

The Department of Basic Education (DBE) received your request to use data that was generated during teacher professional development programmes for research purpose.

The research request is approved on condition that you, as the applicant of the research, adhere to the conditions set in the research protocol of the Department (Annexure A) and to the ethical conduct of using research data and information. It is emphasised that the data should solely be used for the purpose of this research.

We recommend that you submit this letter as evidence that the Department is aware of your research.

We request that you share the findings of the research with the DBE at the conclusion of your research.

Yours sincerely

DR G WHITTLE
ACTING DIRECTOR-GENERAL

Appendix 11

Consent Form from Participants

Dear Participant,

RE: Permission to use data generated during Fundisa for Change training for research.

I am Zintle Songqwaru, a Rhodes university PhD scholar evaluating the implementation of the Fundisa for Change training programme.

This letter serves to formally request your participation in the study – in the form of giving permission for the use of data generated during training be used for research. Data to be generated are training activities, photographs and post training questionnaires. A video camera will be used to observe training activities. A time commitment of an hour post-training may be required for an interview.

My research proposal has been approved by the Rhodes University Education Higher Degrees Committee, and obtained ethical clearance from the Ethics Committee. The research will focus on the program's implementation theory, the implementation theories and practices of the program implementers and the experiences of the program participants.

Participants will be anonymous and data generated will be kept confidential. All findings can be shared on request.

I look forward to working with you in this exciting research project. Please do not hesitate to contact me if you have any queries or require further information about this study (z.songqwaru@ru.ac.za or 073 3068 345).

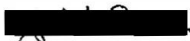
With regards,

Z. Songqwaru



I.....[redacted].....voluntarily
give consent that data generated, as explained above can be used for research.

Signature



Appendix 12

Fundisa for Change 2014 Action Plan



OBJECTIVES AND ACTIVITIES	SPECIFIC ACTIONS	WORKING GROUP	TIMING
Objective 1: CAPACITY BUILDING			
1.1 Implement a Training of Trainers programme	Orientate partners on how to work with the Fundisa for Change materials during training Start development of a Training of Trainers Manual / Guideline Document	Training of Trainers (ToT),	May
1.2 Develop materials	Develop water modules for Senior phase and Intermediate phase Develop a Fundisa for Change module for school management teams, SMTs (Principals, deputies and HODs)	Materials development (MD)	May May - June
1.3 Implement Training of Teachers programmes	Trainers who have been involved in the ToT programme train teachers (at least 6 clusters in 2014) Partners organisations offer accredited teacher training (6 clusters) Expand accreditation to other universities partners	ToT Partners (DEA, DWA, DBE, WESSA, Delta & HEIs)	June - September
1.4 Partner accredited and SACE endorsement	Clarify accreditation options with partners Apply for SACE programme and materials endorsement; and complete the documentation and application process	Accreditation working group (WG)	May April

Appendix 13

Fundisa for Change Material developers' writing guidelines

(Rough outline for writing subject-specific units – use this in conjunction with looking at existing books – Climate Change and Biodiversity)

Teaching...[theme e.g. Climate Change]

Subject ... and Grades....

ORIENTATION

1. ORIENTATION:

1.1. What is ... (climate change, etc.) – 1-2 paragraphs introducing your topic

1.2. Why is it important? – Significance of learning about this subject area for sustainable development, and for the development of learners in their daily lives

1.3. How do these units support teaching and learning about (climate change, etc.) – Orientate teachers to your thinking process in developing the unit standards.

2. (CLIMATE CHANGE, ETC.) IN THE CAPS

2.1. The (FET / Foundation / intermediate / senior) (your title) Units – More detailed orientation to your units –

2.2. (Climate change, etc.) in the CAPS–An orientation to CAPS as it relates directly to your Unit focus areas, including a tabular extract from CAPS if necessary – again it is not necessary to go into too much detail (see below)

2.3. CAPS and the (Climate Change) – Provide a short overview of CAPS links per grade, term and unit. NB SHOW PROGRESSION WHERE POSSIBLE< AND MAKE THE POINT THAT UNDERSTANDING KNOWLEDGE PROGRESSION IS AN IMPORTANT PART OF WHAT THE UNIT IS ABOUT

Climate Change example:

Key concepts and processes	Grade	Term
How is energy supplied and added to the system?	10	1

Try to keep the references to the CAPS documents broad, but clear. Try to avoid too much detail. Teachers must know that the TEACHER EDUCATION unit you are developing is relevant to what they need to teach in CAPS, but the unit is NOT a CAPS unit for classroom teaching. Teachers will have textbooks for this.

3. KEY CONCEPTS – General definitions of key concepts covered in your units

UNIT 1: (title)

1. SUBJECT CONTENT KNOWLEDGE

1.1. Introduction

1.2. Summaries of subject content knowledge- Provide orientation to the core content and concepts necessary to develop deep subject knowledge and how to expand knowledge for teaching of curriculum content

1.3. Expanding knowledge – A section which shows how one may go about expanding knowledge of the topic (with REFERENCES and HYPERLINKS)

2. TEACHING PRACTICE

Provide 4-6 examples of ways in which teachers can use different learning and teaching methods to teach learners about the key content covered in the Subject.

Activity layout:

- Type of method being demonstrated:
- Links to CAPS:
- Core Knowledge: (link to specific subject knowledge and show how it maintains the integrity of the discipline)
- Developing your teaching practice: - Provide a demonstration or example of an activity that provides teachers with the opportunity to practice developing an activity using this or another teaching method

3. ASSESSMENT PRACTICE

3.1. Orientation to your assessment section (how does it relate to the type of assessment required in CAPS)

3.2. Assessing knowledge of curriculum content (Emphasis on higher order questions)

3.3. Provide 3-4 examples of different types of assessment directly linked to the content knowledge and teaching practice in each unit.

