

An action research study exploring how three Grade 9 teachers
develop their understanding and practice of
'Education for Sustainable Development'

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Abstract

The purpose of this action research study was to explore how three Grade 9 teachers developed their understanding and practice of Education for Sustainable Development (ESD) through the use of a participant-designed intervention. ESD may be simply understood as a concept that describes all educational activities concerned with developing an understanding of the relationships that exist among the issues of SD. ESD and SD are terms that hold many meanings. It is no wonder that teachers find it difficult to bridge their understanding and practice. Literature supports these ideas and also notes that the lack of awareness that teachers have about ESD is due to the poor attention it is given in school policy. This study suggests that self-directed professional development could address such a shortfall in schools. The action research study involved four steps of reconnaissance-planning-action-reflection. These steps unfolded within three phases of development, namely: the pre-intervention phase, the intervention phase and the post-intervention phase. The ESD principles were used to identify the teachers' understanding and practice of ESD during the pre- and post-intervention phases. During the intervention phase teachers as co-researchers were then responsible for designing an intervention that they thought would help develop their understanding and practice of ESD. This study was seen to employ co-engaged professional development. The findings of this research served to inform teachers, ESD promoters, resource development workers and relevant UNESCO officials of the challenges and experiences facing teachers attempting to understand and practice a meaningful and much needed ESD. The findings also served to reveal the benefit that engaging teachers in action research and professional development has on teacher professional development. Findings suggest that teachers require certain conditions in

order to engage in professional development. These conditions include: (1) Collaborative meetings in a neutral context within the framework of action research; (2) Verbal communication and sharing of ideas; (3) Sharing of resources and local media; (4) Opportunities for reflection; and (5) An outside facilitator.

Teachers showed a great sense of empowerment as they displayed evidence of teacher efficacy. This research concludes that action research, reflective practice and self-directed professional development offer modes for ESD implementation that is empowering for teacher professional development.

Table of Contents

Declaration	ii
Abstract	iii
Table of Contents	v
List of Diagrams, Figures and Tables	xiv
Appendices	xvii
Glossary of acronyms and abbreviations	xviii
Acknowledgements	xx

Chapter 1 – ‘Plotting the co-ordinates’

1.1. Introduction.....	1
1.2. Purpose of study.....	2
1.3. Rationale.....	4
1.4. The Research Problem and Research Questions.....	8
1.5. Brief overview of the Research Design.....	10
1.6. Overview of the Chapters.....	11

Chapter 2 – ‘Exploring the landscape’

2.1. Introduction.....	15
2.2. Defining ‘Development’.....	16
2.3. Sustainable Development.....	18
2.3.1. Defining Sustainable Development.....	18

2.3.2. Working towards a realisation of Sustainable Development.....	23
2.3.3. Agenda 21 - A plan for realising Sustainable Development.....	24
2.3.4. Education as a tool for realising Sustainable Development.....	25
2.4. Education for Sustainable Development.....	26
2.4.1. Defining Education for Sustainable Development.....	27
2.4.2. The Goals and Principles of the United Nations Decade of Education for Sustainable Development.....	30
2.4.3. Reorienting Education towards ESD – The Challenge.....	32
2.4.4. Learning for Sustainable Living in Kenya.....	36
2.4.5. Implementing ESD – A Southern African report.....	40
2.4.6. Paving the way for ESD implementation.....	42
2.4.7 An Education for Sustainable Development Toolkit.....	45
2.5. Teachers as Curriculum Implementers versus Implementers and Designers.....	48
2.6. Reflective Practice for Teacher empowerment and Professional Development.....	52
2.7. Supporting Professional Development through Learning Theories.....	57
2.7.1. Situated Learning.....	57
2.7.2. Constructivism.....	61
2.7.2.1 A Group ZPD.....	62
2.8. Embracing Change for Professional Development.....	65
2.8.1. Teachers as Change Agents.....	66
2.8.2. Self-directed Professional development.....	69
2.9. Using Action research to address teacher professional development.....	74
2.9.1. Exploring the characteristics of action research.....	75

2.9.2. Benefits of action research.....	77
2.9.3. Engaging in the process of action research.....	78
2.9.4. Locating action research within professional development and empowerment...81	
2.9.4.1. <i>Action research – A tool for professional knowledge development.....</i>	85
2.9.5. Forging partnerships through action research.....	86
2.10. Conclusion.....	88

Chapter 3 – ‘Mapping out the journey’

3.1. Introduction.....	90
3.2. Contexts of the study.....	90
3.3. Accessing and selecting the research participants.....	92
3.4. Research participant roles.....	92
3.5. Action research as a methodology.....	98
3.5.1. The action research cycle structure.....	99
3.6. Data collection methods and instruments.....	103
3.6.1 Methods and instruments fit for purpose.....	103
3.6.1.1. <i>A pre-lesson interview.....</i>	105
3.6.1.2. <i>Analysing lesson plans.....</i>	107
3.6.1.3. <i>A lesson observation.....</i>	108
3.6.1.4. <i>A post-lesson video stimulated recall interview.....</i>	109
3.6.1.5. <i>A final group interview.....</i>	111
3.6.2. Data collection instrument for continuous reflection across the cycle.....	113
3.6.3. Instruments fit for purpose.....	114
3.7. Data analysis methods.....	117
3.8. Research rigour.....	119
3.9. Ethical considerations.....	121

3.9.1. Participant access.....	121
3.9.2. Confidentiality.....	123
3.10. Limitations of the research design.....	124
3.11 Limitations of the data.....	125
3.12. Conclusion.....	126

Chapter 4 – ‘The pre-intervention phase’

4.1. Introduction.....	128
4.2. An introduction to the three teachers.....	129
4.3. Understanding and practice of ESD.....	131
4.3.1. Jays’ understanding and practice of ESD.....	131
4.3.1.1. <i>Jays’ understanding of ESD</i>	132
4.3.1.2. <i>Jay’s practice of ESD</i>	135
4.3.1.3. <i>Jay’s understanding and practice of ESD</i>	143
4.3.1.4. <i>The role of reflection in establishing Jay’s understanding and practice of ESD</i>	145
4.3.2. Kay’s understanding and practice of ESD.....	148
4.3.2.1. <i>Kay’s understanding of ESD</i>	148
4.3.2.2. <i>Kay’s practice of ESD</i>	151
4.3.2.3. <i>Kay’s understanding and practice of ESD</i>	156
4.3.2.4. <i>The role of reflection in establishing Kay’s understanding and practice of ESD</i>	157

4.3.3. René’s understanding and practice of ESD.....	160
4.3.3.1. René’s understanding of ESD.....	161
4.3.3.2. René’s practice of ESD.....	164
4.3.3.3. René’s understanding and practice of ESD.....	171
4.3.3.4. The role of reflection in establishing René’s understanding and practice of ESD.....	173
4.4. A cross-analysis of three teachers’ understanding and practice of ESD.....	177
4.5. Conclusion.....	181

Chapter 5 – ‘The intervention phase’

5.1. Introduction.....	182
5.2. Planning step of the intervention phase.....	183
5.2.1. The context of meeting one.....	183
5.2.2. Teachers get acquainted.....	184
5.2.3. Developing a group understanding of ESD.....	185
5.2.4. Deciding on a plan to develop their understanding of ESD further.....	188
5.2.5. Teachers’ reflections regarding the planning step.....	196
5.3. Action step of the intervention phase.....	197
5.3.1. The context of the first action meeting.....	197
5.3.1.1. <i>Sharing Knowledge – A strategy for development</i>	198
5.3.1.2. <i>Methods to ensure ESD implementation</i>	200
5.3.1.3. <i>Factors influencing ESD implementation</i>	204

5.3.2. The context of the second action meeting.....	206
5.3.2.1. <i>Teachers thoughts about the ESD readings</i>	207
5.3.2.2. <i>Teachers share examples of their own ESD practice</i>	210
5.3.2.3. <i>Teachers share their personal difficulties of implementing ESD</i>	213
5.3.2.4. <i>The teachers motivate for the post-intervention phase</i>	213
5.4. Reflecting on the intervention phase.....	215
5.4.1. Teachers’ thoughts on their choice of intervention.....	215
5.5. Conclusion.....	219

Chapter 6 – ‘The post-intervention phase’

6.1. Introduction.....	221
6.2. Understanding and practice of ESD.....	222
6.2.1. Jay’s understanding and practice of ESD.....	223
6.2.1.1. <i>Jay’s understanding of ESD</i>	223
6.2.1.2. <i>Jay’s practice of ESD</i>	226
6.2.1.3. <i>Jay’s understanding and practice of ESD</i>	231
6.2.1.4. <i>The role of reflection in establishing Jay’s understanding and practice of ESD</i>	233
6.2.2. Kay’s understanding and practice of ESD.....	236
6.2.2.1. <i>Kay’s understanding of ESD</i>	236
6.2.2.2. <i>Kay’s practice of ESD</i>	240
6.2.2.3. <i>Kay’s understanding and practice of ESD</i>	247

6.2.2.4. <i>The role of reflection in establishing Kay's understanding and practice of ESD</i>	249
6.2.3. René's understanding and practice of ESD.....	253
6.2.3.1. <i>René's understanding of ESD</i>	253
6.2.3.2. <i>René's practice of ESD</i>	256
6.2.3.3. <i>René's understanding and practice of ESD</i>	265
6.2.3.4. <i>The role of reflection in establishing René's understanding and practice of ESD</i>	267
6.3. A cross-analysis of the reflection step of this cycle.....	270
6.3.1. The three teachers' understandings of ESD.....	270
6.3.2. The ESD principles displayed.....	273
6.3.3. Teachers' engagement in reflection.....	275
6.4. A post cycle group interview.....	276
6.5. Conclusion.....	281

Chapter 7 – 'Looking back to travel forward'

7.1. Introduction.....	283
7.2. Addressing the Research Questions.....	284
7.2.1. The teachers understanding and practice of ESD.....	284
7.2.2. How the teachers developed their understanding and practice of ESD.....	291
7.2.3. Why the teachers chose to develop their understanding and practice	

of ESD in the way(s) they did.....	295
7.3. Implications of the research.....	297
7.3.1. Action Research – An avenue for teacher empowerment.....	297
7.3.2. The role reflective practice played in teacher professional development.....	299
7.4. Supporting educational change towards an ESD focus.....	301
7.4.1. The role of constructivism in educational change towards an ESD focus.....	301
7.4.2. The role of situated learning in educational change towards an ESD focus.....	302
7.4.3. A model for educational change towards an ESD focus.....	303
7.5. The challenges and barriers facing ESD implementation.....	305
7.6. The limitations of the research.....	307
7.7. Recommendations for further research.....	308
7.8. Conclusion.....	310
References.....	311

List of Diagrams, Figures and Tables

LIST OF DIAGRAMS

Diagram 1. Diagrammatic Representation of the Group Understanding of ESD.....	187
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LIST OF FIGURES

Figure 1. A Broader perspective on the environment.....	20
Figure 2. Huckle’s ESD learning outcomes.....	29
Figure 3. O’Donoghue’s Active Learning Framework.....	33
Figure 4. Billett’s model of Appropriating Knowledge.....	60
Figure 5. Ellsworth’s Model of Change.....	67
Figure 6. Mushayikwa and Lubben’s model of attaining teacher efficacy.....	74
Figure 7. The Cogenerative Action Research model.....	79
Figure 8. Action research cycle (Adapted from Lewin (1946) & Coghlan and Brannick (2001)).....	101
Figure 9. The action research cycle indicating the steps and the phases.....	102
Figure 10. Bentham’s model of The ESD dynamic.....	304

LIST OF TABLES

Table 1. Matrix for identifying skills in Learning for Sustainable Living activities.....	39
Table 2. Matrix to identify sustainable development factors in activities.....	39
Table 3. Teacher and Researcher roles, including justification for these roles.....	93

Table 4. Data collection methods used during the ‘reconnaissance’ and ‘reflection’ steps.....	104
Table 5. Individual and Group understanding and practice of ESD at the reconnaissance step.....	288
Table 6. Individual and Group understanding and practice of ESD after the reflection step.....	290

Chapter 1

‘Plotting the co-ordinates’

1.1.Introduction

"We have not inherited the world from our forefathers - we have borrowed it from our children."

(Proverb)

This chapter serves to frame the study and provide insight into the subsequent chapters. This study focuses on how three Grade 9 teachers developed their understanding and practice of Education for Sustainable Development (ESD). ESD is a term that is explored in more detail further on but for now it may be understood as education that addresses themes that are central to the achievement of sustainability. Education for Sustainable Development requires a reorientation of formal education towards a sustainable future. A major ESD concern highlighted by McKeown (2002) is that teachers are simply handed content and concepts of ESD and expected to deliver these in their teaching. McKeown (2002) views teachers' conceptual development that is independent of teacher input as a problem and not likely to succeed. This study used a co-engaged Action Research approach to explore how three Grade 9 teachers developed their understanding and practice of 'Education for Sustainable Development'. At this point it is important at the outset to recognise that although this study serves to report on how three teachers developed their understanding and practice of ESD, due to the teachers' engagement with the action research process and thus reflective practice,

the study synonymously reveals the open-ended process of teacher professional development. Thus teacher professional development is captured in the focus on the development of professionals' understanding and practice of ESD. From this point forward the term 'Education for Sustainability' and 'Education for Sustainable Development' will be used synonymously.

This chapter is organised according to three foci. Firstly, the purpose and the rationale for doing this study is presented. Secondly the problem statement which focuses on the research questions and the concerns raised in recent research on ESD implementation is explained. Thirdly a brief summary of the main points to be covered in each chapter is presented in the form of a chapter planner.

1.2. Purpose of study

The purpose of this study was to explore how three grade 9 teachers developed their understanding and practice of Education for Sustainable Development (ESD) through the use of a teacher-designed¹ intervention. The term 'understanding' does not refer merely to the teachers' knowledge as assessed in a diagnostic way, rather 'understanding' refers to the teachers' knowledge as represented in their verbal expressions as well as in their practice. Therefore in exploring how three grade 9 teachers developed their understanding and practice, the teachers' emotional, conceptual, practical and professional development experiences are highlighted.

¹ Teacher-designed – refers to that which is initiated and created by the teacher.

ESD may be simply understood as a concept that describes all educational activities concerned with developing an understanding of the relationships that exist among the issues of sustainable development. However, the principles that underpin such educational activities are far more complex (United Nations Educational Scientific and Cultural Organisation, 2005).

This study recognises that educational practice and educational reform is constantly influenced by modernisation and therefore also shaped by the concerns emanating from local and global markets at the time. Popkewitz (1993, p.1) captures this perfectly as he states that,

Educational reform has been the constant object of state action in industrial countries since the end of World War II...Throughout this period, the focus of reform has been on problems that arise in modernizing economies and in producing a cultural consensus through schooling. For the most part, the strategies adopted have been intended to rationalize educational systems in ways that would align them with changing national goals and economic structures and provide flexible responses to fiscal concerns and cultural pressures that emanate from national and international sources.

Through the employment of action research this study aimed to offer teachers an opportunity to explore their own educational practices of ESD, thus granting power to the teacher as a professional. Although teachers' educational practice is strongly influenced by greater national and global policies, teachers themselves still need to position the implementation of such policies within their own context. This study identifies that by teachers engaging in action research, they reflect on their actions and experiences of developing their understanding and practice of ESD within their context.

It is desired that the findings of this research may serve to inform teachers, ESD promoters, curriculum developers, materials development personnel and relevant UNESCO officials of

the challenges and experiences that teachers face when they attempt to understand and practice ESD.

1.3. Rationale

In this section I discuss why the need for the study that I have chosen and its importance for education. As the chairperson of an environmental organization on a university campus, I am involved in developing student awareness and action with regard to campus-related environmental issues. I have drawn student attention to newspaper articles addressing sustainability issues and organised various environmental activities for them to participate in. From my involvement in these activities I have noticed that much environmental concern displayed through media focused upon the impact that humans have on the biosphere and its future. One such example was a News24 newspaper article titled “Call for global enviro rules”, which appeared on the 16th August 2002. This article referred to the unsustainable practices of large companies in South Africa (News24, 2002). Concern of a similar nature was raised at the World Summit on Sustainable Development (WSSD) in Johannesburg (2002) by a key note speaker, Remengesau. He stated: *“Realistically, if we do not come together, now, here in Johannesburg, and solve the issue of the distribution of wealth and opportunity, the world, as we know it will rapidly slip from our grasps”* (Remengesau, 2002). When raising concerns about sustainability in South Africa one need only look at the intense poverty and high proportion of children out of school to understand the problem in conducting ones activities in unsustainable fashions (Alfred Nzo District Municipality, 2007). It is not surprising therefore that an education that aims to promote a sustainable future is

being given attention within global planning documents such as Agenda 21. Agenda 21 highlights the main principles of ESD as follows:

“The core themes of education for sustainability include lifelong learning, interdisciplinary education, partnerships, multicultural education and empowerment. Priority should be given to ensuring women’s and girls’ full and equal access to all levels of education and training. Special attention should also be paid to the training of teachers, youth leaders and other educators. Education should also be seen as a means of empowering youth and vulnerable and marginalized groups, including those in rural areas.”

(United Nations Conference on Environment and Development, 1992, p.74)

South Africa as a United Nations member nation is obliged to adopt the guidelines stated within Agenda 21. The South African adoption of these guidelines is evidenced in its Education policy documents e.g. the Revised National Curriculum Statement documents (Department of Education, 2002).

Central to the success of ESD in South Africa is the Revised National Curriculum Statement document (RNCS). It is a document that guides teachers in their implementation of the curriculum content by specifying the learning outcomes that learners need to achieve. The RNCS (DoE, 2002) highlights the critical and developmental outcomes which are applied across all eight learning areas (e.g. Natural Sciences, Technology, Life Orientation etc.) offered in South African schools. It is the role of ‘learning area’ teachers to ensure that these critical and developmental outcomes are promoted and assessed as far as possible (DoE, 2002). The principles that underpin the critical and developmental outcomes are closely aligned with the principles of education for sustainable development. Both require learners to

solve problems; think critically; organize and manage themselves and their activities responsibly; critically evaluate information; use science and technology responsibly considering the environment and the health of others; participate as responsible citizens; as well as be culturally sensitive across social groups (DoE, 2002). Teachers are viewed by the Department of Education (2002) and by UNESCO (2005) as valuable and critical implementers of these RNCS and ESD outcomes, respectively, in their practice.

“We cannot imagine how the people of all nations could move toward a more sustainable world without the contribution of educators [teachers] from around the globe.”

(UNESCO, 2005, p.11)

The term stretches across all roles involved in education, such as school teachers, lecturers and education officers of various organisations.

Amidst all this policy urging teachers to develop learners towards achieving a more sustainable future is the question ‘How do teachers develop learners towards a sustainable future when they themselves are uncertain about what this means and requires?’ Chisholm (2003) reflects on the move from the South African apartheid education system to Curriculum 2005 as an attempt to create a more open-ended and non-prescriptive curriculum which gave teachers the responsibility and freedom to design their own learning programmes. The new curriculum requires that teachers are no longer mere implementers as they were under the South African apartheid education system, but rather implementers and designers of curriculum. However, according to Chisholm (2003) the review of the curriculum in 2000 revealed that teachers have been overloaded with policy and receive poor policy orientation and development assistance. In recognising the drive for teachers to be implementers of

policy and designers of learning programmes aligned to policy, it is only fair to also recognise the steps that teachers have to take in attempting to develop themselves into active designers and implementers of curriculum. The implication for ESD, taking into consideration Chisholm's (2003) stance on the role of the teacher as designer and implementer, is that teachers would need to engage in developing their own understanding of ESD in order to engage themselves in designing and implementing an ESD focused curriculum.