UNIT 2

See outline for unit 1

UNIT 3

See outline for unit 1

REFERENCES

Include all references cited as well as any additional useful readings/texts

APPENDICES

NOTE: Fundisa for Change will be offered as a 3 – 6 credits course, therefore the units need less pages, e.g. 30 pages with 10 pages on each unit (content, teaching and assessment)

Appendix 14

Fundisa for Change module with links to national school curriculum

Water as a theme in the Senior Phase Social Science CAPS

This unit has been developed to expand teachers' knowledge and expertise in ways that also support teaching the CAPS Social Sciences curriculum for Grades 7 – 9. The activities do not necessarily follow the sequence of the CAPS. The most relevant connections to CAPS topics are indicated at the start of the unit with more details provided at the start of each activity. Teachers should consult the CAPS for specific curriculum content.

The activities are:

1. Getting to know your catchment
2. Why do we need wetlands?
3. Water auditing

Although Water as a theme fits more within the Geography part of the Social Sciences curriculum, the historical impact of water availability on settlement patterns and subsequent development are also important topics. History can be interwoven into current water issues.

Related topics within the CAPS, showing relevant grades and terms:

Key Concepts and Processes	GRADE	TERM
Geography: Volcanoes, earthquakes and floods	7	2
• Floods – 4 hours - Causes of floods – unusually heavy rain, environmental factors (such as farming, settlement, fires and loss of vegetation) and earthquakes (tsunamis) - Effects of floods including injury and loss of life; disease; displacement of people; soil erosion; damage to fields, buildings and infrastructure - Why some communities are at higher risk than others - Reducing the impact – preparing for and responding to floods - Case study of a selected flood		
Geography: Natural resources and conservation in South Africa	7	4
• Natural resources - Natural resources on earth – including water, air, forests, soil, animal and marine life - Use and abuse of selected examples • Management of resources - Concept of conservation – including reasons for conservation - Conservation areas (including marine reserves)		

Appendix 15

Site 1 Training Programme



Social Sciences curriculum advisors: Water module training programme 22nd – 26th September 2014

TIME	ACTIVITY
DAY 1: 22/09	
9h00 - 9h30	Introduction and Welcome
9h30 - 10h00	My Environment, My responsibility – visions of a Sustainable Society
10h00 – 11h00	Water topic in the CAPS – Processes to support the content in water
11h00 – 11h15	Tea
11h15 - 12h30	Exploring the Planetary Boundaries – Looking at Water – Quiz – Presentation on Water Issues
12h30 - 13h00	Exploring the Water Cycle
13h00 – 13h45	Lunch
13h45 – 15h00	Consolidation – Development of a Mind Map – Exploring the Pressures and Drivers and Impacts.
15h00 – 15h30	Reflection and Review – Song Beautiful World
DAY 2: 23/09	
8h00 - 9h00	Meet and Travel to Rand Water
10h00 – 12h45	Arrive in Vereeniging – Begin Catchment Tour and Investigation – Water Act
12h45 - 13h30	Lunch
13h30 - 15h00	Purification Plant Tour
15h00	Leave to travel back to DEC/ Johannesburg
Day 3 – 25/09	
9h00 – 9h30	Reflection – Review
9h30 - 11h00	Exploring Water Distribution
11h00 - 11h15	Tea
11h15 – 13h00	Working with Drama / Puppets/ stories etc using the Active Teaching and Learning Framework.
13h00 13h45	Lunch
13h45 - 15h00	Presentation of drama – case story
15h00 – 15h30	Reflecting on methods in Environmental Education which encourage reading and writing to learn. End
DAY 4: 26th /09	
9h00 – 9h30	Reflection and Review
9h30 – 10h30	Exploring assessment requirements for Social Science
10h30 – 10h45	Tea
10h45 - 12h00	Using case studies for assessment
12h00 - 13h00	Reviewing assessment
13h00 – 13h45	Lunch
13h45 – 14h30	Assessment and Sustainability
14h30 – 15h30	Evaluation

Appendix 16

PoE part 1 task – reflecting on own practice – site 1

PRE-COURSE TASK

Question 1: REFLECTING ON MY PRACTICE (70 marks)

In the CAPS documents for the Social Sciences a considerable amount of knowledge is drawn from environment as a discipline. Some of this knowledge is new knowledge and some of the knowledge is changing, contested and complex. This has implications on how teachers will engage with the environmental knowledge in the CAPS. The content on water is strongly represented throughout the CAPS. Explore how it is taught in your district.

1. REFLECTING BACK AT YOUR OWN PRACTICE- Develop a 1 page summary to reflect on your own personal interactions with the environmental content.

Think about yourself and consider some of the aspects below in looking at your own professional learning linked to the environmental content in your subject.
(20 marks)

1.1. Which key areas and concepts in the subject is underpinned by environmental knowledge that you are struggling to support your teachers on?

1.2. How are you accessing new knowledge linked to the environmental content in your subject? What are you doing? Who are you consulting? What initiatives are you embarking on?

1.3. How do you engage with knowledge that is contested, uncertain and complex? How do you enable teachers to work with this type of knowledge?
1.4. Discuss any programmes that you may have to support teachers in improving their teaching practice and assessment practice.

2. Briefly explain how you have been supporting teachers on the following concepts:
You welcome to provide e.g.'s of things you have done.

CONCEPT	SUPPORT PROVIDED TO TEACHERS	WHAT YOU WOULD LIKE TO DO IN THE FUTURE
2.1. Water cycle		
2.2. Waste water and water recycling		
2.3. Water distribution		
2.4. Role of wetlands		
2.5. Water use in South Africa		
2.6. Water distribution and supply		

CONCEPT	SUPPORT PROVIDED TO TEACHERS	WHAT YOU WOULD LIKE TO DO IN THE FUTURE
2.7. Rivers in South Africa		
2.8. Impact of mining and agriculture on water resources in South Africa.		
2.9. Water use through the ages.		
2.10. Conservation of water resources		
Total for this question = 40		

2.11. Suggest what you think you need to do to be able to support teachers on this topic in the future? (10)

Appendix 17

Field trip worksheet (Vaal and RandWater)

23 SEPTEMBER 2014

DELTA ENVIRONMENTAL CENTRE

SOCIAL
SCIENCES
LEARNING ABOUT
WATER IN
GAUTENG



NEWSLETTER



THE LEARNING JOURNEY OF:

PROVIDE A NARRATIVE OF WHAT YOU FEEL YOU LEARNT AND HOW YOU THINK YOU LEARNT ON THIS TRIP.

SOMETHING TO
THINK ABOUT....

IN FUTURE I WOULD



IN WORKING WITH MY TEACHERS I COULD.....



TO ENHANCE THE METHOD OF TEACHING I WOULD
SUGGEST IT COULD BE STRENGTHENED BY



Appendix 18

Teaching methods contents page / worksheet (site 1)

Contents

A Note on Terminology	2
Expanding Methodological Frameworks	3
Using Methods with Educational Intent	6
Directory of Methods	9
Information Transfer Methods	11
Awareness and Social Marketing Campaigns	11
Talks and Presentations	12
Demonstrations and Experiments	13
Guided Questioning	14
Field Trips, Excursions and Exchange Visits	15
Games and Quizzes	16
Experiential Methods	17
Interpretative Trails	17
Solitaire	18
Music, Poetry and Visual Art	19
Role Play	20
Values Clarification	21
Working with Camera	22
Investigative Methods	23
Participatory Methods (PRA, PLA)	23
Fieldwork and Collaborative Research	24
Exploring Indigenous Ways of Knowing	25
Case Studies	26
Learning By Doing	27
Projects and Practical Actions	27
Action Research and Community Problem Solving	28
Stewardship Agreements	29
Deliberative Methods	30
Dialogic Cartoons	30
Social Learning Methods	31
Critical Media Analysis	32
Story Methods	33
Drama and Theatre for Development	34
Scenario Planning and Backward Mapping	35

Appendix 19

Know your Subject Part 2

Part 2: Know your subject (80 marks)

QUESTION 1

Choose any 1 of the water related concepts from the CAPS for a particular grade.

1.1. Develop a three page summary of the water related concept you have chosen. In developing your three page summary you will need to use some of the following documents.

- a) A researched article from the internet
- b) A scientific journal or article.
- c) Any other relevant and reliable source. (50 marks)

1.2. Compare the information you researched with the information from the textbook. Develop a 1 page summary of your key observations about the information contained in the textbook and what is contained in the other sources of information. You can tabulate the similarities and the differences in the information to help you record your observations. (20 marks)

1.3 Human-Impact on the Environment: Look at the different sources of information and develop a 1 page discussion document about any two human impacts on water resources in South Africa. Relevant resources are provided to help you research and understand some of the impacts. (10 marks)

Due date: _____

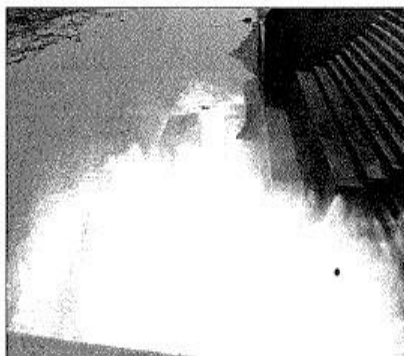
Appendix 20

Working with active teaching and learning framework (site 1)

SKILLS

SKILLS NEEDED TO
ADEQUATELY ADDRESS
THIS CONTENT

KNOWLEDGE



MAKE A NOTE OF THE
KNOWLEDGE NEEDED FOR
THE TOPIC YOU SELECTED

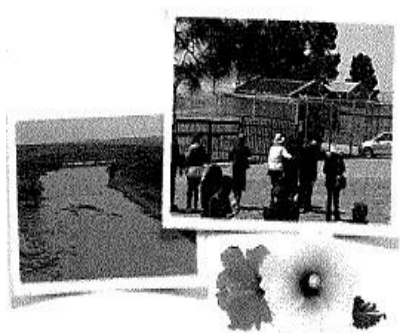
TEACHING AND ASSESSING IN CAPS



CHOOSE A FOCUS ON THE TOPIC OF WATER
RELATED TO A PARTICULAR GRADE

Appendix 21

Analysing questions (site 1)



EXPLAIN HOW LEARNERS ARE EXPOSED TO TRYING OUT AND CREATING NEW INNOVATIONS.

HOW ARE THE LEARNERS EXPOSED TO ANALYSING AND APPLYING THE SKILLS AND KNOWLEDGE THEY LEARNT?

ANALYSING QUESTIONS

MAKE A NOTE OF THREE QUESTIONS YOU FOUND ON WATER AND ANALYSE THE QUESTIONS USING BLOOMS TAXONOMY AND THE ACTIVE TEACHING AND LEARNING FRAMEWORK.