Another significant event linked to ESD was the 'World Environmental Education Congress' (WEEC), hosted in Durban, South Africa in 2007. The theme of the conference was 'Learning in a changing world'. The chair of the WEEC, Mumsie Gumede (2007) stated in her opening address to the participants, that such a congress could open a window of opportunity whereby education as practice and theory may be analyzed according to its potential for achieving the international goals of a more successful future. Gumede (2007) highlighted an important issue which was the role which education needs to play in realizing sustainable development, without which, the future would appear dismal.

The main principles and considerations outlined by ESD, C2005 and Mumsie Gumede are valid for the South African and international contexts. Concern regarding the success of international goals for a more successful future lies in the realization of these goals within education. As a novice qualified teacher I have observed that many of my peers do not implement the principles outlined within ESD in their practice. Some teachers have successfully implemented 'Green' projects within their schools (e.g. Eco-Schools), but these Green projects focus mainly on waste and resource management and not on the social and economic tenets of environmental sustainability. Share-Net (1995, p.8) acknowledges many

teachers' emphasis on "nature-centred" or 'Green' methods when looking at the environment. However Share-Net (1995) informs that the environment and thus the sustainable development of the environment require consideration of the social, economic, political and biophysical aspects as well as the interactions that exist between these. In reflecting briefly on the history of Environmental Education in South Africa, it may be seen how EE shifted from a purely "wildlife and wilderness" (Rosenberg, 2009, p.8) stance to in the 70's and 80's focusing on the interrelationship of ecological, social, economic and cultural components of the environment. It was not until the late 90's that the political tenet was also involved thus bringing about the first revision of school curriculum in South Africa (Rosenberg, 2009). It is clear from this brief review of the history of EE that in South Africa EE and ESD are used synonymously, despite global debates around its differences.

ESD itself often lacks holistic implementation within disciplines not related to the Natural Sciences. Literature indicates that teachers fail to address ESD due to their lack of understanding regarding what sustainable development means (Summers, Childs & Corney 2005; Seybold & Reib, 2006). My study aims to explore this and where necessary, address such a short fall as my research focuses on teachers and how they shape their ESD practice.

1.4. The Research Problem and Research Questions

A number of valuable findings have contributed to the awareness that ESD is an insufficiently explored field within education (Seybold & Reib, 2006; Summers et al., 2005).

The assumption that awareness of environmental crises leads to change in peoples' actions without experiencing any problems has been challenged through numerous findings (Shallcross, Loubser, Le Roux, O'Donoghue & Lupele, 2006; Sterling, 2001). Schnak (1995) and Shallcross et al. (2006) suggest that this inability to change peoples' attitudes and actions could be due to a lack of action-taking with regards to environmental crises. Basically if individuals took part in environmental projects that addressed environmental crises, the positive results would help to change peoples' attitudes and actions. Le Roux (2003) reported on how environmental education is conveyed to schools through extra-curricular competitions and activities and is not seen as an integrated school focus. Research also reports on the ability of school-going children to improve community conditions during the 2000 cholera outbreak in KwaZulu-Natal by teaching adults good health practices through formal education (SANTAG, 2000, 2001). This argues for the need for teachers to expose students to an integrated approach to education such as that advocated within ESD. The mere existence of the need however, does not imply the automatic existence of the means. The means to solving the problem often offers a greater challenge in itself.

A study by Summers *et al.* (2005) focused on Oxford University PGCE (Postgraduate Certificate of Education) students' perceptions of sustainable development. A similar study was embarked upon by Seybold and Reib (2006) who focused on exploring the importance of both environmental education (EE) and ESD. This study was conducted in Germany and used the survey method to identify teachers' understandings and practices of EE and ESD. Findings in Summers et al. (2005) and Seybold & Reib (2006) are that teachers and student teacher mentors have an understanding of ESD that range from poor to nil. These findings also provide knowledge about teachers' difficulties and inability to resolve tensions

between policy, school culture, resources, and personal values and enthusiasms when addressing ESD.

It is due to these and similar findings that the following research questions were developed to frame my study:

1. What are Grade 9 teachers' understanding and practice of education for sustainable development?
2. How do Grade 9 teachers develop their understanding and practice of education for sustainable development?
3. Why do Grade 9 teachers develop their understanding and practice of education for sustainable development in the way(s) they do?

On the basis of these research questions, the following research design is proposed to seek for possible answers.

1.5. Brief overview of the Research Design

The study involved three Grade 9 teachers from three different schools in Durban. Two of the teachers had been teaching for more than 10 years and one was in her second year of teaching. A prerequisite to selecting these three teachers was that they had to be interested in the aim of the study and willing to participate in the action research approach to the study. The study involved one cycle of action research in which there were four steps. The first step was the 'reconnaissance' step of this cycle and it involved a pre-lesson interview, lesson observation and post-lesson Video Stimulated Recall interview. This step involved a baseline

study, looking at what Grade 9 teachers understood by ESD and how they practiced ESD in their lessons. The second and third steps of the Action Research cycle were the ‘planning’ and ‘action’ steps which involved all three Grade 9 teachers coming together to design their own intervention. The intervention served as an opportunity to observe how teachers may attempt to design their own development. The fourth step, the ‘reflection’ step of the action research cycle followed a similar format of data collection. The only difference between the reconnaissance and the reflection steps however is in the ‘reflection’ step of this cycle I conducted a group interview to get teachers to reflect back on various steps within the cycle and on the cycle as a whole. The ‘reflection’ step aimed to explore how the Grade 9 teachers understood and practiced ESD after their intervention. Teachers were encouraged to keep reflective journals of their thoughts and feelings during the entire process.

1.6. Overview of the Chapters

Chapter 2 explores the conceptual and theoretical frameworks that offer a foundation from which the data collected in this study may be synthesised and analysed. The chapter begins by developing the conceptual framework which will serve to make meaning of the findings to come. This is achieved by presenting debates, opinions and research findings that exist around conceptual themes of development, sustainable development and finally education for sustainable development. This exploration of these three conceptual themes provides an insightful look into the deeper need for addressing education for sustainable development (ESD) in South Africa and the global community at large. This chapter clearly defines the

principles of sustainability education (ESD) and the challenges that it poses to teachers as implementers.

Chapter 2 also takes a look at how ESD is supported by South African policy and by global participants at large. Finally the chapter takes a deeper look at teachers as professionals and what would be required from them in order to address the challenges that ESD offers. The chapter then focuses on the theoretical framework of this study which includes critical theory and reflective practice. The chapter critiques the roles that teachers play and the opportunities that they are given to empower themselves in the system today.

Finally chapter 2 serves to outline the function and purpose of action research and to what degree the teacher-researchers in this study participate in their own development with regards to ESD understanding and practice. The characteristics of action research are explored. The functionality of action research in achieving teacher professional development is constantly alluded to in order to substantiate the use of action research in this study. A deep understanding of the action research approach was developed through a wide analysis of literature.

Chapter 3 explains the research methodology adopted in this study. The chapter displays and explains the cycle steps within the action research cycle. Concluding each of the steps of the action research cycle is the action of ‘reflection’. This chapter as a result also describes the purpose and function of reflection and the instruments designed to capture ‘reflection’ data.

Chapter 3 includes a detailed description of my roles as a researcher, the roles of the participants involved, the context in which the study evolved, and the techniques used to ensure that the qualitative data collected is trustworthy. All the instruments designed are

described according to their function and instance in which they are to be used. Finally the chapter identifies the ethics involved in conducting such a study.

Chapter 4 presents and categorises the data according to essential themes identified during the course of the study. Data for the pre-intervention phase which marks the reconnaissance step for each of the three participant teacher-researchers is presented according to four foci. Firstly the teachers' 'understanding of ESD' revealed from the pre-lesson interview is presented. Secondly the teachers' 'practice of ESD' is presented via an analysis of the teachers' lesson planning documents, lessons observed, and post lesson VSR interviews. Thirdly main findings from both the previous analyses of the teachers 'understanding' and then 'practice' of ESD are brought together to provide a holistic view of what the teachers' understanding and practice of ESD is at that point. Finally reflective data was analysed to add perspective on what role reflection played in the activities that teachers engaged with. Each teachers' data was separated within the chapter, except for a particular section of this chapter that serves as a cross-analysis of the reconnaissance step. This chapter serves to present the data in an open and organised manner, lifting important themes that emerged from the data.

Chapter 5 provides an analysis and presentation of the data collected during the intervention phase of this action research cycle. This intervention phase, which marks the 'planning' and 'action' steps of the action research cycle, involved one planning meeting and two action meetings. These meetings were analysed to reveal the methods that the three teachers used to develop their understanding and practice of ESD.

Chapter 6 presents data much in the same way as chapter 4 except for one addition. This chapter presents data for the post-intervention phase which marks the reflection step of the action research cycle. For each of the three participant teacher-researchers the data is presented according to the same four foci mentioned in the overview of chapter 4 above. The addition in this chapter exists in the presentation of data from the final post-cycle group interview that took place at the end of the action research cycle.

Chapter 7 presents the answers to the three main research questions that guided this study. The chapter also discusses the role that reflection, action research and educational change played in the teachers' implementation of ESD within their contexts. This concluding chapter also provides one new model that offers another way to view both innovation implementation and ESD. This chapter also outlines the challenges facing teachers trying to implement ESD and other education based innovations. Finally the chapter suggests the limitations of this research study and recommendation for further research.

Chapter 2

‘Exploring the Landscape’

2.1. Introduction

The following literature review reveals the concept of sustainable development from an array of perspectives and discusses how these perspectives explain the world to which we belong. The review also reveals a variety of opinions regarding the worth of Education for Sustainable Development within the school curriculum, as well as the challenges posed by its implementation (Huckle, 2001; McKeown, 2002; Lotz-Sisitka, Olvitt, Gumede & Pesanayi, 2006). As teachers are considered herein as the core implementers of sustainability concepts in the school curriculum (Calder & Clugston, 2003), literature also serves to illuminate how teachers are viewed and view themselves as professionals (Huckle, 2000, 2001; McKeown, 2002 & UNESCO, 2005). The chapter reviews suggestions as to the conditions required before a successful implementation of ESD may be achieved, as well as guidelines to assist teachers in starting to address ESD in their teaching.

This chapter acknowledges the role of the teacher as an implementer and designer who is faced with the task of incorporating ESD into the existing curriculum. This chapter further suggests that the use of reflective practice will assist teacher empowerment and professional development. Since teachers are seen as targets of policy implementation and change (DoE, 2002; UNESCO, 2005), this chapter attempts to emphasise the need to provide teachers with more autonomy with respect to innovation interpretation and

implementation. It has also been identified that the mastery of any new innovation can become a stressful task (McKeown, 2002). Therefore it needs to be clearly stated that this study aims to reveal how teachers develop or attempt to develop themselves to the point of efficient innovation implementation. During the process of professional development teachers engage in a process of situated learning and function within a constructivist framework, where teacher professional development is seen as a process of constructing and reconstructing their practical knowledge (Billett, 1996). The chapter further elaborates on models of professional development and educational change.

2.2. Defining ‘Development’

If the complexities of the terms ‘sustainable development’ and Education for Sustainable Development’ are to be later understood, it is important to also explore the complexities that exist in the understanding of the term ‘development’. The term ‘development’ may seem straight forward however its interpretation depends largely on the values of the user of this term. According to Capra (2005) there is one common way in which ‘development’ is interpreted and this relates to economic growth. Hasan (2006) extends this meaning by referring to development as the attainment of economic and social goals at a particular rate. The International Union of Conservation of Nature and Natural Resources (1980) however, defines development as the changing of the biosphere and the use of human, financial and living and non-living resources to provide humans with their needs, resulting in improved quality of living.

Rosenberg (2004) explains that viewing 'development' as economic growth disempowers the poor as it works on principles of competitive global capitalism whereby the rich get richer and the poor become poorer. Rosenberg (2004) further comments that this way of viewing 'development' is dangerous as it suggests that the best way to address poverty is to ensure economic growth which will eventually effect and benefit the poor. Rosenberg's views are supported by the UNDP report (2002), which states that there is no indication that with increased economic growth there is decrease in unemployment. Finally Rosenberg (2004) states that the commonly held idea by the general public that what South Africa produces and consumes indicates her economic growth, regardless of the environmental effects, is a damaging and careless one. Although economy is most certainly an aspect of development, it cannot be the sole focus as this plays into the exploitive hands of capitalism which relies upon the degradation of the natural environment to ensure its own growth. My view is that these definitions of development are anthropocentric as they are only concerned with human benefit irrespective of the sustainability of the biophysical world in which we humans live and are a part of. The threat presents itself as we often ignore the damaging effects that increased industry and unsustainable 'development' may pose to the biophysical environment upon which we completely rely (Garber, 2008). It is for this reason that I believe that one should aspire to conceive development only in terms of what I refer to as 'sustainable' development.

Huckle (2000) acknowledges the benefits that economic development has had on society. These benefits include social equity, human rights, freedom of choice and more efficient health services. The problem noted by Huckle (2000) however, is that these benefits are not experienced by the poor and a great divide exists between those that enjoy the benefits of development and those that are subjected to its side effects (Huckle, 2000). The side

effects noted by Huckle include “*cultural and social exclusion*” as well as “ecological and economical instability” (2000, p.1). Living in an unsustainable manner is not only about not enough resources² for all, but it is also about the suffering of those who do not have the means to meet their physical, emotional and mental needs (Huckle, 2000). When referring to ‘development’ perhaps what we need to be most conscious of is that development on its own does not imply a sustainable focus. We therefore need to couple sustainability with development to ensure environmental, political, social and economic progress. Even on the coupling of the terms ‘sustainable’ and ‘development’, teachers are still faced with the task of interpreting what the term ‘sustainable’ means.

2.3. Sustainable Development

The following exploration of literature offers an informed understanding of the concepts *Sustainable Development (SD)* and *Education for Sustainable Development (ESD)*. In attempting to define sustainable development various viewpoints and sources have been considered and cited. These viewpoints draw on some interpretations of the term ‘development’, previously discussed. The exploration of literature below also draws on international planning documents and policy for the address of SD in education. One such document is Agenda 21. Finally the review explores in more detail the concept of ESD and the role education and teachers are expected to play in its implementation.

2.3.1. Defining Sustainable Development

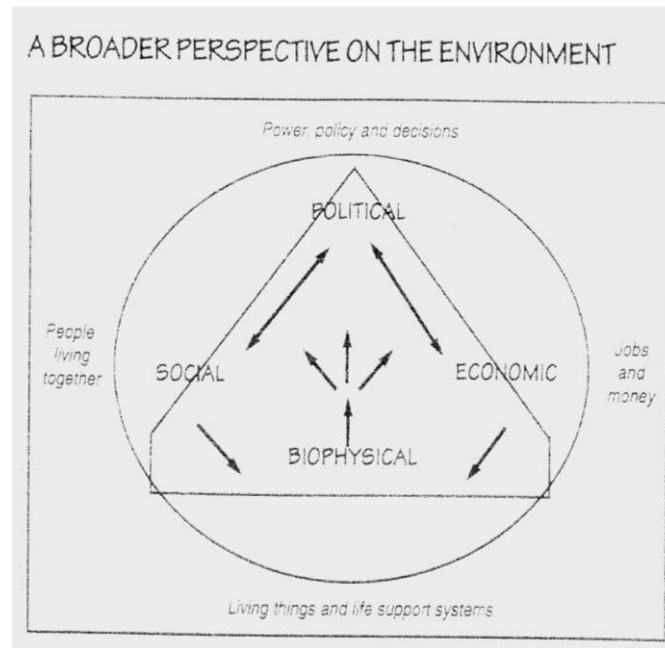
Sustainable development is described by the Brundtland Commission (1987) and within Agenda 21 (UNCED, 1992) as a way of using resources that does not negatively impact on

² Resources – refers to both natural, man-made and services of a limited nature

the biophysical, social and economic aspects within the global environment. Both the Brundtland Commission and Agenda 21 are international planning documents that aim to address sustainable development. Significant here is the equal value placed on the different aspects within the environment, as opposed to an economic focus only. This is the difference between ‘development’ and ‘sustainable development’ as understood by the WCED (1987). The political aspect of the environment is seen to permeate the biophysical, social and economic aspects. This description of sustainable development also supports the use of resources in a way that does not negatively impact on the ability for future generations to satisfy their basic needs. The Chair of the World Commission on Environment and Development, Gro Harlem Brundtland simply defined sustainable development as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*” (WCED, 1987, p. 43)

Gro Harlem Brundtland’s definition of sustainable development leaves a lot open to interpretation, including on the basis of personal interest. Within the final report of the WCED (1987) entitled “Our Common Future” the influence of political, economic and resource management structures is recognized when engaging in discourse around sustainable development. Although a general understanding of sustainable development that encompasses the social, economic, biophysical and political aspects of the environment has been accepted, there are varying realities of sustainable development that persist (Huckle, 1991). However the model in Figure 1 below displays the interactions that do need to be drawn between the biophysical, social, economic and political aspects of the environment when attempting to understand the dynamics that need to be considered in sustainable development.

Figure 1. A Broader perspective on the environment



(Share-Net, 1995, p.8)

These varying realities referred to earlier are understood by Hattingh (2002) and Hasan (2006) who point out that often one aspect of the environment is considered more important than the others with which it interacts. An example would be placing more emphasis on the economic aspect of the environment than the social, political and biophysical, thus leading to unsustainable practices.

Any discussion on sustainable development needs to acknowledge its contentious nature (Huckle, 1991). This nature is evident in that Hattingh (2002) identifies three main ways in which the term 'sustainable development' has been interpreted. Hasan (2006) also identifies three notions of sustainable development and attributes each to a preferred agenda. The first interpretation of sustainable development highlighted by Hattingh (2002) views the maintenance of nature as a priority, whether or not humans benefit. This

interpretation claims that the Laws of Nature regarding carrying capacity apply to all living organisms and should therefore also apply to humans. Carrying capacity refers to the maximum number of organisms of a particular population that an ecosystem can support at a given time (Catton & Dunlap, 1993). The view can be criticized as it implies that the earth can support a limited number of people. Hasan (2006) further defines this notion of sustainable development as a purely eco-friendly view whereby sustainable development refers to the restriction of any kind of unsustainable practice in order to preserve the environment. The model in Figure 1 displays a broader view of the environment which is usually portrayed narrowly as a biophysical focus.

The second interpretation of sustainable development focuses on the satisfaction of human needs by way of economic growth (Hattingh, 2002). Similarly Hasan (2006) states that some view sustainable development as the aim to maintain an increasing economic growth. This view holds that any human's main role is a possessor and generator of capital. In this interpretation value is laid only upon the usefulness of nature with regards to satisfying human needs and as a result little emphasis is placed upon the protection of the natural environment. This interpretation of sustainable development was emphasized in the Rio Declaration within Principle 1 where humans are acknowledged as being at the centre of concerns regarding sustainable development (1992). I find this interpretation of sustainable development to be anthropocentric as it places the support of human lifestyle paramount to the lifestyle of all living organisms.

The third and final interpretation raised by Hattingh (2002) views sustainable development as activity that can be maintained indefinitely. This involves the view that all life is to be valued, not only human life, thus making human benefit subject to the laws of carrying

capacity. Hasan (2006) refers to this notion of sustainable development as ‘inter-generational’ equity which considers the fulfilment of generations’ social, economic and physical needs without compromising future generations’ abilities to realize their needs. Although this view is far more general and therefore more difficult to manage, it would seem that it considers the sustainable practice of humans’ considering and co-existing with their habitat, the biosphere.

Each of these views has their value towards SD. For example, economic support is crucial in order to ensure equal distribution of resources within developing countries. However a solely economic motive would prove unsustainable in the event that resources were to be exploited for economic gain and secondly that this gain may in some instances benefit only the minority population of the upper class. The idea of restricting unsustainable practices of any kind is understandable in a world confronted by global warming. However, completely extinguishing any processes that generate pollution today would have detrimental effects on the global economy thus accentuating poverty. Major industries (farming, fishing, mining, factories etc.) that are responsible for mass production today, provide a means for income, food, medical supplies, shelter etc. We should rather have an approach in which these activities are moderated.

A second notion presented by Hasan (2006) adopts the notion within the WCED, which acknowledges the need to consider society, economy and environment and its interconnectedness in achieving holistic sustainable development. This study adopts this notion of sustainable development, as elaborated upon by Hasan (2006) and Gro Harlem Brundtland (WCED, 1987). The reason for adopting this particular view is that it avoids the anthropocentric focus on development to recognize the need to consider all aspects of

the environment for the good of all aspects of the environment. It seems that teachers, who are expected to address issues of SD in their teaching (UNESCO, 2005), are faced with a very difficult task. Teachers need to understand SD for themselves and from their contextual point of view, and also how the interconnection between the societal, economic, political and the ecological aspects of the environment can be implemented into their practice to contribute towards meaningful learning and ultimately SD.

2.3.2. Working towards a realisation of Sustainable Development

Mere awareness of sustainability issues does not ensure a change of mind for decision makers. This is apparent especially considering the fact that within the last ten years many conferences and summits have been held to address sustainability issues and although each has contributed towards a deeper insight into sustainable development, the social and environmental conditions have still deteriorated (Calder & Clugston, 2003; Calhoun & Courtese, 2006). These conferences are attended by many different stakeholders such as climatologists, sociologists, environmentalists, educators, economists, eco-tourism representatives and other participating sectors of society. Conferences and summits oriented around issues of sustainability bring together a consortium of key stakeholders who share a common interest in areas of participative democracy, effective citizenship, equity, natural management, sustainable economic development and sustainability education. The amount of attention given to issues of SD emphasizes the need to address it more thoroughly in our education systems.

Santone (2003) defines the main goal of sustainable development as being that of increasing the value of human life while reducing the negative effects of human lifestyle on the surrounding environment. Santone (2003) recognises another goal of sustainable

development to be that of the promotion of social equity by the fair distribution of power and resources. It is due to the broad involvement of economy, society and ecological systems that sustainable development may be addressed in all disciplines³ (Santone, 2003; UNCED, 2000). Although this may be the case, it does not mean that teachers from all disciplines are able to see how this may be done.

The World Commission on Environment and Development views sustainable development as: *“A process in which exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.”* (WCED, 1987, p. 43)

It is clear from the above definition that South Africa and many other countries with high poverty rates and environmental degradation have not managed to implement SD.

2.3.3. Agenda 21 - A plan for realising Sustainable Development

The term ‘Sustainable Development’ was accepted and promoted at the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, in Rio de Janeiro, Brazil in 1992. It was also at this conference that Agenda 21 (1992), a plan for achieving sustainable development in developing countries by addressing specific relevant needs and challenges that those countries put forward, was adopted.

³ Disciplines – refers to the subjects taught in schools, such as Natural Science, Business Economics etc.

The document addresses major concerns such as the promotion of sustainable human settlement development, protection of the atmosphere, combating deforestation as well as environmentally sound management of biotechnology and many other relevant issues. The manner in which Agenda 21 addresses these issues is by firstly defining the issue, then listing the objectives that governments should aspire towards, suggesting activities that would support such objectives and finally listing the means by which these objectives should be implemented (UNCED, 1992). The ‘means’ mentioned above does not refer to a detailed indication as to how governments should go about implementing certain activities that may address the issues listed. Rather ‘means’ refers to resources that may assist implementation of activities that address the issues raised within Agenda 21.

Teachers may be seen as one of these ‘means’. It is within chapter 36 of Agenda 21 where “*Reorienting education towards sustainable development*” is mentioned and its value emphasized. In this section the international document acknowledges the dependence on education for the success of the implementation of the entire policy: “*Education, raising of public awareness and training are linked to virtually all areas in Agenda 21*” (UNCED, 1992) It is at this point that the role of the teacher with regards to SD address, is elevated.

2.3.4. Education as a tool for realising Sustainable Development

Education plays a vital role in the attainment of any major paradigm shift (Dede & Hoagland, 1972). Perhaps it this understanding that led Jucker (2004) to motivate for eight priorities in education. Jucker (2004) suggests that a way of ensuring sustainable development and thus sustainable education would be to address a suggested list of eight ‘educational priorities’. Firstly ‘educators as role models and learners’ imply that teachers themselves need to be well educated about sustainable development before they can serve to educate learners in a meaningful manner. The second priority refers to the need for

‘enacting change here and now’, whereby teachers involve learners in the experience of making a difference within their community. Thirdly ensuring ‘critical thinking’, as learners are encouraged to be critical about the nature of knowledge. The fourth priority refers to ‘experiential learning: reconnecting to reality’ and implies a strong reliance on learner’s exposure to real-life problems in which they actively engage in decision-making. The fifth priority listed by Jucker (2004) speaks of ‘reconnecting to a sense of place’ whereby learners develop their sense of belonging to a community and being responsible as a community member. Sixth ‘empowerment of the learner’ refers to the learners’ opportunity to become part of the knowledge production process whereby the learners are empowered to add meaning to their learning materials. The seventh priority includes ‘learning for action’ whereby learners willingly adopt a desire to change and equip their community for a sustainable future. Finally the eighth priority is ‘systemic learning’ which refers to the need for learners to develop critical reflective practice. This may be achieved as learners are encouraged to see how systems work together as a holistic system as opposed to viewing actions and their consequences at a local fragmented level. These eight priorities may be understood as only one aspect of ESD, which is explored further on, and refers to the teacher and learner activities within ESD.

2.4. Education for Sustainable Development

The difficulties that face teachers regarding the conceptualizing of concepts such as ‘development’ and ‘sustainable development’ as well as the role that international policy expects teachers to play in the successful implementation of SD are evident. Education for

Sustainable Development is an innovation that suggests in part how teachers are expected to conceptualize and implement ESD effectively. The contextualized application of this guide however, is ultimately up to the teacher.

2.4.1. Defining Education for Sustainable Development

It is important to note that although ESD has been separated from the above section of SD, they are essentially the same construct. The only main difference is that ESD has an education orientation that is not obvious when exploring the concept of SD. This section serves to focus on the development of ESD in Curricula in schools today.

Education for Sustainability has been described as:

“a lifelong learning process that leads to an informed and involved citizenry having the creative problem-solving skills, scientific and social literacy, and commitment to engage in responsible individual and cooperative actions. These actions will help ensure an environmentally sound and economically prosperous future.”

(National Forum for Partnerships Supporting Education about the Environment, 2008)

ESD is a broad term that refers to education that aims to address sustainability issues in the light of development, whereby a balance between economic growth, social uplifting and environmental protection may be struck (NFPSEE, 2008). Educational programs thus need to include ways of addressing poverty, social justice, cultural diversity, ecological degradation and issues related to the balance of the three pillars of sustainability (economy, society and ecology) (NFPSEE, 2005). The political aspect runs across and within all three of these pillars mentioned.

Education for Sustainability, which also refers to Education for Eco-justice and ESD (Jucker, 2004) implies an education that endorses life-long learning aimed at striking a balance between the interconnected systems of society, economy and ecological systems. This learning is meant to use technology education as a means for problem-solving, encouraging critical, creative and considerate thinking, and motivating learners to engage in a collaborative manner towards a common goal of sustainability (Santone, 2003; UNESCO, 2003). Federico, Cloud, Byrne & Wheeler (2002) and McKeown (2002) go one step further than the above explanation to also mention the higher order thinking skills that ESD develops, such as decision making, problem-solving, communication and co-operative learning. These skills are not foreign to the ears of South African teachers. The South African Revised National Curriculum Statement (2003) includes skills such as critical and creative thinking, communication, collaboration and problem-solving within its critical and developmental outcomes (DoE, 2002). The curriculum statement further describes that the kind of learner that is visualized is one:

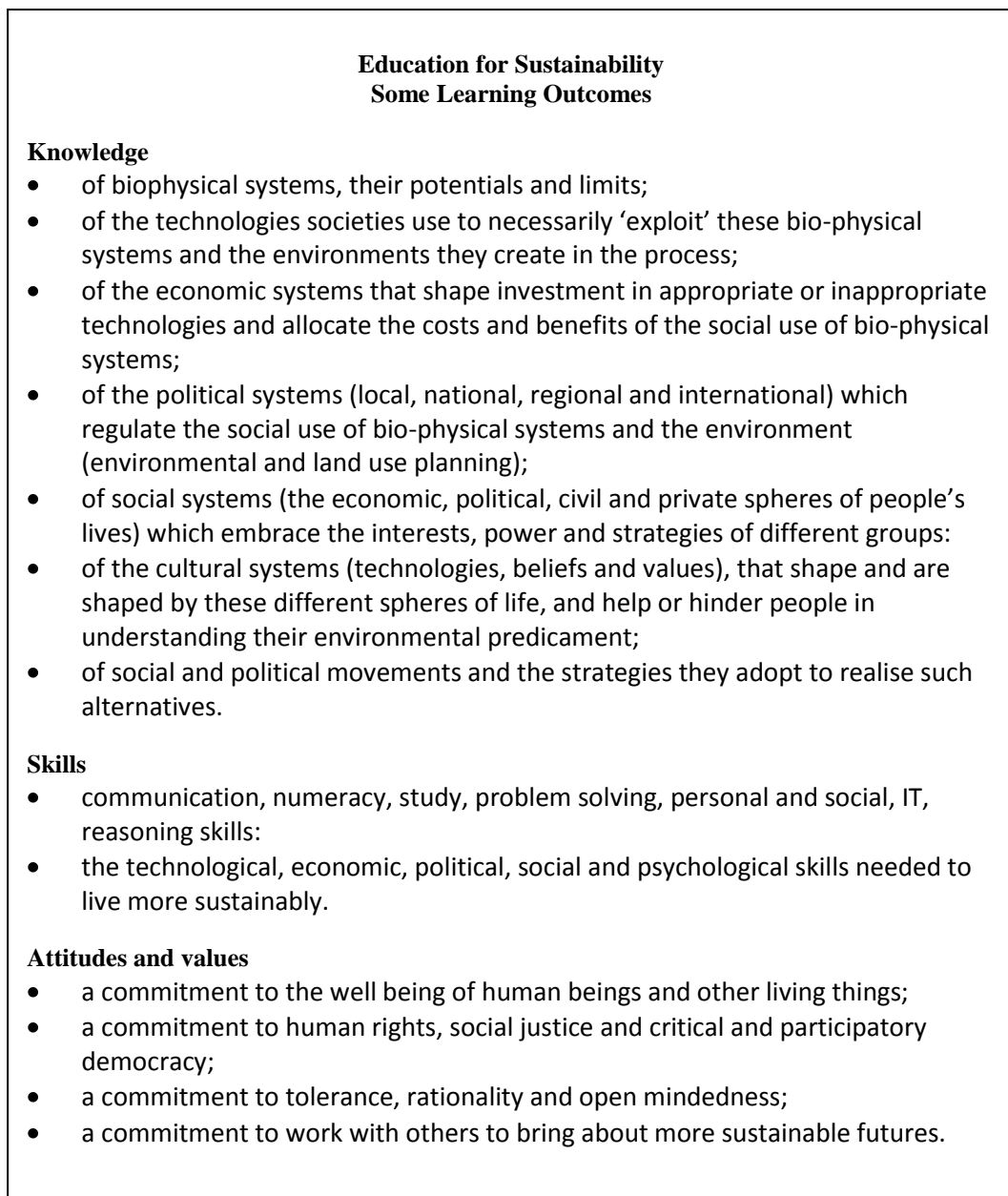
“...who will act in the interests of a society based on respect for democracy, equality, human dignity, life and social justice. The curriculum seeks to create a lifelong learner who is confident and independent, literate, numerate, multi-skilled, compassionate, with a respect for the environment and the ability to participate in society as a critical and active citizen.”

(DoE, 2002, p. 3)

However the terms ‘Sustainable Development’ and ‘Education for Sustainable Development’ are never explained within the curriculum documents for each discipline. At most SD is sometimes mentioned under specified topics to be covered in the content areas of particular curricula.

Huckle (2000) lists some learning outcomes of ESD with the assistance of the principles outlined within the Decade of Education for Sustainable Development and groups these into knowledge, skills, attitudes and values. These may be viewed in Figure 2 below.

Figure 2. Huckle’s ESD learning outcomes



It was through the analysis of these learning outcomes listed by Huckle (2000) and the principles highlighted in the United Nations Decade of Education for Sustainable

Development (UNESCO 2005) that I designed the conceptual framework used for analysis. This may be viewed in Appendix II

Wolff (2005) on the other hand views ESD as a type of education that has a great deal to do with equipping learners with the ability to partake in long-term planning to ensure that an equal share of resources is attained by all individuals within a community. By community, Wolff includes animal (including humans) and plant life. The skills that Wolff speaks of refer to critical reflection to enhance correct decision making and long-term planning, all of which impact on the economy, ecological environment, society and policy which runs across all three.

As the term is a broad one and subject to interpretation within the school context, the above explanations provide an informed perspective of how ESD may be understood within this study and by the three teachers ultimately. This study uses Huckle's interpretation of the UNDESSED to analyse teachers' understanding and practice of ESD.

2.4.2. The Goals and Principles of the United Nations Decade of Education for Sustainable Development

It was after the adoption of Agenda 21 that in December 2002 the United Nations Decade of Education for Sustainable Development (2005-2014) was adopted by the United Nations General Assembly. The United Nations Decade of Education for Sustainable Development is a policy that is led by the United Nations Educational, Scientific and Cultural Organization (UNESCO). It started on the 1st January 2005 and extends to the end of 2015. **The goal of the UN Decade is to merge the principles, values and implementation of sustainable development into the education sectors (UNESCO,**

2005). The hope is that education orientated in this way will ensure a more sustainable future where environmental, societal and economic aspects are responsibly managed in order to service present and future generations. Owing to South Africa's membership of the United Nations, she is compelled to follow the aims and objectives outlined within Agenda 21(1992) and by the UN Decade of Education for Sustainable Development (2002). It is this obligation that motivates me in this study to ask: 'What are Grade 9 teachers' understanding and practice of Education for Sustainable Development?'; 'How do Grade 9 teachers develop their understanding and practice of Education for Sustainable Development?'; and 'Why do Grade 9 teachers develop their understanding and practice of Education for Sustainable Development in the way(s) they do?'

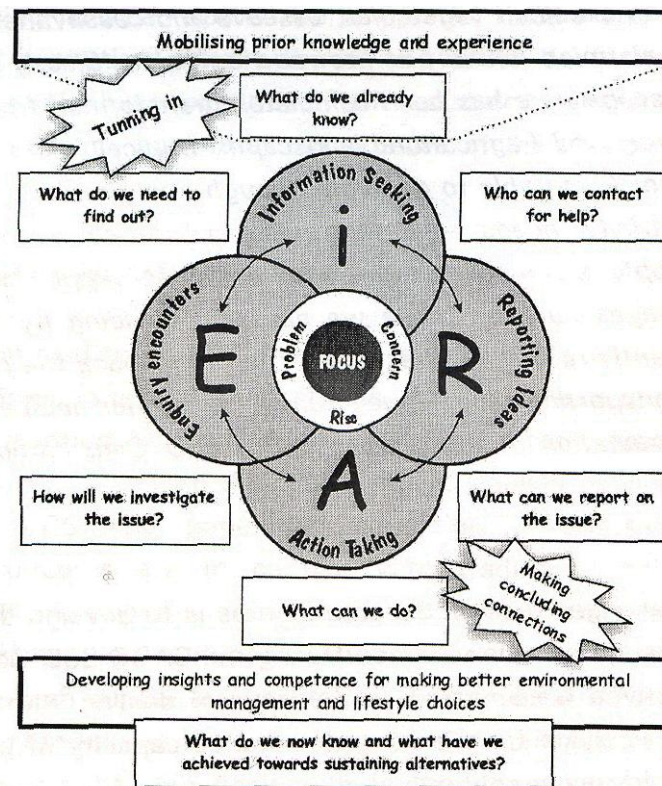
The principles outlined within the UN Decade of Education for Sustainable Development (UN, 2002) include: learning for sustainable development using an interdisciplinary approach as opposed to addressing the concept in a separate subject; exploring and sharing the values that underpin sustainable development; using different teaching and learning methods to explore issues of sustainable development; allowing learners to participate in meaningful and relevant decision making; and finally to instil a frame of critical thinking and problem solving that will give learners the confidence to address challenges of sustainable development. Although these principles are admirable and necessary my concern is still: **'How do teachers develop themselves to address these principles within their practice?'**

2.4.3. Reorienting Education towards ESD – The Challenge

Education for Sustainable Development is an initiative that arose out of a global need to address the unsustainable development of the global community. The principles underpinning ESD provide an opportunity for the development of critical and reflective thinkers, who are able to apply specialist knowledge within a relevant context in order to address injustices in social, economic and environmental spheres. The adoption and integration of ESD would require deep critique of existing structures (Orr, 1992). Its implementation would require a close review of the existing curriculum whereby teachers would need to identify topics of sustainability that they may incorporate into their teaching (Ogunyemi, 2005). Reluctance to change the current curriculum and thus the status quo may be experienced as teachers would be required to develop assessment activities that may go beyond their previous professional experience (UNESCO, 2005). Teachers implementing ESD are encouraged to provide opportunities whereby learners are involved in authentic decision-making that impacts on their local communities (Jucker, 2004; UNESCO, 2005). Finally Jenkins & Jenkins (2005) draw on the growing phenomenon of not being able to translate the understandings of ESD into practice. However Huckle (1996) does not see this as a barrier, rather such open interpretation offers an opportunity for making meaning of ESD in a local context.

What is lacking in literature is an explanation as to how teachers, especially within a South African context, develop the knowledge and skills to engage with the complex issues of sustainable development in the curriculum. One way is suggested in O' Donoghue's (2001) active learning framework which is referred to below in Figure 3. This model provides an explanation of how teachers can engage learners in independent learning as advocated by ESD (SADC-REEP, 2002).

Figure 3. O’Donoghue’s Active Learning Framework



(SADC-REEP, 2002)

One challenge in addressing SD issues in the curriculum is appealing to learners’ attitudes and developing the skills that enable learners to be effective and considerate action takers and decision makers. The model provides an action plan for learning about and responding to environmental issues. This model advocates that learners be engaged in action taking activities within the community in the attempt to develop their attitudes and skills towards the better interests of SD. However it still needs to be contextualized by teachers within their practice. There is no model that displays how teachers can implement ESD principles within their particular subjects this is left to trial-and-error. Chisholm’s (2003) suggestion that teachers be given the freedom and responsibility to design their own learning programs is a noble one. The challenge, however lies in the teachers’ capability and know how. Surely teachers need some support in shifting their learning programs

towards a sustainable development focus. It is for this reason that in 2002 South Africa's Minister of Education Professor Kader Asmal, launched a South African teacher education program that addressed 'teaching and learning for a sustainable future'. This multimedia resource pack contained 100 hours of material intended to facilitate training and practicing teachers to educate towards sustainable development (Calder & Clugston, 2003). However, the public visibility of this resource is questionable as none of my participants had ever heard of it.