QUESTION ONE:



LEARNING THROUGH DOING - TRYING OUT



REFLECTING AND CONTEMPLATING

QUESTION TWO :



EASY READING START UP RESOURCES



PARTICIPATION AND ACQUISITION

QUESTION THREE



FINDING OUT



DELIBERATING

Appendix 22

CAPS Social Sciences tables on cognitive verbs for assessment

SOCIAL SCIENCES GRADES 4-6

KNOWLEDGE AND RECALL	COMPREHENSION/ UNDERSTANDING	APPLICATION	CONCEPTUAL REASONING: ANALYSIS	CONCEPTUAL REASONING: SYNTHESIS	CONCEPTUAL REASONING: EVALUATION
Low order	Middle order		High order		
Absorb Count Define Identify Label List Match Memorise Name Outline Point out Quote Recite Recognise Repeat Remember Reproduce Respond Select State Trace	Classify Compare Convert Discuss Distinguish Define Demonstrate Describe Estimate Explain Generalise Give examples Illustrate Infer Interpret Match Paraphrase Restate Rewrite Select Summarise Translate	Change Compute Construct Demonstrate Draw Illustrate Predict Relate Solve Use	Breakdown Differentiate Discriminate Investigate Organise Relate Separate Subdivide	Abstract Arrange Combine Compile Construct Create Design Discuss Formulate Generalise Generate Group Integrate Organise Summarise	Appraise Conclude Contrast Create Critique Criticize Decide Dispute Evaluate Grade Judge Justify Interpret Support Recommend

Appendix 23

Improve assessment practice (site 1)

Part 3: Improve your assessment practice (80 marks)

Explore the assessments that are required for Social Sciences either Grade 4 to 6 or Grades 7 to 9 as outlined in the CAPS and the competences and suggested verbs for assessing these.

3.1 Make a list of the formal assessment requirements for Social Sciences () for the selected topic or concept. The list should be derived from the requirements for the CAPS as specified in the policy and the Department of Education guidelines.

(5 marks)

3.2. Complete a critical review of at least one assessment task which is either an assignment or a research project related to water resources or human impact. Include a copy of the criteria you used to analyse the tasks. Use the Active teaching and learning booklet and framework to help you analyse the task. Compile a **two page report** highlighting the strengths of the assessment task, its weaknesses and suggested changes. Justify your suggested changes. Redesign the assignment or project for the appropriate grade. (40 marks)

3.3. Review either a grade 4,5,6,7,8 or grade 9 exam paper or test (or a common test set in your district) . Make a note of the questions related to the topic or concept you researched. Make a note of at least 3 questions asked on the topic or concept. Thereafter analyse the questions and make a mind map to highlight the type of content knowledge required to be able to answer the questions. (20 **MARKS**)

3. 4. Using a reading provided, discuss your role as a curriculum advisor in supporting the relationship between teaching and assessing the water content in the curriculum. Also highlight what your learning needs will be to help support you to be able to support teachers with the selected content (01 page summary). (15 marks)

Due Date: _____

Appendix 24

Improve teaching and assessment (site 1)

Part 4: Improve your teaching and assessment practice (120 marks)

4.1 During the course of next year you will be required to support the teachers in your district on the content you have researched and the assessment tasks developed. Develop a Plan to highlight how you will support teachers in your district to address the specific concept that you worked with in Part 2 and 3, **taking care to include reflection on human-environment relationships in at least one of the activities.** (20 marks)

4.2. Choose one of the workshop activities from your plan and work out a programme for the activity. Clearly highlight the methods you will use. Make sure that you select a method (or methods) appropriate to the content, concepts, skills and values that are included in the CAPS and that is relevant to the context of learning. Also remember to include the assessment activities on the plan both formal and informal.

(20 MARKS)

4.3. Explain and motivate the methods you have chosen to use in your workshop programme. Use your Handbook entitled "Methods and Processes to Support Change-Oriented Learning" to help you think critically about the activity outcomes. **How relevant and appropriate are** the methods and resources you are suggesting? In what way you are able to work with and meet curriculum requirements? Did you develop the knowledge, skills and values as prescribed by the curriculum? What can you do better? What changes should you make? **(2 pages).** (30 MARKS)

4.4. Share your district plan for supporting teachers on the identified topic with at least one other colleague. Also share the workshop programme that you have planned. Capture the discussions and suggestions from your colleagues about your plan and make relevant suggestions on what you can change and adapt. (20 marks)

4.5. Explain how you will evaluate the intervention in your district. Include a copy of an evaluation plan and the tools you will use to help you gather information about your intervention with the teachers in your district. Remember in the plan to include the goals and objectives of the evaluation. An example of an evaluation plan is included. (30 marks)

Due date: _____

Appendix 25

PoE implementation plan (site 1)

PART 5: IMPLEMENTATION OF PLANNED ACTIVITIES AT DISTRICT LEVEL (50 marks)

20 October 2014



5. During the course of 2015 you will be required to provide evidence of implementation of your plans to show how this content on water will be facilitated with teachers in your district. To show implementation you can provide the following:

- 5.1. Six carefully narrated photographs of the session you have held with the teachers highlighting how you have used different methods in facilitating the sessions.
- 5.2. Examples of any materials used during the session with the teachers e.g. worksheets prepared.
- 5.3. Observation sheets which maybe filled by your colleagues or other relevant individuals.

(25)

6. Reflecting on implementation (25)

6. 1. Critically reflect on the implementation process. Develop a one page reflection report the following key points should be addressed:

6.1.1. The strength of the learning intervention?

6.1.2. The challenges experienced?

6.1.3. Suggestions for improving the practice for the future.



Appendix 26

Limpopo provincial DBE funding request for Fundisa for Change training



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

TO : ADMINISTRATOR
FROM : SENIOR PHASE DIRECTORATE
SUBJECT : REQUEST TO USE FOUNDATION PHASE BUDGET TO AUGMENT
AVAILABLE FUNDS FOR AN ENVIRONMENTAL EDUCATION
TRAINING PROGRAMME FOR SUBJECT ADVISORS

DATE : 8 December 2014

1. PURPOSE

The purpose of this submission is to request to use Foundation Phase budget to augment funding for the training of Subject Advisors on Environmental Education topics in CAPS.