Jickling (1994) contests the idea of educating for sustainability. He states that this idea of educating for sustainability assumes that sustainable development is not a contested concept. He questions the confidence with which teachers would teach a contested concept. Janse van Rensburg and Du Toit (2000) concur with Jickling's uncertainty regarding sustainable development, and point out that the current use of the term sustainability offers more than fifty different meanings. One may choose to accept these arguments (Jickling, 1994; Janse van Rensburg & Du Toit, 2000) as a reason for not educating for sustainable development, however one also needs to consider that perhaps the diversity of meanings within themselves could be embraced by teachers (Le Grange & Loubser, 2005). Teachers from different contexts may explore the different terms in an attempt to come about to a term that suits their particular context (Huckle, 2001).

A counter argument to Jicklings' view is that sustainable development may be understood within each context in a slightly different manner, thus defining the term becomes a "social process" (Le Grange & Loubser, 2005, p.117). It would be the task of individuals in an educational institution to first establish a contextualized understanding of what sustainable development is before attempting to address the concept within the institutions' specified

curriculum. Wals and Jickling (2002) support the view that the meaning of sustainability should undergo constant critical re-examination as they argue that sustainability is not a fixed and de-contextualized concept.

Rauch (2002) raises the following global challenges for teachers attempting to implement ESD: conveying to learners that they are key players in society and able to employ change; transforming the transmission approach of knowledge into a more critical and reflective approach towards knowledge; contributing towards social development; creating opportunities for cooperation within society. Along with the challenges highlighted above are the challenges of professionalism for each teacher. In order for knowledge to be presented by teachers in a critical and reflective manner, they need to be able to provide input into complex and contradicting issues in a way that allows space for reflective and critical development of knowledge by both learners and teachers (McKeown & Hopkins, 2003).

Giroux and McLaren (1987) emphasise the difficulty that teachers went through in the past to empower their practice in an attempt to remove the debilitating effect of state control. Teachers in the past have played the role of mere curriculum implementers who are expected to incorporate state demands and policies into their teaching and assessment strategies (Giroux & McLaren, 1987).

History has shown that teachers in the past were overtly oppressed with regards to their own practice, however today it seems that a different level of oppression is taking place right under our nose. Although teachers have been allowed the level of autonomy to shape their practice according to their values, they are restricted by various expectations. One of these expectations involves implementation of various numerous policies that have been infiltrated at a rapid speed in the last twenty years. This study suggests that the enforcement of policies on teachers and expectations for teachers to immediately deliver is

not an empowering approach to teacher professional development. Freire (1970, p.77) captured this point many years ago when he stated:

“We must never merely discourse on the present situation, must never provide the people with programs which have little or nothing to do with their own preoccupations, doubts, hopes, and fears...It is not our role to speak to the people about our own view of the world, nor to attempt to impose that view on them, but rather to dialogue with the people about their view and ours. We must realise that their view of the world, manifested variously in their action, reflects their situation in the world.”

Thus according to critical theorists the only way to approach curriculum change and implementation is to consider and consult with teachers on the ground.

At this point it is important to mention that each teacher in every discipline brings to the fore their own strengths of skills and perceptions when it comes to understanding ESD and shaping its' implementation (McKeown & Hopkins, 2003). However without at least a more elaborate model than O'Donoghue's Active Learning Framework or mediation, teachers may find it difficult to know how to begin implementing ESD principles into their subject areas.

2.4.4. Learning for Sustainable Living in Kenya

Kenya, like South Africa, is an African developing country that faces many challenges of sustainability. Little research has been done in the field of sustainable development education however Kenya presents an opportunity to explore what little research has been done, in a context not dissimilar to that of South Africa. According to Kenya's 2003 Environmental Report, no improvement has been made even with the recent implementation of Environmental Education and conservation strategies (Deche, 2005). Deche (2005) comments that Kenya now realizes that the only way to address

environmental degradation is to create an “informed, educated and skilled citizenry” (2005, p.29) and the way in which they anticipate this transformation is by ‘reorienting’ education towards ESD.

One of the major motivations for Kenya’s wanting to move from EE to ESD is that often materials delivered to schools do not contain locally relevant issues of Sustainable Development. It was out of the realized need that Kenya initiated a project called “Learning for Sustainable Living in Kenya” (Deche, 2005, p.30). This project was an attempt to realize the need to conserve water and energy, see to effective health care, secure sufficient food supply via sustainable agriculture and protection of Biodiversity. This project focus became abbreviated WEHAB (Water, Energy, Health, Agriculture, Biodiversity) which are also key foci of the Millennium Development Goals (MDG).

Deche (2005) supported in his views by the Kenyan Education Department believes that a vital way of ensuring an improved environmentally oriented citizenry is to work through education systems and focus on improving their understanding of Sustainable Development. The two avenues suggested are via schools and NGOs. Deche (2005) acknowledges that it is only by the improved understanding of SD that implementation can be effective. Deche (2005) provides an example stating that once an improved understanding of the impacts of decisions are achieved, learners, community members and decision makers will become more equipped to make decisions that consider the ecological, political and economic well-being of our environment.

The project ‘Learning for Sustainable Living in Kenya’ used the WEHAB themes along with the input of teachers and environmental educators to create ESD focused materials.

One of the main aims was to ensure that locally relevant consideration of sustainable development issues accompanied the development of teaching and learning resources. The idea of integrating teachers as stakeholders in the material development process was to counteract the effects of material development procedures that incorporated the Research-Develop-Disseminate-Adopt (RDDA) model whereby teachers and Educators merely play the role of innovation implementers and not innovation initiators and developers.

The project followed a series of four stages. The first stage involved a workshop whereby teachers and experts drafted resource materials. Stage 2 integrated ideas and materials developed by both teachers and experts. The third stage involved trialling the materials in selected schools. The teachers using the materials made comments regarding their suitability and these comments were used during stage 4. The final stage involved using teachers' comments about the resources to improve them and refine them before printing and dispensing them. The following Tables 1 and 2 were used in assessing the activities for suitability towards development of knowledge and skills around Sustainable Development. These criteria also consider the ESD principles stated within the Decade of ESD and thus also appear in my data analysis tools.

Table 1. Matrix for identifying skills in Learning for Sustainable Living activities

	Activity	Activity	Activity
Develops creative skills			
Develops critical thinking skills			
Develops oral communication skills			
Develops written communication skills			
Promotes collaboration and cooperation			
Develops decision making skills			
Develops problem solving and planning skills			
Promotes practical citizenship			
Develops conflict management skills			

Table 2. Matrix to identify sustainable development factors in activities

	Activity	Activity	Activity
Problems caused through economic reasons			
Solutions through economic reasons			
Problems caused through social reasons			
Solutions through social reasons			
Problems caused through political reasons			
Solutions through political reasons			
Problems caused through physical environment reasons			
Solutions through physical environment reasons			

(Deche, 2005, p. 37)

Such a grid may be useful in identifying evidence of ESD address in one's teaching. Deche (2005) reports on Kenya's substantiated focus on ESD material development, which closely resembles the SADC-REEP Consultation reports which also look at relevant South African implementation of the ESD initiative. As relevant as one may attempt to make such material for South African or Kenyan schools, each school realistically has a unique context. Ultimately each teacher also needs to understand SD in order to implement such a paradigm into his/her very own teaching. Even if materials are relevant and implemented into one's teaching, the maximum benefits of such materials may not be achieved if the teachers themselves have not come to a holistic understanding of what SD means to them and their learners in their school. ESD also involves particular teaching and learning strategies that promote the development of learners who are able to function as critical SD implementers in society. In order for teachers to motivate learners to become active and actual decision makers, the problems that they attempt to solve must be real and local. No materials could supplant this. My question therefore reappears: 'How do teachers develop their understanding and practice of ESD?'

2.4.5. Implementing ESD – A Southern African report

In 2005 the secretariat for the Southern African Development Community (SADC) requested from the SADC Regional Environmental Education Program, that they support SADC in designing guidelines for participation in the United Nations Decade of Education for Sustainable Development. Representatives from 13 SADC countries joined at a meeting in July that year and it was at this meeting that they agreed to support the idea. Between July and November that year consultations took place, involving UNESCO

representatives, education ministries and institutions, NGOs and representatives from the agriculture, health, environment and education sectors.

The SADC REEP ESD Consultation report revealed two main issues with regards to ESD policy implementation (Lotz-Sisitka, Olvitt, Gumede & Pesanayi, 2006). The first issue pertains to the lack of diverse role-player collaboration that takes place when policy is being formed, the second being the inability of institutions to successfully implement ESD initiatives and programmes.

Although sub-Saharan Africa has developed strategies for implementing ESD it still remains up to schools and businesses at the local level to develop their own policies (Lotz-Sisitka *et al.*, 2006). The SADC REEP ESD Consultation process revealed that countries in Southern Africa have shown a weak effort to support ESD via policy. The problem of implementing an ESD policy does not only lie in the lack of policy synergy, it also lies in the misinterpretation and ‘mis-implementation’ of policy (Lotz-Sisitka *et al.*, 2006).

There is a ‘mis-implementation’ of ESD policy. This claim is supported by SADC-REEP ESD Consultation findings that reveal there is still a gap between ESD policy/theory and ESD practice. A suggestion made in the report is to ensure that professional development of educators and trainers be maintained thus providing a support for ESD knowledge and practice development (Lotz-Sisitka *et al.*, 2006). Such ESD knowledge and practice development should equip ESD practitioners to display eight quality indicators revealed by the Consultation report.

- Contributions to sustainable development actions

- Participatory and active learning approaches
- Dealing with complexity, tensions and contradictions
- Working with different ways of knowing, particularly with indigenous, local and traditional knowledge
- Including values and ethics in contexts of cultural diversity
- Ensuring Inclusivity (cultural, linguistic, socio-economic and physical)
- Responsiveness to different learner groups in different learning environments
- Critical and creative thinking

(Lotz-Sisitka *et al.*, 2006, p.14)

These eight quality indicators have been used to further inform my analysis of teachers understanding and practice of ESD. Largely the report reveals the need to train teachers and other educators to implement ESD and to develop learning support materials. My study poses a look at how teachers educate and develop themselves given the ‘freedom and responsibility’ (Chisholm, 2003).

2.4.6. Paving the way for ESD implementation

Implementing ESD into one’s curriculum implies that perhaps drastic or slight changes, depending on the curriculum, need to be made (UNESCO, 2003; Ogunyemi, 2005). Ogunyemi (2005) mentions four elements around which all school curriculum issues revolve. In relating these elements to ESD implementation within any curriculum the first element refers to the ‘statement of objectives’. This involves asking the question ‘Does your relevant education policy refer to objectives of sustainability?’ It therefore would be important to identify which education policy objectives need to be maintained and which do not align with sustainability. The second element refers to the ‘selection and

organization of content' and involves a close examination of already existing subject content, and a decision about how sustainability is to be integrated, as well as a deep involvement of teachers to ensure the life span of the integration. 'Materials and methods' are advocated by Ogunyemi (2005) as an important element within ESD as he expresses that no one really knows how to meet the sustainability demands. He further suggests that instead of relying upon instruction as a method of achieving a consciousness for sustainability we should rather look to action, as findings have shown that awareness of environmental issues does not necessarily equal change (Sterling, 2001; Shallcross et al., 2006). Ogunyemi (2005) lists problem-solving activities and action research as instrumental in promoting sustainable living more successfully. Perhaps something that could be added to Ogunyemi's (2005) suggestion of teaching methods is the consideration of O' Donoghue's (2001) Active Learning Framework. The fourth and final element identified as important in realizing a successful curriculum is 'evaluation of effectiveness'. Ogunyemi (2005) suggests here that teachers would need to learn a new method of assessing, as more emphasis is to be placed on learners' abilities to solve relevant problems rather than on their ability to recall information. The above refers to the elements that each school would need to consider in attempting to align their curriculum with principles of sustainability such as those referred to in the UNDES (UNESCO, 2003). However I would add that these elements need to also be adopted and recognized by every practicing teacher in their own discipline in order for the curriculum to be addressed and implemented. Perhaps an amalgamation of both Ogunyemi's (2005) Four Elements of Curriculum Redress and O'Donoghue's (2001) Active Learning Framework, offers a more helpful insight for how teachers should attempt to implement ESD into their subject areas.

UNESCO (2005) offers guidelines to teacher educators and teachers to consider when designing teaching and learning materials. These guidelines suggest an avenue by which teacher educators and teachers may better understand what a curriculum geared towards ESD should look like.

- ESD is locally relevant and culturally appropriate.
- ESD is based on local needs, perceptions, and conditions, but recognises fulfilling local needs often has global effects and consequences.
- ESD engages formal, non-formal and informal education.
- ESD is a life-long endeavor.
- ESD accommodates the evolving nature of the concept of sustainability.
- ESD addresses content, context, pedagogy, global issues, and local priorities.
- ESD deals with the well-being of all three realms of sustainability – environment, society and economy.
- ESD is not imported from another cultural, economic, or geographic region.
- ESD is not ‘one size fits all’, but must be made to account for regional differences.

(UNESCO, 2005, p. 16)

Capozzi (2005) proposes that it is not only curriculum that can help to overcome the obstacles of ESD but it is also school culture. Capozzi (2005) draws on the four main principles for building a sustainable society, outlined within the Earth Charter⁴. These

⁴ Earth Charter – an international declaration of values and principles used for building a sustainable society in the 21st Century

principles include: ‘care and respect for the community of life, ecological integrity, social and economic justice as well as democracy, nonviolence and peace’ (Capozzi, 2005, p. 133). These principles need to be upheld within the curriculum and within the school culture in order to ensure a move towards ESD (Capozzi, 2005). Any curriculum is not value-neutral, thus it should be clear from the start that ESD aims to promote peace and equity (McKeown, 2002). Taking into consideration these various views on successful curriculum implementation, one realizes the great deal of attention required by the key players involved. I would add that any attempt to involve teachers in implementing change in education needs to be done in a manner that is empowering to teachers by offering a process for personal and professional development.

2.4.7 An Education for Sustainable Development Toolkit

Although it has been said here that teachers generally have a poor awareness and understanding of ESD and that they find it difficult to implement ESD in schools today, it does not mean that attempts to address this condition have not been made. Rosalyn McKeown, after attending a meeting based on sustainable development in 1998, noticed that ESD was not receiving the attention by teachers and community leaders that she felt was required. It was this observation that led McKeown (2002) to design a manual that would assist teachers and community leaders in addressing SD in education. The manual was entitled “Education for Sustainable Development Toolkit” (McKeown, 2002)

In the introduction to the toolkit manual, McKeown states that sustainability is a concept that is hard to define as it relies on the context in which it is being understood. It becomes clear that teachers within their specific contexts need to define sustainability/sustainable development and to make sure that it is locally appropriate. This toolkit was designed in

Tennessee for teachers all around the globe, its' potential as a guide and support is valuable but limited due to the fact that teachers need to know how to apply the materials to their context to ensure locally relevant implementation.

McKeown (2002, p. 11) writes that a 'higher education level' is required in order to realize sustainability. McKeown (2002) also makes a supported statement that research and life-long learning are required to help a nation move from a dependency on foreign technology to reliance on local knowledge and innovations. Finally, McKeown (2002) suggests that within reorienting education, teaching and learning need to be aimed towards sustainable living. Although these three suggestions are valuable, they do not suggest how teachers should begin to engage with addressing them.

McKeown (2002, p. 17) suggests that when looking to reorient a formal curriculum towards sustainability, the five aspects that need to be considered are knowledge, issues, skills, perspectives and values. In reference to 'knowledge', teachers and learners need to understand what is meant when referring to sustainable development. Teachers and learners also need to gain experience in addressing sustainability 'issues' that encompass the social, economic and environmental spheres. In reference to 'skills', learners need to be equipped with skills that will enable them to sustain their lives after school and these skills include communication, systemic thinking, future planning, working as a team, acting on knowledge, and other skills like recycling that may be applicable to the context. In all of this, it should be noted that not only do these five aspects need to be addressed in learners also teachers need to be assisted through the same process of development. The question 'How do teachers develop these five aspects in order to develop the same aspects in their learners?' thus leads to the pondering of the practicality of this. McKeown (2002)

mentions the need to develop learners' ability to see issues from different angles. McKeown (2002) states that 'perspectives' need to be understood for a collaborative attitude to be attained. Finally existing *values* need to be realized if people are to live sustainably together. This means human rights in general and the specific right for every individual to have food, shelter and education needs to be realized if a sustainable future is to be secured. McKeown (2002, p.23) includes values outlined within the Earth Charter which include: 1) Respect and care for the community life; 2) Ecological Integrity; 3) Social and Economic Justice; 4) Democracy, Nonviolence, and Peace. The question yet remains: 'How could teachers address these aspects in the existing curriculum?'

McKeown (2002, p. 25) suggests that the use of the 'Strengths Model', which involves every discipline teaching for sustainability, is an effective approach to achieving a reorientation of the curriculum. A description and explanation of how the strengths model should be implemented is provided by McKeown (2002). She explains that firstly teachers need to ensure that they understand sustainable development and the principles that underpin this concept. Once teachers understand the concept of sustainable development, teachers from each discipline need to review the curriculum for any attributes related to ESD. Teachers also need to identify gaps in the curriculum that allow opportunities for new knowledge, skills, values, issues and perspectives that are related to sustainability, to be inserted. Finally, once integrated programs have been designed, teachers need to approach other teachers to create a growing awareness of the role that different disciplines play in developing ESD. Although this is a logical and useful strategy, I would agree with McKeown (2002, p. 28) as she acknowledges that a barrier exists in firstly getting teachers to a point where they understand the concept of SD and secondly in developing them to the extent that they are able to educate for SD.

The major challenge that lies before teachers is implementing the strengths model into the existing curriculum in a meaningful way for learners. A shortfall of the ESD toolkit designed by McKeown, which also poses a threat to the implementation of ESD, is its lack of publicity. Many teachers have never heard of ESD before and as a result have never searched for any tools that may assist them in understanding and practicing sustainability principles. What also poses a threat to successful curriculum implementation is the lack of empowerment teachers feel when they are expected to play the role of curriculum implementer without being given the opportunity to take on the active empowering component of curriculum design.

2.5. Teachers as Curriculum Implementers versus Implementers and Designers

Curriculum theory attempts to understand the development, implementation and evaluation of curricula (NFPSEE, 2008). Beauchamp (1982) states that

“...a curriculum theory is a set of related statements, or propositions that gives meaning to the phenomena related to the concept of a curriculum, its development, its use and its evaluation.”

(Beauchamp, 1982, p.24)

It is important to realize that although the references to literature below do draw partially on aspects relating to curriculum theory, this study does not seek to adopt the theory within. The reason for this is that ESD is not a curriculum rather it refers to principles that

should be integrated into an already existing curriculum. Due to the fact that the study seeks to explore teachers' understandings and practices of ESD, this study recognizes teachers as implementers and also designers of curriculum change and thus aspects of curriculum theory have been drawn upon to understand this teacher role.

Every new policy and initiative that is introduced into schools requires both an implementer and a receiver. This means that teachers are often expected to implement the change that learners are expected to benefit from. This African National Congress (ANC, 1995) claimed that any educational policy will become of no effect if there is no support with regards to an implementer and a benefiter. The policy document further stated that teachers who are responsible for implementing the change must not only be part of the process but should also understand the change that is desired. It asserted that under no circumstances should teachers be seen as targets for change (ANC, 1995). In 1994 the ANC inherited an education system that was laden with discrimination, inequity and totalitarian rule. Under this apartheid system teachers were mere implementers. The ANC since then have claimed that their aim is to ensure that change is motivated by the people and not just the system, thus transforming teachers' roles to implementers and designers of change. The roles of a teacher are further listed as:

“...being mediators of learning, interpreters and designers of Learning Programmes and materials, leaders, administrators and ,managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors and Learning Area and Phase specialists.”

(DoE, 2002, p. 3)

Despite the fact that the ANC does not approve of making teachers targets for change, the reality remains that teachers are the implementers of policy (Silva, 2000). From my observations, teachers are often sent to two-day workshops that are designed to equip them for the effective implementation of new concepts, methods, principles and policies. In the event that teachers do not feel equipped to implement the purposes set, how do they develop themselves to the point where they feel equipped?

Carl (1995, p. 5) identifies professionalism as key to teacher empowerment when attempting to implement curriculum changes. He supports this by saying that when teachers ask and attempt to answer the ‘what’ and ‘how’ questions of curriculum change they become engaged in the change process. Although sustainability principles are not a curriculum in itself, they do contribute towards changes in the way existing curricula are implemented. For example, ESD would require that Technology Education not only focus upon the solving of relevant needs, but also focus upon the social, economic and ecological impacts that these solutions may have. ESD principles cut across content and teaching approaches. In reflecting upon Carl’s (1995) statement, teachers would need to understand ‘what’ ESD is and ‘how’ their teaching advocates for the principles underpinning ESD. Another question that needs to be addressed is: How do teachers achieve the answers to the ‘*what*’ and ‘*how*’ questions previously posed?

The role that teachers play in answering these ‘what’ and ‘how’ questions may be instrumental in deciding whether the curriculum is eventually implemented and to what degree it is, as teachers show cognizance of a new idea or curriculum. Silva (2000) reflects on two decades of literature based on curriculum. According to Silva (2000) teachers are involved in reflecting about curriculum and employing curriculum as part of

their work activities. However there is a danger that such activities may be carried out at a superficial level. It is for this reason that Fullan (1992) states that teachers need to understand and be part of the change that needs to take place. Teachers need to also understand the **need** for the change that is taking place as well as attempt to enact the change they have identified as important (Fullan, 1992). Morrow (2007) motivates that educational and thus curriculum change is only possible once teachers change the way they think and act.

According to Talbert (2003) teacher opinions are rarely considered at the policy formulation level. Runyan (1991) defines an empowered teacher as one who has been actively involved in their own personal and professional development. For this reason Talbert (2003) expresses the need for teachers to become empowered active designers and implementers of curriculum initiatives. Teacher empowerment only occurs once teachers set goals and means for their own development in teaching approaches and content knowledge (Runyan, 1991). This idea is supported by Talbert (2003) who thinks that teacher empowerment is assisted by allowing teachers to take charge of the change process by providing teachers with a degree of sovereignty in which they are accountable and reflective. In reflecting on the question posed: ‘How do teachers understand ‘what’ ESD is and ‘how’ their teaching advocates for the principles underpinning ESD?’ the implicit answer is teacher empowerment.

Although Talbert (2003) and Runyan (1991) offer insight into what attributes constitute teacher empowerment, what they do not offer is a means by which such empowerment may be achieved. Farrell and Weitman (2007, p. 37) however, claim that action research is “*perhaps the best vehicle for professional development*” and this suggestion is explored

further in this chapter. Farrell and Weitman (2007) further elaborate upon this statement saying that research conducted by teachers themselves is used as a means for attaining teacher professional development and empowerment as teachers are now given the opportunity to experience classroom based research which develops teachers' self worth. Although the three teachers participating in this study were not responsible for designing and conducting their own research study, they were very involved in the research process to the extent of fulfilling the role of co-researcher in many cases. The teachers were most certainly designers of their own lessons and were also the initiators in the changes of their designs. A bottom-up approach such as this one whereby teachers as implementers of change are also the designers of change, serves to alleviate the top-down approach which involves teachers as the targets of statistical research and training workshops whereby teachers are expected to be implementers of foreign designs (Farrell & Weitman, 2007).

2.6. Reflective Practice for Teacher empowerment and Professional Development

In the preceding paragraphs I have supported the idea that in order for teachers to become effective implementers of change and thus innovation, teachers need to feel empowered in the process. In the following paragraphs I argue that in order for teachers to become empowered implementers of ESD principles, they need to also become reflective practitioners. I therefore adopt Reflective Practice theory in this study to provide insight into teachers' experiences of their development regarding their understanding and practice of ESD and how, if at all, their experiences contribute to their empowerment as teacher professionals. Reflective practice theory has also been adopted in this study as it is

believed through support represented below, that reflection offers a tool for deeper meaning of learning experiences which eventually contributes towards teacher professional development and a feeling of empowerment by the teacher.

Vonk (1991) supports the active process of development whereby teachers reflect on experiences to develop their professional ethic and capacity. In accepting Vonk's view that reflective practice is one way in which a teacher may develop themselves professionally, it is at this point, important to establish an understanding of professional development as a process. Vonk (1991) defines professional development as the building of knowledge, values, skills and attitudes that ultimately assist the teacher in providing the required and efficient support to the learners.

If one is to understand the role that reflective practice plays in teacher professional development, then it is necessary that the concept of 'reflection' be explored. Rosenberg (2004) discovered that the term 'reflection' is one that has many meanings and it is due to this myriad of definitions that one cannot simply assume that teachers engaging in reflection will automatically realize and experience its benefits for professional development. Rosenberg for the purposes of her study defines three types or aspects of reflection in relation to teachers and their practice. Firstly she recognizes Schön's (1983) *reflection-in-action* as a very real way of reflecting in the heat of the moment. Secondly Rosenberg (2004) acknowledges Dewey's inquiry process as reflection on one's practice, which is also recognized by Schön. Finally Rosenberg (2004) adds a third type of reflection to holistically define her interpretation of reflection. This third aspect is referred to as 'reflection for action' and was coined by Farrell (1998). '*Reflection-for-action*' acknowledges the teacher's potential role as a researcher and relies upon the teachers' use

of their reflection during and after action to shape their plans for future actions. Rosenberg (2004) is of the opinion that ‘*reflection for action*’ is the desired outcome of *reflection-in-action* and *reflection-on-action*. It seems that not only is reflection necessary for professional development but a particular level of reflection needs to be attained by the teacher for the teacher to benefit professionally. As ESD reflective practitioners, teachers would need to reflect critically in a way that ensures that the three pillars of sustainability (economy, society and ecology) are embraced within the curriculum as well as the political thread that runs through them.

Boody (2008) provides further knowledge about reflection as he identified that writing based on teacher reflection falls into four categories. The **first type** of reflection that Boody (2008) identifies is ‘Teacher reflection as retrospection’ (Boody, 2008, p. 500). This is explained as the reflecting back on experiences that have just gone on before, in an attempt to understand why a particular experience occurred or in an attempt to learn from specific experiences in order to improve upon a particular situation. This may be understood as an identical concept to Dewey’s (1933) ‘reflection-on-action’.

The **Second type** of reflection involves thoughts from John Dewey (1933). Dewey motivated that reflection is a ‘Problem-solving process’ (Boody, 2008, p. 500). The steps of the problem-solving process involve a ‘*pre-reflection*’ *step* which is the problem as it presents itself to the teacher, thus causing an initial phase of confusion. The second step in the problem-solving process is the ‘*reflection*’ *step* which is broken up into five phases. The first phase refers to a no-action phase whereby plans of action are suggested. The second phase is identified by feelings of unease which are quickly refocused to identify a formal problem that needs to be solved. The third phase involves the formulation of a

hypothesis which is flexible and is used to guide the process of inquiry. The fourth phase involves a solution that is rationally supported. Finally, the fifth phase of this second step involves verifying or refining the original hypothesis. The third and final step of the problem-solving process is referred to by Dewey (1933) as the '*post-reflection*' step whereby the teacher feels a sense of problem-mastery and fulfilment. This process of problem-solving designed by Dewey (1933) follows *steps* that show some similarities to those in an action research cycle where firstly planning occurs then an enacting of the plan takes place and finally reflection on that action.

The **third type** of reflection referred to by Boody (2008) is 'Van Manens Critical Reflection' which recognizes three levels of reflection. The first level places emphasis on whether or not the methods employed justify the objectives desired. Rosenberg (2004) describes these three levels more effectively by using examples. Rosenberg (2004, p.85) likens this first level to a teacher making surface reflections based on particular activities within the lesson. The comments made are usually unsupported judgments and do not attempt to question aspects of the curriculum or the context in which the learners live and learn. The second level reflection focuses on the value of specific experiences, understandings and opinions and the impact that this may have on practice. Rosenberg (2004) describes the second level of reflection as one where the teacher reflects on their decisions and actions in the light of theory. The third level reflection involves critically examining the value of the objectives and the methods used to attain these objectives. Rosenberg (2004) asserts that the third level of reflection exists when a teacher becomes concerned about the ethics of certain choices made. Furthermore the teacher becomes critical about the greater good of the curriculum and whether or not it is serving the learners within their social context (Rosenberg, 2004). This third level describes the kind

of reflection that would serve well for a teacher who aims to practice ESD. The principles that underpin ESD which have already been mentioned also require teachers to be conscious of the societal, economic, ecological and political aspects of our environment and of the curriculum that we subject our learners to. Teachers need to be critically reflective about the curriculum that they educate for to ensure that the curriculum agenda is a noble one that serves the greater good of all three pillars of sustainable development (McKeown, 2002).

The **fourth type** of reflection highlighted by Boody (2008) is Schöns' (1983) *reflection-on-action* and *reflection-in-action*. Both of these types of reflection have already been described through the elaboration of Rosenbergs' (2004) three types of reflection. Boody (2008) comments that although these four types of reflection are the most written about, they only refer to reflection on short-term events. Boody (2008) argues that reflection is more than just a case of looking back on experiences and learning from them, rather it also involves an aspect of teacher change and development. Boody (2008) states that what has not been considered are the long-term lessons that may be learnt from long-term reflections. Boody (2008) refers to data from one of his research participants who persisted to reflect as she saw it as her moral obligation. This idea of a moral obligation could be the key that links reflective practice to teacher empowerment.

Reflective teacher education assists teachers in becoming more critical about their practice and therefore enables them to play a more active role in their own professional development (Bain, Ballantyne, Packer, & Mills, 1999). By teachers developing their own professional identity, teachers may begin to see themselves higher up the ladder of autonomy than is currently the case. According to Pithouse (2004) teachers should be seen

by others and by themselves as artists who engage in creative activities. Pithouse (2004) claims that teachers are so caught up in trying to satisfy expected outcomes that they seldom have time to be creative about what they do, this results in teachers becoming less motivated about the work they love doing. Such disempowerment results when any attempt at transformation is not approached from the point of the teacher (Pithouse, 2004).

Moletsane (2004) also acknowledges the use of reflections and action research as a method for attaining professional development however she adds that teachers need to be empowered in their position in order to develop.

2.7. Supporting Professional Development through Learning Theories

UNESCO (2005) relies on teachers for the effective implementation of ESD however there is very little guidance provided regarding its implementation. My argument thus far is that teachers need to feel empowered in the implementation process and that this may be achieved by providing them with the opportunity to design and implement their understandings of ESD, using reflective practice as a tool for such teacher professional development. The following section considers the argument thus far, to suggest two appropriate learning theories that offer assistance in attaining teacher professional development towards the concept of ESD.

2.7.1. Situated Learning

When schools ship their teachers off to professional development workshops, teachers are expected to gain knowledge and on returning to their school context, are expected to apply

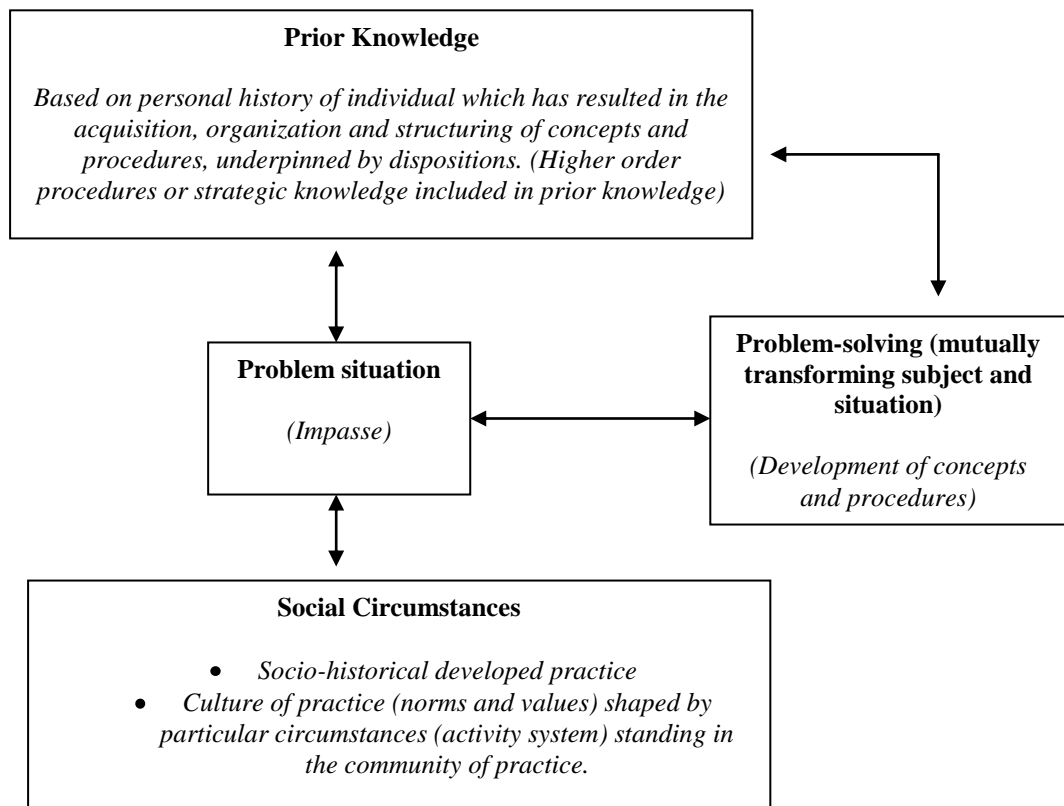
their learning to the new arena. This is particularly difficult when implementing ESD into one's curriculum. ESD requires that first a contextualized understanding of sustainable development be achieved. Secondly any attempts at active learning requires a teacher to have a good understanding of the local community issues, which can then be addressed through the use of the content structures in the existing curriculum. Taking these two considerations into account, ESD is an innovation that requires the teacher to use trial and error with relevant activities in an attempt to address SD which is relevant to his/her learners. Thus a workshop removed from the context offers little help to the teacher (McKeown, 2002). According to Lave (1988) and Roelofs and Terwel (1999) learning needs to be situated in a real situation and context also known as 'authentic pedagogy'. This means that professional development activities that promote professional learning would need to be those that are situated within the practitioners' actual context to ensure that learning is applied and not abstract. Not only is the context deemed important, also social engagement whereby practitioners/learners enter into a 'community of practice' is crucial to ensure learning (Lave, 1995).

Situated learning has also been described as context-specific learning that ensures that the knowledge learnt can be applied in the authentic situation in which it ultimately needs to be applied (Billett, 1996). This often lacks in professional development initiatives where practitioners are expected to apply abstract and de-contextualized knowledge to their very specific contexts in which they work. Thus it becomes not only about the relevance of the knowledge being learnt but also the relevance of the context in which the knowledge is being learnt. In fact Billett (1996) attributes the ability for practitioners to relevantly apply knowledge, to the context in which the very knowledge was acquired. Therefore in order for practitioners to become more competent in applying their learned knowledge to their

work context, the learning of this new knowledge must take place in the same or a similar context.

Further in order to fully understand the situated nature of learning, Billet (1996) states that one needs to understand the cognitive and socio-cultural perspectives that influence this type of learning. The construction or appropriation of knowledge may be assisted by practitioners engaging with problem-solving activities within their contexts whereby they become resourceful in an attempt to solve the posed problem (Billett, 1996). In this way the solutions that practitioners devise are socio-specific, according to the resources they had available to them within their specific contexts. The model represented in Figure 4 below acknowledges the influence of prior knowledge and social circumstances on the way in which concepts and procedures are developed.

Figure 4. Billett’s model of Appropriating Knowledge



(Billett, 1996, p.271)

In solving the problem posed (in this study the problem posed refers to teachers developing their understanding and practice of ESD), practitioners use their prior understandings, beliefs, experiences etc. (also known as their current cognitive structures). As a result the practitioners’ current cognitive structures will either be reinforced or redefined depending on its level of success in addressing the posed problem. Whether the practitioners’ cognitive structures are reinforced or transformed, learning and development still take place during problem solving activities. This theory of situated learning is closely linked with Vygotsky’s theory of constructivism which places large emphasis on the role of the cultural context on learning.

2.7.2. Constructivism

Knowledge is constructed and as a result cannot be objective. In the same light, knowledge does not occur via transmission but rather through an engagement with inquiry, active searching and experience (Roelofs & Terwel, 1999). Although constructivism as a theory has been used for many years to provide constructive insight into the way children learn in schools, this theory also offers useful insight into understanding how professionals learn to the degree of professional efficacy. In this way this study accepts von Glaserveld's (1991) notion that 'knowledge' is the *sine qua non* of a learner's activities and not necessarily the starting point. The learners in this case are the teachers.

Constructivism serves as the main theoretical framework for this study as it offers a meaningful lens through which the data could be analysed. In order to understand how teachers develop their understanding and practice of ESD it is crucial that we look at how teachers construct their understandings over the period of the action research study. At the outset, this study has acknowledged the contentious nature of the term and reality of 'sustainable development' from a universal perspective. What has been proposed within this study and by Huckle (2001) is that SD and therefore ESD are concepts that require contextualization to be effective in a given educational setting. In this instance it is clear that knowledge is constructed and not transmitted (UMass Physics Education Research Group, 2001). Thus, with respect to constructivism, when referring to teachers' understandings and practice of ESD, it is their constructed meanings regarding ESD that is being observed and explored.

Piaget viewed constructivism in the light of cognitive constructivism, whereby an individual's private interactions and concrete experiences are seen to contribute towards a

construction of meaning for the individual. Piaget, like Vygotsky, saw the need for social interaction however for Piaget this meant formal instruction that was delivered by a more knowledgeable adult at the correct developmental stages (age determined) in the individual's life. Although Vygotsky also acknowledged the important role that interaction with the physical world played in the construction of knowledge, he viewed this as taking place within a socio-cultural context, whereby before cognitive construction could take place an individual needed to internalize concepts through incidences of social interaction (Nyikos & Hashimoto, 1997). For Vygotsky social interaction referred to collaborative engagement in problem solving, whereby meaning is constructed and reconstructed on an ongoing basis. This reconstruction of meaning that happens in a social context provides space and opportunity for 'self-regulation' (Nyikos & Hashimoto, 1997: 507). Simply for Vygotsky and social constructivists at large, cognitive development cannot occur through isolated learning, rather it is engagement in collaborative learning that ensures cognitive development. This study adopts social constructivism to understand how the three teachers come together to develop their understanding and practice of ESD. Social constructivism is based on three premises. First it is understood that *reality* is not something that exists independent of human interpretation. Secondly *knowledge* is also not independent of human interpretation as it is in actual fact a product of human interactions. Finally *learning* is a process that is influenced by external factors such as one's social context or engagement in social activities (Kim, 2001).