2. BACKGROUND

The Administrator approved the implementation of a Teacher Development Programme in Environmental Education by the Department of Environmental Affairs (DEA) in August 2014 (approval attached hereto). DEA will fund the training of Subject Advisors in February and March 2014. The purpose of the programme is to develop educators on environmental related topics that are part of CAPS in the following subjects:

- Life Skills – Grades R to 6
- Natural Sciences and Technology – Grades 4 to 9
- Social Sciences – Grades 4 to 9
- Geography – Grades 10 to 12
- Life Sciences – Grades 10 to 12

The DEA will implement the programme under a consortium called Fundisa for Change Teacher Education Programme. The consortium is composed of DEA, DBE, the private sector, universities and NGOs in the environmental sector. All the modules are

REQUEST TO USE FP BUDGET TO AUGMENT AVAILABLE FUNDS FOR EE TRAINING PROGRAMME
FOR SUBJECT ADVISORS Page 1

Appendix 27

Mpumalanga training programme



environmental affairs
Department
Environmental Affairs
REPUBLIC OF SOUTH AFRICA



RHODES UNIVERSITY
Where leaders learn

environmental
LEARNING RESEARCH CENTRE



Mpumalanga Social Sciences subject education specialist Fundisa for Change Water training

16th to the 19th February 2015

TIME	ACTIVITY
09h00 – 10h00	Welcome and Introductions
10h00 – 10h45	Information on the Fundisa programme + Evaluation questionnaires handed out
10h45 – 11h00	TEA
11h00 – 12h00	Exploring ideas on Environment and Sustainability
12h00 – 13h00	Orientation to Water Content in the CAPS Looking at performance on Water related content in GR 12 Geography – identifying teachers' challenges.
13h00 – 14h00	LUNCH
14h00 – 15h00	Water situation in South Africa
15h00 – 16h00	Foundational Knowledge practices - Exploring the Water Cycle
16h00 – 17h00	Reflection and Review – Designing Questions on a Case study Provided and giving it to each other to answer and review Homework – Complete Task 1 and 2
Day 2	Collection of Task 1 and 2
8h00 – 9h00	Travel to Destination – While completing observation form
9h00 – 10h00	Foundational knowledge and Teaching practise Processes in water Purification – Water treatment plant
10h00 – 10h30	Travel to SANBI
10h30 – 10h45	TEA
10h45 – 13h00	Foundational knowledge and Teaching practise - Understanding the catchment
13h00 – 13h45	LUNCH
13h45 – 15h30	Foundational knowledge and Teaching practise- River System Study at SANBI – water quality
15h30 – 16h00	Travel back to venue
16h00 – 17h00	Consolidation of information – related to water purification Set a Test on Water Purification Reading provided – and River System Complete Task 2
Day 3	
8h30 – 9h00	Reflective processes
9h00 – 10h00	Exploring types of methods supporting teaching and learning
10h00 – 10h30	TEA
10h30 – 12h30	Understanding issues linked to water distribution / purification
12h30 – 13h00	Exploring the content in the Fundisa Materials and linking to workshop programme
13h00 – 14h00	LUNCH
14h00 – 15h00	Consolidation of activities using a reading/ writing task and Active teaching and learning framework
15h00 – 15H45	Preparation of an Assignment linked to water purification and review of the assignment with the marking tool – Task ¾
15H45 – 16H00	TEA
16H00 – 17H00	Review conducted investigation using criteria or a reading on assessment - Task ¾
Day 4	
8h30 – 9h00	Reflection/ Review
9h00 – 10h00	Active teaching and Assessment Reflection on Assessments designed using some key readings. Assessment of learning and assessment for learning
10h00 – 10h30	TEA
10h30 – 11h30	Considering practical ways to support teachers and their assessment practices- Presentations
11h30 – 12h30	Designing Assessments
12h30 – 13h15	Working through the POE – wayforward – submission dates
13h00 – 14h00	Consolidation
14h00 – 15h00	LUNCH

Appendix 28

PoE know your subject (site 3)

The assignment requires you to complete each aspect during the contact session. Each day you will ensure you produce a piece of work which has been allocated.

Part 2: Know your subject (40 marks)

QUESTION 1

1.1. Develop a mind map of the concepts to be taught in either intermediate or senior phase from the CAPS on the theme you are exploring. (20 marks)

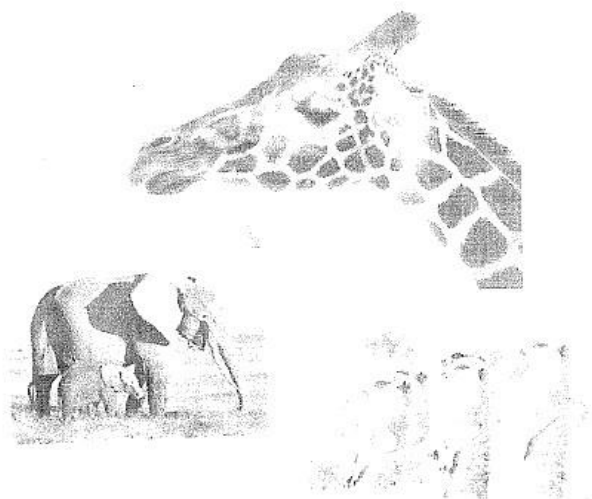
1.2. Choose one of the concepts related to your theme. Develop a one page summary of the particular concept you have chosen. To help you develop the summary use your textbook and one other resource provided. (20 marks)