2.7.2.1 A Group ZPD

Vygotsky identified a Zone of Proximal Development (ZPD) that exists between an individual's current developmental level and their potential developmental level, the achievement of which is assisted by engagement with more experienced peers. Nyikos

and Hashimoto (1997) expand on Vygotsky's notion of the individual ZPD to include a notion of an existing group ZPD. The notion suggests that when individuals engage in collaborative problem solving, not only does every individual move from their actual level of development to their potential level of development, but due to the variety of skills and understandings that are brought to the table, the group as a unit may move from their actual level of development to their potential level of development. This group potential level of development is identified as the point at which the individual's zones of potential development intersect. This means that some individuals may go beyond the established group ZPD, however the group ZPD is still acknowledged to be a level that exists only when the particular individuals involved are brought together to problem solve. The process of collaborative problem solving is seen as a mutually beneficial process for all members of the social group, for even though each individual's ZPD varies, all members have something to offer and something to gain.

For Nyikos and Hashimoto (1997) intersubjectivity is crucial when engaging in a collaborative group activity. Intersubjectivity acknowledges the need to move from fragmented individual understandings to mutual shared understandings that work for all individuals of the group. Cognitive apprenticeship and critical thinking are two processes that are identified by Nyikos and Hashimoto (1997) to promote intersubjectivity.

Cognitive apprenticeship does not refer to apprenticeship in the way that we often understand it. Instead of an expert imparting knowledge to the less knowledgeable, cognitive apprenticeship here refers to the cognitive development that takes place due to social conversation, debate and interaction. Cognitive development advocates that the learners/apprentices themselves are responsible for their own learning, so in the group

situation, members of the group are responsible for ensuring that a mutual understanding of meaning occurs. Meta-cognition thus plays an important role in the ability for the individuals of the group to contribute towards the development of mutual understanding/intersubjectivity. Due to the dependence on the group situation to develop meaning, learning only takes place in the way that it does due to the group context that exists and as a result situated learning is evident (Nyikos & Hashimoto, 1997). The danger that does exist in any collaborative project is unequal participation. For this caution, critical thinking needs to be engaged in by all members of the group to ensure intersubjectivity during the collaborative process.

Critical thinking suggests that members in the group engage in divergent thinking regarding a given problem before converging towards a common solution or understanding. Such a process requires “(a) a frame of mind that allows examination of multiple viewpoints and (b) a number of specific mental operations, such as determining reliability of a source, distinguishing relevance, detecting bias, identifying assumptions, and recognizing inconsistencies or fallacies” (Nyikos & Hashimoto, 1997, p. 509). It is dialogical thinking that enables the group to enter into intersubjective meaning making, thus assisting the attainment of a group ZPD which assists cognitive development.

Finally Nyikos and Hashimoto (1997) mention the importance of language in the cognitive development process. Language is an aspect that both Piaget and Vygotsky agreed needed to be engaged in when developing ideas and constructing meaning. Language was often expressed in the form of verbal and written reflections regarding the thought processes at hand. Once again meta-cognition is deemed crucial for self-regulation and cognitive development at large and thus is acknowledged as an important step in the development

processes within this research study. Constructivism and situated learning offered great insight into the methodological design of this research study and offers reason as to why the intervention phase later discussed in chapter 3, was implemented. The social learning context offered by both learning theories provides a natural setting for teachers to develop themselves professionally.

2.8. Embracing Change for Professional Development

Moletsane (2004) reflects upon the mounting expectations of teacher roles in South Africa, especially when considering the change in education policy that has taken place over the last ten years. She lists the demands made of teachers, these include being transformative, addressing the societal issues of the present such as HIV/AIDS, violence and teenage pregnancy, as well as being effective implementers of many policies (Moletsane, 2004). Not to mention the fact that teachers are becoming increasingly de-motivated due to the degradation of teaching conditions, namely poor payment, few resources and little autonomy (Moletsane, 2004). Moletsane (2004) argues that teachers need to be at the centre of change. When considering programmes that are meant to assist teachers in dealing with certain educational transitions and challenges, it is important that teachers be the focus if professional development is to be realized (Moletsane, 2004).

Moletsane (2004) further states that professional development is not only about developing a teachers' pedagogical knowledge and skills, it is also about developing their sense of ethics and increasing their sense of responsibility within the teaching profession. Moletsane (2004) believes that by attaining professional development of this kind, teachers may come to be seen by themselves and others as professionals. I would add that once this

level of respect is achieved by firstly the teacher and then society only then can teacher empowerment be fully experienced.

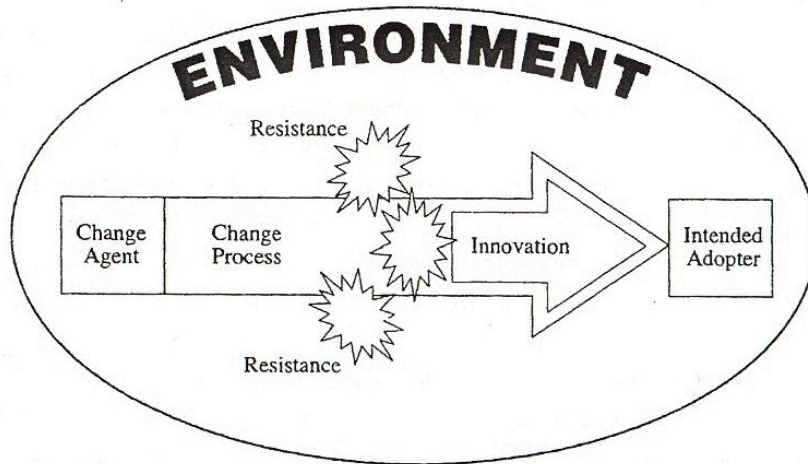
The Department of Education has recently initiated the idea of professional development ‘points’ that requires teachers to attend a particular number of workshops to build up their number of hours for the year. Moletsane (2004) points out that these workshops are usually not placed within the teachers’ context, meaning that there is very little that teachers can take back to their schools with them. This reinforces the importance of situated learning. Moletsane (2004) comments that although the intentions of the one day or two day workshops are good they seldom make a difference. For these reasons Moletsane (2004) supports that teachers should be responsible for managing their own professional development. This study recognizes the need for professional development of this kind and to some extent aims to identify how teachers attempt to develop themselves when faced with the challenge.

The following section explores the role of teachers as change agents and how self-directed professional development is a sustainable and realistic mode of professional development that equips teachers in implementing new policy innovations.

2.8.1. Teachers as Change Agents

This study recognizes the unethical nature of imposed change and aims to allow the intended adopters to eventually become instruments of their own change process.

Figure 5. Ellsworth's Model of Change



Ellsworth explains that although this model appears to represent a one-way linear process of adopting an innovation to ensure change via the assistance of a change agent, it is in fact a two-way process. This two-way process is evident when the intended adopter becomes the change agent. Ellsworth (2000) deems any change process that involves a one-way communication flow from an outsider change agent to an intended adopter, unethical. Although Ellsworth refers largely to systemic change, he also refers to the importance of sub-systemic change. Sub-systems of change together contribute towards holistic systemic change. For example, systemic change may involve ESD principles being adopted into the schools' curriculum permeating all of the schools' policies. However, sub-systemic change within this systemic movement may involve individual teachers adopting principles of ESD in their teaching. This study focuses on sub-systemic change/development.

The Change Communication Model (Ellsworth, 2000) also acknowledges the existence of resistances or factors contributing to the failure to adopt and successfully implement an innovation. Such factors could be extrinsic (time, workload, resources, lack of assistance

etc.) or intrinsic (self-doubting, doubting the value of the innovation, uncertain about particular characteristics of the innovation, conflict of personal interests, pressure to perform etc.).

Ellsworth (2000) states that resistance offers a barrier to change. Ellsworth (2000) identifies the possible barriers that one may encounter, one category of which includes 'cultural barriers'. Cultural barriers include one's personal principles such as beliefs, morals and ethics which impact upon a person's willingness and even ability to partially or fully adopt and implement an innovation. Zaltman and Duncan (1977) also mention the ability for social barriers to impact upon change. One such social barrier may be fear of the impact that adopting the innovation will have on personal relationships in the work place. Another such social barrier mentioned, refers to that of resentment of outsiders. This resentment may be rooted in the fear of not performing well in front of the outsiders or caused by the feeling that an outsider is far too removed from the context to understand why things function in the manner in which they do. As a result the proposed innovation adopter sees any proposed change from the outsider to be doomed to failure. Such social barriers could be countered and diffused by redefining the role of the outsider from mere 'adopter' to 'participant change agent', whereby the outsider seeks to understand the innovation within the 'adopters' context thus emphasizing that change is a process of discovery for both outsider and 'insider/adopter' (Zaltman & Duncan, 1977; Ellsworth, 2000). This strategy was one which my study employed as it was stated from the outset that my role was not 'the expert' but that of 'co-researcher'.

Zaltman and Duncan (1977) identify 'introspection' as another social barrier to change. 'Introspection' is described as the inability for an insider to see how change or

implementation of a new innovation is possible as they have no concrete examples to draw and work from. Zaltman and Duncan (1977) state that even though the individual may motivate for the proposed innovation he/she becomes de-motivated when they cannot see how the practical implementation of change can take place. For this reason Zaltman and Duncan (1977) support the collaboration of insider and outsider efforts in change implementation.

When adopting and implementing a new policy innovation it is not merely the resistance and barriers to change that need to be considered. The next most practical concern is ‘How do I get myself to a level whereby I am able to implement this change/innovation?’ Self-directed professional development offers an explanation as to the motivating factors that guide teachers on their journey towards professional efficacy and towards the eventual implementation of change/innovation.

2.8.2. Self-directed Professional development

Considering how much policy and curriculum change teachers in South Africa have had to endure it is just not possible to send every teacher to training workshops each time a policy innovation arrives. For practical reasons it is common practice for schools to send representative teachers from the school to attend these workshops. This means the teachers back at their schools receive interpretations of what went on at these workshops, and it is possible that these interpretations are not all that accurate. Perhaps a method whereby teachers become responsible for their own development, offers a more sure way of adopting and implementing new policy innovations. Mushayikwa and Lubben (2008) in a study focusing on self-directed professional development, identify the desire for

teacher efficacy ⁵ to be the driving force behind teachers turning to self-directed forms of professional development.

Mushayikwa and Lubben (2008) recognize ‘self-directed professional development’ to refer to any professional development that occurs as a result of the practitioner themselves taking on catalyst roles. Sarsar (2008) supports the notion of self-directed professional development as she declares that it is largely the teachers’ willingness to embark upon new professional development initiatives that deem such a venture a success. Sarsar (2008) also acknowledges the negative images that teachers may hold of professional development programmes, as they often situate teachers as invalids who are inadequate and need to be trained. As a result often professional developers “*adopt a technical-rational approach to professional development*” (Sarsar, 2008, p. 1) thus neglecting reflective methods of development. Sarsar (2008) proposes that by simply adopting the reflective practitioner approach, self-directed professional development becomes a natural consequence. By allowing practitioners the freedom to critically reflect, teachers construct their own skills, knowledge, attitudes and values in relation to their practice and therefore develop themselves professionally. Gould and Baldwin (2004, p. 102) describe teachers as “*reflective practitioners [who] build on their experiences and are actively engaged in developing theories that they can use in practice*”. According to Clark (1992) self-directed professional development offers a change from seeing professional development as addressing teachers’ deficits to seeing teachers as thinking, communicating and acting practitioners who reflect responsibly on their own professional development.

⁵ Teacher efficacy – refers here to a teacher’s belief about his/her own competence

As many researchers (Clark, 1992; Gould & Baldwin, 2004) agree that self-directed professional development is an important practice, many researchers also show their restricted understanding with regards to how such professional development takes place successfully (Mushayikwa & Lubben, 2008). However, one thing is for sure according to Mushayikwa and Lubben (2008, p. 2) “*By empowering teachers, professional developers encourage them to take the initiative in identifying and acting on their own individual needs.*” Such a statement implies that self-directed professional development is iterative, meaning that one instance in which teachers are given the opportunity to develop themselves professionally, will ultimately result in teachers’ future ability to develop themselves in different instances that pose challenges.

As stated previously, teachers’ willingness to get involved in professional development is crucial for success. Mushayikwa and Lubben (2008) identified seven motivational concerns that teachers displayed as reasons for becoming involved in self-directed professional development. These concerns may offer some insight into understanding how teachers develop themselves and by which motivations their developments are driven. Also, by understanding the major concerns driving self-directed professional development one may also come to identify more easily the benefits and extent of empowerment experienced by teachers.

The first concern refers to ‘professional identity’ whereby teachers become concerned about how they are respected professionally by colleagues, parents, learners and general society. Teachers become concerned about how they may gain respect to be seen as professionals (Mushayikwa & Lubben, 2008). The second concern alludes to career development, whereby teachers desire to update their skills and knowledge regarding their

practice to better their achievement of pursuing further qualifications. The third concern refers to ‘professional networking’, whereby teachers desire to form connections with peer educators to form a community of practice where knowledge, experiences and skills are shared in an attempt to develop further. These three concerns have been merged to form one main category of concern, that of ‘professional efficacy’ (Mushayikwa & Lubben, 2008).

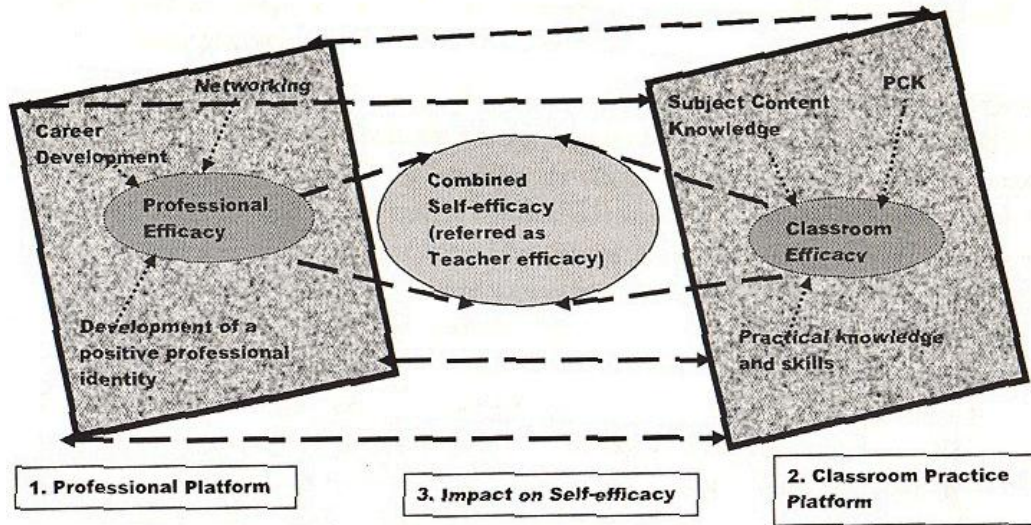
The fourth area of concern that motivates teachers towards self-directed professional development is the status of one’s ‘theoretical and content knowledge’ (Mushayikwa & Lubben, 2008). In this instance teachers become focused on ways in which they can increase their subject content knowledge to ensure they are up-to-date in their area of specialization. A fifth concern similarly refers to updating ‘practical knowledge and professional skills’ (Mushayikwa & Lubben, 2008). Such focus may refer to identifying resources and methods that enhance teaching and learning in the classroom. ‘Pedagogical content knowledge’ development is also a motivating concern, as teachers search for ways to adapt content taught to the learners’ living context, in an attempt to make learning more meaningful and relevant to learners. These three concerns have also been collapsed into a common category of ‘classroom efficacy’ identified by Mushayikwa and Lubben (2008).

The seventh concern, which is a general concern falling into both broader categories identified is ‘benefits to the teacher and students’ (Mushayikwa & Lubben, 2008). This general concern refers to concern about developing learners to a point of maximum understanding, enjoyment and engagement with the subject, offering learners skills that can be carried forward. This concern also refers to the development of the teacher with regards to their content knowledge, teaching and assessment methods and ability to remain

reflective regarding their practice to ensure constant improvement. This general concern along with concerns relating to professional and classroom efficacy merge together to be understood by Mushayikwa and Lubben (2008) to form the motivations for self-directed professional development. These concerns can be summarized as concerns of ‘teacher efficacy’ (Mushayikwa & Lubben, 2008).

It is only upon understanding the concerns that drive teachers towards self-directed professional development, that a model of self-directed professional development can be explored. In a model by Mushayikwa and Lubben (2008) the process of self-directed professional development is represented as a focus on individual aspects of concern which have the ability to impact positively on other concerns of teacher efficacy. The model below shows a professional platform, which refers to all concerns of professional efficacy. Addressing these concerns can result in teachers feeling empowered, contributing towards their sense of professional efficacy and ultimately their self-efficacy as teachers. The model also recognizes the possible impact that addressing concerns within one platform may have on concerns on the other platform. Ultimately through various actions aimed at addressing concerns within professional efficacy and classroom efficacy, teachers work their way to achieving the ultimate teacher efficacy, which provides teachers with an increased level of self-esteem and professional-esteem (Mushayikwa & Lubben, 2008). Figure 6 displays a pictorial representation of the motivational concerns driving teacher self-directed professional development and ultimately achieving teacher efficacy.

Figure 6. Mushayikwa and Lubben’s model of attaining teacher efficacy



It is crucial to note that, for it to be an empowering development process teachers need to see this development process as one that increases their teacher efficacy. If this is the case, it is also necessary to follow how teachers work towards achieving this state of teacher efficacy with regards to ESD.

2.9. Using Action Research to address teacher professional development

Action research is seen as the main driver of this study as it offers an opportunity for reflective practice and thus professional development with regards to the development of an understanding and practice of ESD. The critical nature of action research is highlighted as well as its ability to promote professional development in a way that is empowering to teachers. In the past, attempts to promote professional development amongst teachers, have not occurred in an empowering manner for teachers (Chisholm, 2003). Finally a case

study from Pedersen (2005) is included to explore the function that action research has in forging learning partnerships between researcher and practitioners.

2.9.1. Exploring the characteristics of action research

Kurt Lewin (1946, p.35) was the first to refer to ‘action research’ and he defined it as:

“...a comparative research on the conditions and effects of various forms of social action and research leading to social action” which involves, *“...a spiral of steps, each of which is composed of a circle of planning, action, and fact-finding about the result of the action”*

Greenwood and Levin (2007) define action research simply as research that is conducted by at least one expert with individuals in an organisation or common field, to bring about a transformation of the context in which the individuals exist or work. The transformation must lead to a better and more functional environment in which the individuals live or work (Greenwood & Levin, 2007). Thus action research has a clear agenda for transformation. Both Lewin’s (1946) and Greenwood and Levin’s (2007) definitions of action research are adopted in this study as they recognise the impact of social interaction and reflective practice on transformation. Greenwood and Levin (2007) add detail to Lewin’s (1946) definition by acknowledging the importance of outsider specialist knowledge and insider practical knowledge. In this way this research study deems both the researcher and participant-researchers as vital for the process of transformation.