Due date: End of Day One of the Course

Appendix 29

Mpumalanga fieldwork worksheet

FIELDWORK OBSERVATION



TO BE COMPLETED
DURING THE FIELD -
TRIP

Type to enter text

Fieldwork observation form (2017) 1/1

3. What are some of the issues which need to be considered when managing purification plants.

4. What key concepts would teachers need to know about the purification of water?

5. Identify the key policies which regulate water purification and management issues.

Mpumalanga



Province

Complete this task as you travel to the purification plant a waste water treatment plant

Fieldwork observation form (2017) 1/1

6. Discuss how waste water is treated, take note of the differences between the purified water and waste water.

7. In what way has Nelspruit's needs in the purification of tap water and waste water changed over the last 15 years?

Appendix 30

Part 4 PoE (marked, site 3)

Part 4: Improve your teaching and assessment practice (80)		
4.1. A Plan to support teachers in the district or circuit on the water content in the curriculum. The plan covers aspects of time, content, outcomes/objectives, resources required, assessment	20	16
4.2. A critical review of district plans from colleagues is provided. A summary to highlight suggestions from colleagues on the prepared planned is provided highlighting a sharing of practice. Comments are relevant and appropriate to the context suggested.	20	06
4.3.1 An activity from the plan is selected and a programme is designed. Methods to be used are clearly explained. The methods appropriateness to the content, concepts, skills and values that are included in the curriculum statement and that is relevant to the context of learning is explained and discussed.	10	08
4.3.2 A 2 pg summary using the Methods and Processes Book is used to explain the appropriateness of the activities. The discussion and explanation indicates a level of reflexivity and clearly highlights strengths and weaknesses and opportunities to improve the practice.	10	08
4.4. Suggested Evaluation of the intervention. A well thought out evaluation plan, relevant evaluation tools have been included. The plan highlights the goals of the evaluation or objectives.	20	16
Sub-Total	80	54
Assessors comments:		
A good plan to support teachers provided.		
Evaluation Plan is relevant.		

Appendix 31

Teacher context task (site 4)

Fundisa for Change Teachers Context tasks



Name:

Setting the scene

Part 1: Describe your practice

1. Use the questions below to describe the context in which you teach.

1.1. How are you currently working to improve your content knowledge, teaching practice and assessment practice?

1.2. Which aspects, key areas and/or concepts in your subject are you struggling with?

1.3. What challenges are you facing in your school?

1.4. How are you addressing those challenges?

1.5 How are you accessing and engaging with the 'new' environmental content knowledge in your subject?

1.6 Are you supported in your district to work with environmental and sustainability concepts in teaching your subject? If so, how?

1.7 What do you think you need to do, to be able to teach this topic in the future?

1.8 What local school support programmes are there for environmental education in your area?

1.9 What opportunities for environmental learning exist in your surrounding area – places of interest for fieldtrips for example.

Appendix 32

Test activity on-course task (site 4)

Subject: Social Sciences / Geography

Time: 1 hour

Marks: 55

Question 1 (Clouds):

Complete the following table:

Cloud Name	Illustration	Type of precipitation (e.g. rainfall)	Description of cloud
Stratus			
Cumulonimbus			
Cirrus			

Question 2 (The greenhouse effect):

Provide the names for three MAJOR greenhouse gases. Give the dominant function or role these gases play in energy transfer in the atmosphere e.g. absorb solar radiation; reflect solar radiation etc. (6 marks)

Question 3:

Give 3 advantages and 3 disadvantages of adaptation to climate change to either humans or the environment (6 marks)

Question 4:

Complete the following paragraph by **selecting and circling or inserting the missing word** in the spaces provided:

The Earth between latitudes _____ receives more incoming solar radiation than it emits. This surplus of energy is carried to other areas of the globe via the _____ circulation cell. Here it then sinks and usually brings with this sinking _____ weather. Major deserts e.g. the _____ in northern Africa are located in this zone of major subsidence. At the ITC, moist air from the easterlies results in large thunderstorms in the form of _____ clouds. (5 marks)

Question 5:

Draw a neatly labelled diagram showing some of the key features of the atmospheric circulation. On your diagram fill in the major winds and circulation features. (8 marks)

Question 6:

In a detailed paragraph, no more than 10 lines explain what is meant by climate change and climate variability. (6 marks)

Appendix 33

Lesson plan template (site 4)

A4a Appendix B: Teachers' Sample Lesson Plan Template

Key Questions		
Prior Knowledge		
Resources		
Informal assessment	What is teacher doing?	What is the learner doing?
Assessment activity		
Extension ideas/ challenges		

Appendix 34

Lesson plan assessment rubric (site 4)

Teacher Assessment Task



A1: Planning a Lesson Assessment Task

This task requires you to:

- First, with your group, pick a topic and plan a series of lessons on the topic, detailed in the T-sheet. The description of the lessons will give a general idea of the goal of the activities to be completed and the methods to be used.
- Secondly, individually, you need to plan one of the lessons described in the series above, using the lesson plan template provided (or your own), including detail of the activity and/or assessment task using the guidelines in the *Framing Active Teaching and Learning in CAPS* booklet. The focus of the lesson must be an aspect of the topic of the short course.
- Thirdly, you need to produce the actual lesson activity. The rubric that will be used for assessing your activity is given below.