Altrichter, Kemmis, McTaggart and Zuber-Skerritt (2002) define action research as an activity that mainly aims to develop process skills and achieve emancipation. Objectives cannot be predetermined when the context, action and experience are continuously being redefined and developed. In realising this dynamic, teacher researchers are given more

freedom and responsibility than first appears to be the case (McNiff, 2002). It is essentially through the engagement of reflection that experiences are made sense of and problems are thus redefined (Garcia, Sanchez & Escudero, 2006). In order for teachers to become critical action researchers, they need to engage with critical reflection at a more advanced level of reflecting for future action as opposed to simply recalling events that transpired (Carr & Kemmis, 1986). This study recognises the phenomenon of redefinition of the original problem, a concept not elaborated on by either Lewin (1946) or Greenwood and Levin (2007). It is via the above exploration of understandings of action research that a more holistic view of action research can be addressed in this study.

Greenwood and Levin (2007) define action research by highlighting its five main characteristics. Firstly, action research is a manner of study that is defined by its context and attempts to provide solutions to problems that exist within that particular context. Secondly, action research is a form of reflective inquiry which allows and requires participation and input from all parties involved in the study. Thirdly, action research values the diversity of skills and experiences present within the participating group as it promises more meaningful action taking. The fourth characteristic that Greenwood and Levin (2007) mention is the benefit that meaning construction has on the participants' ability to take action. Furthermore, it is not only the taking of action that is the benefit for participants. It is rather through reflecting on particular actions, that participants of the inquiry process also develop new meanings (Greenwood & Levin, 2007). Finally action research and the validity thereof is measured by its ability to produce a solution to a problem, as well as to develop the participants to a point where they are able to function well in problem situations.

When considering the different role players in any action research inquiry, Greenwood and Levin (2007) do not believe that the purpose of the action researcher is to guide others to the right social or professional situation. Rather they state that their role as researchers is to offer the tools and opportunities for the insider participants to be agents of their own professional development. This is recognised within this particular study for although the main purpose of this study is not to lead the three Grade 9 teachers in their own change it does in part aim to bring these teachers to the point whereby they are able to reflect upon their understanding and practice of Education for Sustainable Development. In this way it is really the teachers who are responsible for their own skill development and ultimately their own professional development, even though I do play a part in their development.

2.9.2. Benefits of Action Research

According to Elliot (1991) the main aim of action research is to improve one's practice and of subordinate significance to that is the development of knowledge. One may argue here that the improved practice or action is only an indicator of the development of knowledge which is the main aim. I think that both these viewpoints ignore the dependent relationship that exists between experience/action and cognitive and practical knowledge development. By this I mean that as much as experiences/actions may be influenced by cognitive and practical knowledge, so do actions/experiences influence the way cognitive and practical knowledge are developed. In this study, participants' understandings of ESD are being developed using the action research approach. The actions exhibited by participants will indicate the development of conceptual understanding with regards to ESD, as well as the development of practical knowledge of how to implement ESD in one's teaching. Elliott's (1991) point holds a large degree of truth, as he states that improved practice is the focus of action. However, one needs to consider the

understanding of his use of the term ‘knowledge’ and whether or not this should be extended to include practical knowledge of how ESD may be implemented into the taught curriculum of any given Learning Area.

Elliott (1991) highlights that in order for improved practice to occur, the defined values must be appropriately translated into concrete actions. Elliott (1991) felt that the only way to ensure that values were being translated into appropriate actions, would be to engage in a constant process of reflection. This view acknowledged that personal values, interpretations of predefined values and varying contexts all influence the process of translating values into actions in order to improve practice. From this insight it becomes clear that when practitioners engage in action research they are engaging in a dynamic process that is influenced by their social, religious, professional and ethical values. Through the use of reflective practice within action research, practitioner researchers may come to a point where theory is no longer divorced from practice (Elliott, 1991). This is crucially relevant for this research study, whereby the abstract principles of ESD need to be redefined by the teachers within their contexts in order to arrive at a point where these principles appear within their practice.

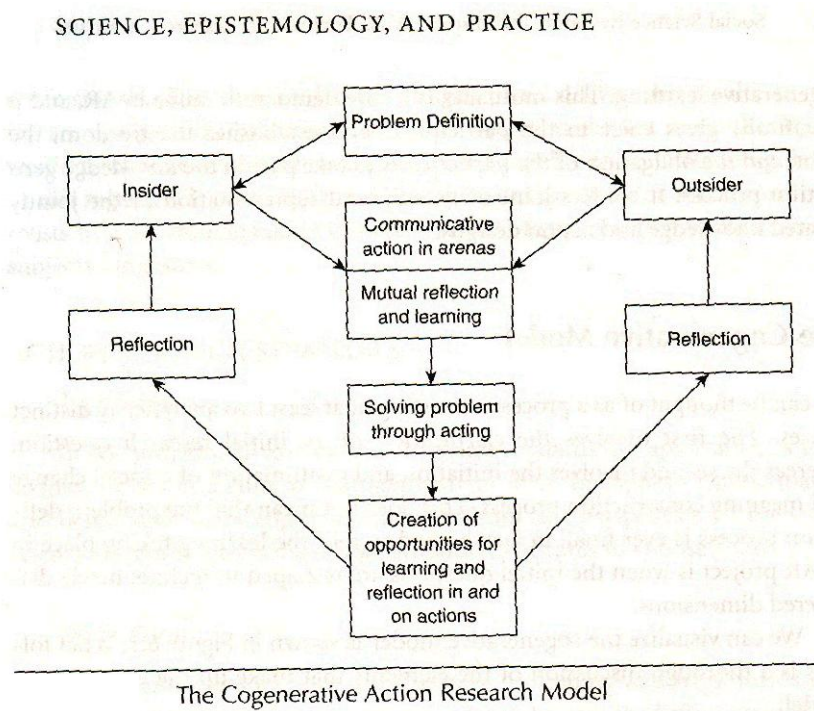
2.9.3. Engaging in the process of action research

According to Greenwood and Levin (2007) the participants within any action research study along with the expert action researchers should define the problem that is to be studied collaboratively. This requirement is not satisfied within this study as the problem was not defined by the participants but rather by the researcher. It is through recognised that such a requirement exists to ensure that whatever the problem is being studied through an action research approach, it will have an emancipating and thus empowering effect

upon the participants involved (Oettle & Law, 2005). However, as indicated by the findings discussed previously in this chapter which reveals that teachers know very little about ESD and how to implement it, such a process of defining the problem collaboratively could not possibly be achieved. It is also acknowledged within the *Cogenerative Action Research Model* (Figure 7) outlined by Greenwood and Levin (2007, p. 94) that problem redefinition may and should take place. This means that participants in the research reshape their questions according to new understandings and experiences that develop.

In reflecting upon the model presented below, it is noted that both outsider/insider researcher and insider participants enter into a circle of dynamic learning and communication.

Figure 7. The Cogenerative Action Research model



(Greenwood & Levin, 2007, p. 94)

The Cogenerative Action Research model (See Figure 7 above) shows how both researcher (indicated by ‘Outsider’ here, although this is not always the case – in this study the researcher was free to partake in the planning and action steps of the action research cycle if requested by the teacher-participants) and teacher-participants (indicated by ‘Insider’) reflect on the teacher-participants’ actions in order for mutual learning to take place.

The Cogenerative Action Research model emphasises the interaction of the insider and outsider towards the cyclic developmental process. Oettle and Law (2005) offer further explanation on the importance of the social dynamic. Oettle and Law (2005, p. 2) define action research as being a ‘dynamic social process’ where all parties are responsible for the outcomes of their practice and their interactions with others. Oettle and Law (2005) explain that the interactions that take place during this action research process result in the transforming of participants’ ideas and therefore their actions, changing the nature of their interactions as they move along. This development is seen to be emancipatory and therefore empowering for participants as they are given the power to assess their situation and engage in activities that will bring about change in these very situations. The ‘situations’ spoken of here refers to the teachers’ attempts to implement ESD into their lessons. In this way Oettle and Law (2005) also define action research as a cycle of learning, whereby situations are reflected upon in order to improve future situations.

Oettle and Laws’ (2005) interpretation of action research as a learning cycle extends the Cogenerative Action Research model as it captures the essence of both researcher and participants developing together and benefitting in different ways. Whereas the researcher may gain insight into the conditions, context and experiences of the group being studied the participants may gain insight into their current status, how they feel about it and what they require to transform their situation for the better, all this through the use of an action

research approach. In 1948, Lewin recognised the importance of real-life problem-solving as a tool for knowledge production. It was for the reason of relevant problem-solving that Lewin saw the value of the researcher moving from being a mere distant observer to becoming a participant in the problem-solving process. Oettle and Law (2005) show how the teacher becomes the researcher, strengthening Lewin's case for the importance of moving research from the outsider perspective towards the insider perspective when attempting to problem-solve.

2.9.4. Locating action research within professional development and empowerment

This particular section in the chapter aims to reveal the function that the nature of action research serves in professional development. Many authors take the view that it is both reflection and collaboration during the action research process that helps individuals to develop themselves professionally (Schoen, 2007; Garcia, Sanchez, Escudero, 2006; McNiff, 2002).

Action research particularly is supported by Farrell and Weitman (2007) who state that it offers the exact attributes of teacher empowerment. These attributes are listed as firstly providing opportunities whereby teachers may express their roles as decision-makers, secondly, providing the means and occasion for knowledge development, and finally increasing the teachers' status in the school. This means that by access to instances that allow teachers to display a sense of autonomy and knowledge development, teachers may come to be seen by others and themselves as professionals. This is consistent with the principles of action research which provides the researcher-teacher with the freedom to design and reflect upon inquiries in their own classrooms. Action research provides the means for teachers to be in control of their own professional development (Farrell &

Weitman, 2007). This is attained as teachers recognize that the change that they are witnessing is as a direct result of their actions of inquiry. Change becomes ownership as opposed to an employer enforced weapon (Farrell & Weitman, 2007).

Action research and its role in professional development has been explained simply as a process that an individual or group of practitioners engage in, in order to merge theory and practice. They do this by a type of exploration whereby an intervention is designed and implemented and the effectiveness of the intervention is given feedback by the practitioners (Avison, Lau, Myers & Nielsen, 1999). It is the process within action research of reflection-on-action that enables one to make the connection between theory and practice (Garcia, Sanchez & Escudero, 2006). Schoen (2007) adds that action research is a tool that encourages practitioners to reflect on the way that they think in their attempt to find the best strategies for practice. It becomes evident to me that action research involves instances of reflection *in advance of* action, reflection *in* action and reflection *on* action. Garcia, Sanchez and Escudero (2006, p. 1) view the act of reflection as “*the conscious immersion of an individual in the world of his/her experience, a world with values, interactions, affects, social and political interest*”.

McNiff (2002) highlights the importance of self reflection in action research, which she refers to as ‘practitioner research’. Although McNiff (2002) in her definition of practitioner research refers to practitioners’ conducting and writing up their own research, this is not the case in this study. Although the teachers in this research do not write up their own research, the teacher practitioners do begin with McNiff’s (2002, p.7) proposed question of ‘How do I improve my work?’ In this study, teacher practitioners during their lesson preparation and implementation ask: ‘How do I incorporate my understanding of

Education for Sustainable Development into my practice?’ This question is preferred to the possible question of an outsider researcher who may ask: ‘How do I get teachers to incorporate ESD into their practice?’ The reason why the former question is preferred is because it offers an opportunity for self-empowerment of teacher professionals, as opposed to an external imposition of forced change. McNiff (2002) stresses that practitioners solving their own problems through action research, has benefits for their own professional learning. McNiff’s (2002) view of practitioner research contrasts with the traditional workshop-type training methods that have and still do flood the teacher development programmes today (McNiff & Whitehead, 2002). McNiff’s (2002) view of practitioner research acknowledges that teachers have the means to develop themselves, thus giving power back to the teachers. This element of self-reflection in action research has been adopted within the framework of this study.

According to McNiff (2002) when practitioners engage in action research there are two processes that are taking place simultaneously. Firstly there are the action research steps that are procedurally carried out and secondly there is a process of learning that occurs as the steps are carried out. It is therefore not only the actions and events that are to be focused on but also it is the meaning making and learning that take place as a result. McNiff (2002) goes one step further to say that learning is not merely as a result of the actions that unfold but more so a result of the reflecting on those actions. The actions mentioned also need to mean something to the practitioner.

McNiff (2002) indicates that it is through becoming responsible and accountable for one’s actions that a practitioner begins to feel empowered. Action research does not just become about critiquing one’s own practice but it also involves realising and understanding why

one decides to practice in a particular way and how this impacts on other stakeholders, in this instance the learners (McNiff, 2002). As teachers are provided the space and freedom to research their own practice, they begin to develop a sense of professional identity (Farrell & Weitman, 2007). As far as Farrell and Weitman (2007) are concerned teachers have been given very little recognition as professional decision makers, as research pertaining to education has mostly followed a top-down approach in its attempts to improve education. This means that employers' attempts at educational transformation predominantly involves experts removed from the educational setting, designing policy that impacts upon the implementers within the context, yet never consulting the implementers in the policy design process. As a result teachers are left feeling like end-product-implementers (Chisholm, 2003).

Farrell and Weitman (2007) report on the ability for action research to develop teachers' professional ego which eventually results in greater performance in the workplace. As teachers increasingly make decisions that impact upon the workplace, they begin to feel responsible and therefore empowered. What informs practitioners' decision-making is their increased knowledge development during the reflection-on-action processes in the action research cycles. In fact Farrell and Weitman (2007, p. 38) report that teacher-researchers are of the opinion that they are more informed after the action research process, so much so that many times they view themselves as field experts. Teachers gain this sense of motivation once they realise that any change that they are experiencing is not due to external powers but due to their own perseverance within their own inquiry (Farrell & Weitman, 2007). Finally an important aspect that must not go unnoticed is the importance of working together with other teachers. Farrell and Weitman (2007) state that by being willing to learn from someone else, one's colleagues and even one's learners,

teachers move into a more sustainable state of professionalism. It is by placing teachers at the centre of research, that change occurs as a result of teachers' understanding and practice and not as a result of imposed policies that involve outsider research (Farrell & Weitman, 2007; Carson, 1990). Thus it can be said that teachers move from the periphery of disempowerment to the centre of empowerment, giving teachers back their professional voice.

2.9.4.1. Action research – A tool for professional knowledge development

This study advocates an action research approach whereby teachers as insiders are responsible for their own development. Carson (1990) speaks of 'critical action research' as a way of giving teachers the power to understand their practice and alter their practice in order to improve their concrete situations. Habermas (1972) states three ways in which knowledge is produced by people. Firstly technicist knowledge formulation involves generating knowledge through experimentation and observation. As a result people engaging in this type of knowledge formation produce empirical knowledge with facts and generalisations. The second type of knowledge formation that Habermas (1972) talks about focuses on knowledge formulation via communication and aims to understand people and their situations. As opposed to the first type of knowledge formation, knowledge here in most cases cannot be generalised due to its context laden nature. The final type of knowledge formation that Habermas (1972) describes – and it is this which is drawn on in this study - is knowledge that is critically reflective and as a result has a liberating and emancipatory effect on those who engage in this type of knowledge formulation. Carson (1990) is of the view that technicist knowledge formation has strongly permeated research and has resulted in the objectification and measurement of people being researched and doing research. According to Carson (1990) such control

over people and their actions during inquiry and knowledge formation is not suitable for liberation, rather people should engage in critical reflection and “*democratic decision making*” (Carson, 1990, p.168).

Carr and Kemmis (1986) support the idea that critical action research brings together the objective nature of positivist knowledge production with the subjective nature of interpretive knowledge production by critical reflection on how the two interlink. By this Carr and Kemmis (1986) acknowledge the ideas of social construction of knowledge through individuals’ experiences. However, Carr and Kemmis (1986) propose that critical action research which invites critical reflection, changes the passive role of the researcher into an active participant role, allowing the individual to recognise and change his/her social constructions of knowledge. Critical action research is described by Carson (1990) as a sustainable form of problem solving whereby an ongoing cycle of planning, acting, observing and reflecting is maintained until school and society are eventually redefined. This concept of redefinition is a popular one within action research (Altrichter, Kemmis, McTaggart & Zuber-Skerrit, 2002). With reference to the Cogenerative Action Research model described earlier, the insider teacher-participant and outsider researcher would need to reflect critically on the teacher-participants actions, claiming responsibility for their own knowledge construction.

2.9.5. Forging partnerships through action research

Pedersen (2005) wrote a paper solely discussing the possibilities of “*forging learning partnerships between researcher and practitioners*” (2005, p.167). The learning referred to here, occurs via an action research approach which is focused upon the effective

implementation of ESD. The action research method of inquiry is proposed by Pedersen (2005) as she motivates that it provides an empowering option for practitioner learning.

Pedersen (2005) reports on her research which initially attempted to look at how 3 schools implemented a 'whole school sustainability program'. As Pedersen engaged further in trying to access her participants she found that very few of the staff and students were actually interested in developing such a programme. The reason Pedersen (2005) identifies for this resistance to participate is the perceived gap between Pedersen's role as a researcher and her drive for attainment of sustainable practices. As a result Pedersen (2005, p.168) established with her participants a common goal to come to an "understanding of sustainability education". Pedersen removed the social barrier that presented itself by engaging in an action research approach.

Pedersen's exploration unfolded using Kurt Lewin's (1946) action research steps of plan-act-observe-reflect, in an attempt to empower practitioners through a process of critical reflection. Pedersen (2005) comments that it is through placing every participating teacher and researcher at the level of inquiry that all participants can achieve the freedom of empowerment, as "*...the spiralling approach of action research empowered a learning framework that will enable this group's learning to progress indefinitely.*" (Pedersen, 2005, p. 169) Pedersen (*ibid*) further states that the action research approach provided an emancipatory climate for 'collaborative learning' which is an interaction advocated for in the United Nations Decade of Education for Sustainable Development (UNDESD) (UNESCO, 2003) For similar reasons (avoidance of social barriers) as to those stated by Pedersen (2005), this study aims to encourage co-researcher participation from teacher practitioners in an attempt to discover and develop an understanding and practice of ESD.

2.10. Conclusion

This chapter explored the conceptual understandings of Sustainable Development and Education for Sustainable Development and the contentions behind these. The chapter offered insight into the implications and challenges of implementing ESD and the role that teachers need to adopt in order to become effective ESD implementers. The literature in this chapter reveals the need for teachers to become active and reflective agents of change in order to empower themselves professionally towards ESD. Guidelines for improving teacher efficacy with regards to innovation and therefore ESD implementation are listed as well as indicators of ESD implementation in practice. An understanding of the important role that reflective practice plays in professional development was taken forward in the design of the research method of this study. Teacher empowerment, professional development and teachers as agents of change are all considered vital in realising the critical nature of this research and of the research design. The chapter explored the situated and constructivist learning theories that drive teacher professional development. Self-directed professional development drew on aspects of these learning theories as an empowering way of driving educational change that also works towards teacher professional development. This chapter also served to set the scene from a theoretical perspective for the methodology chosen in this study and shed more light on the reasoning behind choosing the particular methods that were eventually employed. The following chapter serves to describe the research design and process embarked upon and the substantiations for these methods. The chapter also links the data collection tools used to their functionality in answering the posed research questions. Chapter 3 describes the context in which the research study took place, how data was collected and what measures were taken to ensure an ethical and trustworthy data collection process.

The ESD principles and guidelines for implementing ESD evident in this chapter have been considered in the design of the data collection instruments revealed in chapter 3 and used as an analytical tool. Literature regarding reflective practice and teacher professional development, have contributed to the understanding that Self-directed professional development was to be an important aspect that would feature in the way that the research was designed. These theories also decided the roles of the participants and the researcher at varying points in the action research cycle. The learning theories have been used to understand the manner in which the three teachers' knowledge development took place.