As you prepare the learning tasks and assessment materials listed in the table below, bear the following in mind:

- Expected knowledge and skills, attitudes and values
- The nature of the activity and its relevance to the topic of the short course
- Include appropriate language strategies like reading to learn
- Include questions that accommodate for learners different cognitive levels
- How you will assess the learners (include an assessment task with guidelines for marking – memo or rubric)

Certain of the items listed below do not have a mark attached. However, the assessment task for the course will not be considered as complete unless all items are present.

You will need to provide:	Assessment rubrics	Mark
1. Completed "Setting the scene" context task from Day 1		
2. T-sheet Use the T-sheet as a guideline (on page 24 of the <i>Framing Active Teaching and Learning in CAPS</i> booklet).	T-sheet rubric is Appendix A	10
3. Detailed lesson plan	You may use your own lesson plan template or the one provided as Appendix B. Lesson plan rubric is Appendix C	12
4. Lesson activity (with memo if needed) and possibly also assessment task and marking guidelines. Select a teaching strategy from the <i>Methods and Processes to Support Change-Oriented Learning</i> book.	Lesson activity rubric is Appendix D	14
5. Declaration of authenticity and Personal details page		
6. Overall effort in presentation of task		4
TOTAL: 40 MARKS	TOTAL:	40

Appendix A: T-sheet rubric

Refer to pages 22 – 27 in the *Framing Active Teaching and Learning in CAPS* booklet

2 points if the criteria are fully met.

1 point is awarded for partial fulfillment.

0 points awarded if criteria are not met.

T-sheet: Criteria for evaluation				
Mark Allocation		2	1	0
1	T-sheet includes a "Find out" section with: - Keywords and concepts - What the curriculum requires			
2	- What the teacher already knows - What the teacher needs to find out			
3	T-sheet includes a "Work out" section with: A plan for the learning			
4	Reading, writing and activities including a reason for why they were chosen			
5	T-sheet includes an "Assessment" section that will assess: - What is known and remembered - What is understood and can be explained			
TOTAL: 10 MARKS				

Appendix 35

Participant project for learners (site 4)

GEOGRAPHY RESEARCH PROJECT
DURATION: 2 WEEKS

GRADE: 11
ISSUE DATE: 28 JULY 2015

MARKS: 56
DUE DATE: 7 AUGUST 2015

YOU WILL BE PENALISED 10% DAILY FOR LATE SUBMISSION

In South Africa energy is mainly generated by burning fossil fuels (e.g. coal). Burning fossil fuels produces CO₂ (carbon di-oxide) a greenhouse gas. Excessive release of CO₂ adds to global warming, resulting in climate change. Electricity generated by burning coal causes almost 0.915kg of CO₂/kWh to be released. In other words, for every 1 hour use my 1 000W toaster, almost 1kg of CO₂ is being released into the atmosphere.

1. Select any 5 electrical appliances in your home and complete the table below over a period of 5 days.

Electrical Appliance	Qty	Power		Usage time per day in hour (h)	Energy consumption per day in kWh	No. of days	Total Energy consumption in kWh
		Watt (W)	Kilowatt (kW)				
Light bulb	1	100	$\frac{100}{1000} = 0,1$	$\frac{30\text{min}}{60\text{min}} = 0,5\text{h}$	$0,1\text{kW} \times 0,5\text{h} = 0,05\text{kWh}$	5	$0,05\text{kWh} \times 5\text{days} = 0,25\text{kWh}$
Kettle	1	1600	$\frac{1600}{1000} = 1,6$	$\frac{48\text{min}}{60\text{min}} = 0,8\text{h}$	$1,6\text{kW} \times 0,8\text{h} = 1,28\text{kWh}$	5	$1,28\text{kWh} \times 5\text{days} = 6,4\text{kWh}$

2. Draw a bar graph to indicate which appliances consume the most energy.

3. Indicate the total amount of kWh consumed.

(2)

4. If one unit (1 kWh) costs R1.10 – what is the cost of the total amount of electrical energy that has been consumed?

(2)

5. Now determine the total amount of CO₂ that had been released in order for you to use the above appliances.

(2)

Appendix 36

KZN request for Fundisa for Change training



uThungulu District Office
North Park, Richards Bay, 3900
Tel: 035 7800331, Fax: 035 7898211
Cell: 0824617670
MkhwanaziNO@kznded.gov.za
Private Bag X 20018
Empangeni, 3880
www.kznded.gov.za

TO	Mr. DEPUTY DIRECTOR – SECTOR EDUCATION, TRAINING AND DEVELOPMENT DEPARTMENT OF ENVIRONMENTAL AFFAIRS
FROM	MRS ASSISTANT MANAGER: ENVIRONMENTAL EMPOWERMENT SERVICES
SUBJECT	REQUEST FOR FUNDISA FOR CHANGE TRAINING TO BE PROVIDED FOR 30 EDUCATORS IN UTHUNGULU DISTRICT
DATE	09 JUNE 2015

**RÉ: REQUEST FOR FUNDISA FOR CHANGE TRAINING TO BE OFFERED TO 30
EDUCATORS IN THE SENIOR PHASE IN UTHUNGULU DISTRICT**

PURPOSE

The purpose of this letter is request the National Department of Environmental Affairs Directorate of Sector Education and Training and Development to offer assistance of providing accredited Fundisa for Change training to thirty (30) educators in the senior phase in uThungulu Educators during winter school holidays. Training could be provided during one of the two proposed weeks (13-15 July 2015) or (21-23 July 2015).

BACKGROUND

In March 2014 about sixty (60) educators attended Elementary Course in Environmental Education that was facilitated by North West University which National Department of Environmental Affairs funded the training. Forty six (46) educators successfully completed the training by submitting portfolios to the NWU and were awarded the certificate in February 2015 during School Environmental Education Programme District Summit.

Appendix 37

KZN Fundisa for Change training invitation for participants



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA



edtea

Department :
Economic Development, Tourism and
Environmental Affairs
PROVINCE OF KWAZULU-NATAL

The National Department of Environmental Affairs, in partnership with The KZN Department of Economic Development, Tourism and Environmental Affairs

hereby invi to the

Fundisa For Change Workshop , which will be held as follows:

DATE: 18 to 20 August 2015

VENUE: Tre Fontane Lodge,

1 ABBOT FRANCIS ROAD, MARIANNHILL, PINETOWN

For more information please contact:

@kzndard.gov.za

Tel:

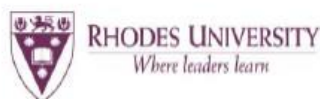
Fax :

NOTE:

1. Accommodation, transport and meals will be paid by Department of Environmental Affairs.
2. All educators will be sleeping over.
3. Please bring your NS curriculum document/s, textbook/s, laptops and USB (Min. 8 gigs).

Appendix 38

KZN training programme



FUNDISA FOR CHANGE 3 DAY WORKSHOP ON CLIMATE CHANGE



University of KwaZulu-Natal

Guest lecture on the Greenhouse Effect by of SANBI

Day One: Tuesday

Date: 18 August 2015

Fundisa UNIT 1: THE EVOLVING PLANET

Time	Duration of session	Event
8h00-9h00	1 hour	Welcoming, introductions And orientation to Fundisa for Change programme ZS
9h00-11h00	2 hours	20min ICE Breaker: Teaching Climate Change with a Change in Attitude SM 45 min lecture: Climate Change and Associated Concepts Explained, Earth's Ages and Changes (Poster from Fundisa P.14) GH 30 min peer activity (Earth from Space Pic, P.20) SM 25 min feedback/report back
11h00-11h20	20 min	TEA BREAK
11h20-12h45	1 hour and 25 mins	45 min lecture : Climate as a complex interaction between multiple actors: GH 30 min: Globe demonstration and small group activity SM 30 min feedback/report back
12h45-13h30	45 min	LUNCH
13h30- 15h00	1, 5 hours	45 min lecture on Assessment and Cognitive levels using Table on Solar System (Milankovich cycle) SM 45 min activity: Create a worksheet and rubric SM
15h00-15h20	20 min	TEA
15h20- 16h00	40 min	Consolidation of material + Q and A SM and GH
14h15-14h35	20 min	TEA
14h35- 15h00	25 min	Consolidation of material via flashdrive loading + Q and A , course evaluation GH and SM

Appendix 39

KZN participants' assessment task on sustainable living

ST. 5 SUBSTANTIATED STEPS TO ADDRESS C.C. (20)

ENERGY SAVING: Children at schools are the "disciples". They will carry "the word" home. I would start a programme/policy which ensures that every class has a monitor (rotational) who will switch off lights when it is bright and when the learners leave the room. They must do the same at home. Send a memo to parents at this is good practice and they must assist the child by buying into the idea. Do an audit before & after. Give a special badge "Energy-saver monitor".

GREENING: Every grade must be taught about the 2s and CO₂; global warming and climate change. This must emphasize the importance of tree-planting. Celebrate Tree Week on a big scale, with posters and competitions and tree-planting events. I would go a step further and Adopt-a-Spot in the community.

WATER SAVING: Have a group of learners who will report all dripping taps! Also, close all taps.

LITTER: Community clean-up campaigns. Declare your school a Litter-free zone.

COMPOST: Feed back the organic material into the earth. Have a reward system for learners who bring their fruit and vegetable waste to school to "feed" the garden.

$\frac{18}{20}$

Strategies for my School

As a teacher I'll work in collaboration with my local authority such as districts to get advice on climate change and energy saving. Apply for the collection of hazardous waste. Health and safety at work, water resources. - 3

Involves learners in practical projects around by using recycling things such as plastic bottles, plastic bottles, papers or cardboard etc. It will help the school as well as the community for saving money to buy new products. 4

Encourage learners to use bicycle or walk instead of using transport. Encourage to have garden in our homes to minimize the flying power. 2

To tackle climate change and to work with residents and partners to reduce the city's Carbon dioxide. - 2

$5 \times - = \frac{11}{20}$

Appendix 40

Approval of Fundisa for Change programme by the Department of Basic Education



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Private Bag X895, Pretoria, 0001, Sol Plaatje House, 222 Struben Street, Pretoria, 0002, South Africa
Tel.: (012) 357 3000, Fax: (012) 323 0601, www.education.gov.za

Ref no:
Enquiries: Mr. H Mahomed
Tel: (012) 357 3686
Fax: (012) 324 4484
E-mail: Mahomed.h@dbe.gov.za

Ms V Malema
Director: Biodiversity Education Empowerment
Private Bag X101
Pretoria
0001

By fax: 086 586 1471

Dear Ms Malema

A TEACHER DEVELOPMENT PROGRAMME IN ENVIRONMENTAL EDUCATION WITH A FOCUS ON NATURAL SCIENCE AND GEOGRAPHY IN THE SCHOOL SYSTEM

A request for the implementation of teacher development programme in environmental education with a focus on natural sciences and geography in the school was approved.

We hope that your quest for the development and piloting of a strong environment and sustainability resource for teacher education will be successful.

Any effort on working towards the improvement of our teachers thus benefiting our students is greatly appreciated by the department.

Yours sincerely

MR T KOJANA

ACTING DIRECTOR-GENERAL: TEACHERS, EDUCATION HUMAN RESOURCES AND INSTITUTIONAL DEVELOPMENT

DATE: 18/06/2013