Chapter 3

‘Mapping out the journey’

3.1. Introduction

Chapter Three frames the research design and methodology of this action research case study. The contexts in which the research study took place and the manner in which the participants were accessed and selected for the study are described. The participant roles are also defined. In this chapter the action research approach adopted, and its purpose and design for this research study are highlighted. The instruments designed for each of the steps within the appropriate cycles are described according to their purpose and design. The ethical considerations are drawn on and the deep implications of these considerations for the study are mentioned. Finally the limitations of the research design are pinpointed and elaborated upon.

3.2. Contexts of the study

The study was carried out in the greater Durban area. Three participants were accessed from three different schools. Originally it was thought that these three teachers would ideally come from the same school, however as time went by, it became apparent that the criteria of

selection, being those of interest and willingness to participate, could only be satisfied across more than one school.

The first school, Albany Girls High School ¹⁰ is found in a middle class to upmarket Durban suburb. This school is a very well resourced school and it strives for excellence in all areas. Albany Girls High School engages in sustainable environmental practices, e.g. recycling of newspapers, as well as has a functioning environmental club which is lead by the teacher participant in this study.

The second school, Bahemia Secondary School ¹¹ is found in a middle to low income area. This school is resourced in terms of teaching and learning materials. The school has its own organic vegetable garden yet no recycling projects.

The third school, Cashmere Secondary School ¹²exists in a low income suburb, whereby resources are hard to come by. The school has computers where learners may access information; however when observing the general classroom situation the observer will see that there is little access to resources such as video machines, television sets, overhead projectors and the like. Cashmere Secondary does not run any recycling projects nor does it have an environmental team or club.

¹⁰ Albany Girls High School – A pseudonym for the school at which Jay teaches

¹¹ Bahemia Secondary School – is a pseudonym for the school that René teaches at

¹² Cashmere Secondary School – is a pseudonym for the school that Kay teaches at

3.3. Accessing and selecting the research participants

Due to the nature of this research study it was important that teachers were willing and interested in the research topic itself. In order for teachers to be empowered in the development of their understanding and practice of ESD, they had to display interest in what they were about to undertake. The first attempt made to access teacher participants, involved a direct address by myself to the teachers. This address is described in more detail below.

One of the teacher participants, who was very interested in the idea of action research and ESD is an Environmental Education Curriculum Forum (EECF) member. The EECF served as the networking station for accessing participants for this study. A five minute presentation was delivered to members of the forum regarding the aim, rationale and purpose of my research study. The other two participants were accessed via forum members who knew of potentially interested teachers. All three teachers needed to be interested in the topic of study and teach at least one Grade 9 subject.

3.4. Research participant roles

The research participants in my study played the role of ‘co-researcher’ amidst many other roles. It is important that teacher expectations of the researcher be identified as well as researcher expectations of the teachers. Table 3. below represents and justifies both teacher and researcher roles.

Table 3. Teacher and Researcher roles, including justification for these roles

Research Participants	Roles	Why these roles?
<p>Teachers</p> <p>Teacher 1 – Jay From Albany Girls High School, teaches Natural Science to Grade 9</p> <p>Teacher 2 – René From Bahemia Secondary School, teaches ----- to Grade 9</p> <p>Teacher 3 – Kay From Cashmere Secondary School, teaches ----- to Grade 9</p>	<p>Co-researchers – throughout the action research cycles teachers observed and influenced their own and their peer participants’ development</p> <p>Planners & Designers – planning and designing their lessons and their intervention which aimed to develop their understanding and practice of ESD</p> <p>Reflectors – continuously reflecting on their lessons in which they attempted to implement principles of ESD. In this way teachers reflect on, in and for action.</p> <p>Implementers – teaching their lessons and conducting their interventions that they designed</p> <p>Collaborators – teachers formed a group to discuss the type of intervention required. They also gathered to discuss the impact that the intervention had on them and their development.</p>	<p>Teachers need to be aware of their learning in order to recognise and implement their development in their teaching (Merriam & Caffarella, 1998)</p> <p>Teachers show how they plan to educate for sustainability</p> <p>Teachers become aware of their many decisions and their reasons for making them. Teachers become conscious of their learning and development regarding ESD implementation.</p> <p>Teachers show what they understand by ESD in their practice. They also demonstrate their ability to display their understanding and perhaps any challenges implicated in this</p> <p>Teachers work together to identify what each understands and what each can learn from one another. Teachers pull together to identify what intervention is required and the impact that this has on their learning and development.</p>
<p>Researcher</p> <p>Hayley – I am a Masters student at UKZN. I</p>	<p>Non-Participant Observer – As the researcher, I interviewed the teachers as well as observed them without contributing my input.</p> <p>Participant Observer – As</p>	<p>As the researcher I aimed to identify the teachers’ understandings and practice of ESD without providing any influence.</p> <p>As the researcher during the planning and action steps of the</p>

<p>currently lecture and tutor Biology and Natural Science.</p>	<p>the researcher, I observed during the intervention (planning and action steps) and assisted when teachers' requested.</p>	<p>cycle I observed teachers making decisions however I was not closed off from helping if teachers requested it. However the degree to which help was given was limited, to prevent me as the researcher from guiding teachers in what is meant to be self-directed professional development.</p>
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This research study acknowledges the phenomenon that many policies and programmes that are implemented at the classroom level have come about due to research that has been done on teachers and not necessarily by teachers. Few programmes and policies are incorporated as a result of research that has been done by teachers in their fields (Farrell & Weitman, 2007). It is because of this top-down debilitating model of policy and programme design, which calls upon individuals removed from the context of implementation to draft policies that teachers are required to implement, that this research aimed to involve teachers in the design and implementation of their interests. As shown in Table 3 above, teachers were provided with the opportunity to track and change their ideas and actions by being granted status of planner, implementer, reflector and collaborator, all elements of the combined role of a co-researcher. According to Farrell and Weitman (2007) such a role reversal offers teachers an opportunity for empowerment.

Although teachers within this research study were not the initiators of conducting action research on their understandings and practice of ESD, in other words this topic is not a research endeavour of the teachers per se, teachers did however voice their interest in the participation of such an endeavour. This feature of the research was used to justify the claim that teachers were participating in research that they felt would benefit them in some way. Farrell and Weitman (2007) comment that the mere ability for teachers to make decisions that

they know will affect their teaching environment is enough to promote teachers' sense of self-efficacy¹³.

This research study cannot be seen as merely research being done *on* teachers, due to the decision making on behalf of the teachers and the opportunity given to teachers to change their current status. Rather this research should be seen as research being done *by* and *with* teachers. This claim is supported by the strong reliance on teachers' interpretations of their own development if there is any, their views of how their development should take place and why they view their development in the way(s) in which they do. Farrell and Weitman (2007) suggest that when teachers feel empowered through the research process, this can be observed when they begin to feel that transformation is a result of their actions as opposed to a result of any external imposition.

Finally teachers are identified as collaborators, due to their engagement during their planning, implementing and reflecting upon their own intervention and general development. There are benefits of planning, acting and reflecting within a group (Farrell & Weitman, 2007). One such benefit is described by Farrell and Weitman (2007) to include the realisation that you are not the only one who cares and is interested in what you are investigating. This realisation provides teachers with a sense of power, knowing that what is being investigated is a legitimate concern that can/should be addressed. Another benefit is the shared contribution and learning that occurs when teachers each bring something different to contribute and realise they can learn from one another (Farrell & Weitman, 2007). McNiff (2002) supports the idea of collaboration during a study that incorporates action research as she states that researchers doing research within their field should collaborate with others in

¹³ Self-efficacy – refers to teachers' high level of confidence in achieving their professional requirements.

their field to gain insight into their perceptions of what is taking place. McNiff (2002, p.15) also emphasises the importance of a 'critical friend' who can help evaluate your work and you theirs, thus creating a 'community of enquirers' (McNiff, 2002, p.17). The researcher may also be called upon as a critical friend.

The role of the researcher during the reconnaissance and reflection steps of the action research cycle was intended to be that of 'the outsider' and this was achieved. The first step, the reconnaissance step, aimed to establish the teachers' understanding and practice of ESD before any intervention. The intervention formed the second and third steps of the action research cycle, those being the planning and action steps. The final step, the reflection step of the action research cycle, aimed to establish the teachers' understanding and practice of ESD after the intervention. Both the first and final steps of the action research cycle involved teachers' planning and implementing lessons that they thought incorporated principles of ESD.

According to Babbie and Mouton (2001), the role of 'complete observer', which they also refer to as 'non-participant observer', is one whereby the researcher observes a particular context and process without becoming involved in what is unfolding. This role may also be referred to as the 'outsider role'. The main point highlighted by Babbie and Mouton (2001) is that although this method of observation largely ensures that the situation under observation is not being affected by the researcher, it does run the risk of not revealing a true understanding of what is taking place. It is for this reason that during the first and final steps of the action research cycle, teachers were questioned during pre-lesson and post-lesson interviews as to their actions, decisions and reasons for these. In this way, although the researcher took on a non-participant role during the reconnaissance and reflection steps (first

and final steps), the depth of each observed context was captured via interviews and the teachers own personal reflective journals.

During the reconnaissance step, the researcher needed to adopt an outsider role to ensure that the findings regarding teachers' understandings and practices of ESD were not influenced by the researcher in any way and this was eventually done. The reconnaissance and reflection steps required the researcher to be as objective as possible within an outside observer role. For these steps it would not have been acceptable for the researcher to assist the teachers in the planning and implementing of their lessons that attempted to incorporate principles of ESD and thus the researcher remained removed. If the researcher assisted the teacher, then the researcher could not make claims as to the teachers' understandings and practice of ESD as the researcher's understandings would have influenced this.

The role of the researcher during the planning and action steps of the action research cycle was 'participant observer'. These two steps aimed to observe the intervention that teachers decided to design and enact in order to try develop their own understanding and practice of ESD. This role of participant observer emerged during the planning and action steps of my action research study. As the researcher, although I observed the planning and implementing of the teacher-designed intervention, I could be called upon by the teachers to assist them in the process. The reason why the researcher considered the role of participant observer was the realisation that teachers would in any natural circumstances be free to call upon help from many and any other outside sources.

According to Cohen, Manion and Morrison (2007) the participant observer has less contact with the participants than the complete participant, however this role allows the researcher a more informed view of the situation being observed. The limitation expressed is that of subjectivity (Cohen *et al.*, 2007). Babbie and Mouton (2001) explain that the researcher may

find him/herself facing a difficult situation of trying to balance their participation with their observation as one may affect the other. It is due to this possibility of increased subjectivity when adopting this role of participant observer, that the researcher in this study employed other more distanced forms of data collection, such as non-participant observation, interviews and content analysis. By combining non-participant and participant observation methods, it was intended that the data may be triangulated in a trustworthy manner.

A possible limitation of using observations as a data collection method is that by the mere existence of an observer, the data is more than likely to be affected in some way (Babbie & Mouton, 2001). The knowledge that someone is watching may cause participants to act in ways that they may not have under natural conditions. Since a researcher can never rule out the effect that 'knowing you are being researched' may have on the data, this study embraces the effect. This was done by employing the method of action research. Teachers were observed according to how their understanding of ESD developed and how they implemented their understandings in their practice. This knowledge of being observed may be capitalised on by the teachers who desire to show how they would implement their understanding of ESD into their practice. The teachers' conscious effort of practicing ESD is not being denied here but rather celebrated as they also observe themselves and reflect upon their actions. Action research is a conscious effort to reflect on one's practice in the attempt to transform and/or improve upon it.

3.5. Action research as a methodology

In this study, both the teacher-participants and the researcher's through the application of various steps of the action research cycle aim to become problem-solvers in their particular

school contexts. Lewin (1948) recognises the importance of engaging in real-life problem-solving in the production of knowledge. As mentioned in chapter 2, both Lewin's (1946) and Greenwood and Levin's (2007) definitions of action research are adopted in this study as they recognise the impact of social interaction and reflective practice on transformation. This social interaction aspect of action research leads to a form of co-engaged professional development. It was due to the emphasis on reflective practice that the action research framework chosen was a hybrid of Kurt Lewin (1948) and Coghlan and Brannick's (2001) action research models, as they highlight steps of diagnosing and fact finding. It was felt that this action research framework captured the essence of action research and reflective practice as diagnosing one's current practice was seen as an important starting point for reflection that may lead to professional development.

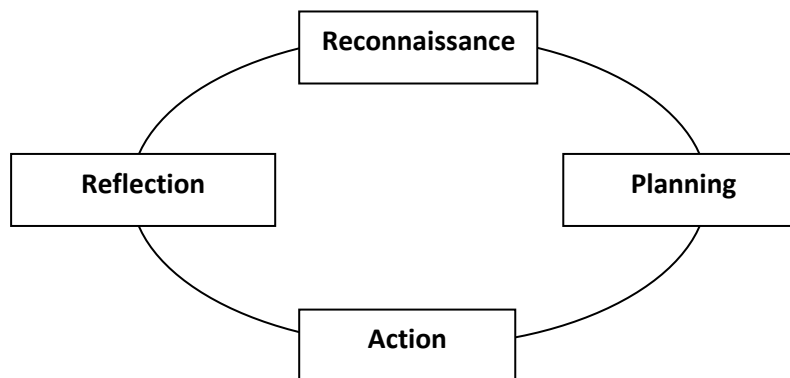
3.5.1. The action research cycle structure

The action research cycle used in this study is adapted from Kurt Lewin's (1948) model of an action research approach. Lewin's (1948) model begins by exploring a concept or idea. This is achieved via a step of 'reconnaissance' whereby the individual or group establishes what they know about the concept, idea or context to be investigated. A second step of 'planning' involves designing a plan that will result in a desired outcome. This outcome may be experienced as the end product of the research or the actual process engaged in. Lewin's (1948) third step of 'taking action' involves acting out the plan that was previously designed. Finally 'evaluating' the action that was taken and depending on the results of the evaluation, a new cycle may emerge in which re-planning takes place to improve the action. Elliott (1991) however contested the nature of this seemingly over-simplistic model. Elliott (1991) felt that one could not simply see such a process as linear, as the mere reflection on each step

may result in a redefining of the outcomes to be attained and the process values within. Elliott (1991) strongly advocates reflection on the process and outcome of any investigation as he felt that it equipped practitioners with the critical and analytical tools that they could use to develop themselves professionally. Elliott (1991, p. 52) states that the tools of reflective practice used in action research can assist practitioners as reflective practice “informs professional judgement and thereby develops practical wisdom, i.e. the capacity to discern the right course of action when confronted with particular, complex and problematic states of affairs”.

Considering the contributions of Lewin and Elliott, this research aimed to employ attributes of reflective practice and action research in a collaborative relationship which aimed to provide teachers with opportunities to develop themselves professionally. Within this study there was only one cycle during which data was collected. This cycle involved four steps of reconnaissance-planning-action-reflection, a model that arose through a combination of Coghlan and Brannick’s (2001, p. 17) Diagnosing – Planning action – Taking action – Evaluating action Model and Kurt Lewin’s (1946) model that involved a Reconnaissance or “fact finding” step (Elliott, 1991, p. 70). In addition to this study adopting the steps of reconnaissance-planning-action-reflection, it was put to participant-teachers that these steps be reflected upon continuously as they engaged in these steps. Therefore these steps are not seen as linear steps acted out. Rather each step is informed by reflective thinking, involving instances of reflection-in-action, reflection-on-action and reflection-for-action. Figure 8 is an adapted version of Kurt Lewin’s and Coghlan and Brannick’s (2001) model of action research which has been adopted for this research.

Figure 8. Action research cycle (Adapted from Lewin (1946) & Coghlan and Brannick (2001))



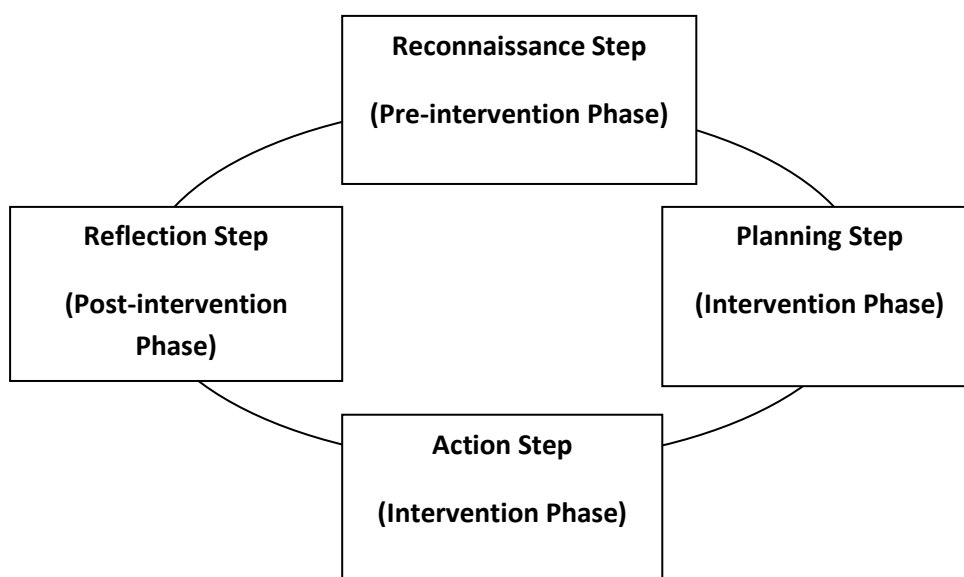
In this research the **reconnaissance step** is also referred to as the ‘pre-intervention phase’. The purpose of this step was to establish the teachers’ initial understanding and practice of ESD prior to the intervention that they eventually designed. The first research question regarding teachers’ understanding and practice of ESD will be partially answered by the data collected during this first step of the cycle.

In this research the **planning and action steps** involved an intervention that the teachers designed themselves and is referred to as the ‘intervention phase’. The purpose of these steps was to observe how teachers developed their understanding and practice of ESD, by observing what innovation teachers designed. Data was collected at each of these steps (the intervention steps) using data collection instruments that were appropriate for the intervention phase. The data collection instruments that were used during this intervention phase could not be predicted due to the unknown nature of the intervention that teachers were still to design. However the data collection instruments that were eventually used and are displayed in the findings chapter were designed to capture data that assisted in the answering of the second and third research questions. Teachers met three times during the intervention phase. The planning step started when I phoned all three teacher participants to organise when we could

all possibly meet for the first time as a group. I managed to secure the 11th April 2009 from ten o' clock until twelve. I decided, with help from my participants to organise the meeting at the Durban Botanical Gardens. This would serve as a central point for all three participants as well as a neutral meeting place. From the first meeting, the teacher-participants organised the meeting times of the next two action meetings. In all three instances data was collected via an audio tape recorder.

The **reflection step** is referred to as the 'post-intervention phase'. The purpose of this step was to establish the teachers' understanding and practice of ESD after the intervention cycle. This second analysis of teachers' understandings and practices of ESD served to identify how and if teachers had developed from their initial understandings and practices of ESD. The data collected during this step served in part to answer the first research question. Data collected from the reconnaissance and reflection steps collectively served to answer the first research question in full. For this reason the data collection methods (which are elaborated upon further on in the text) were very similar during these two steps.

Figure 9. The action research cycle indicating the steps and the phases



3.6. Data collection methods and instruments

The following description serves to describe the action research model in terms of the different methods, techniques and instruments used specifically during the *reconnaissance* and *reflection* steps within the action research cycle. The methods and instruments used are described and motivated for by revealing the kind of data that they were designed to collect. Each data collection instrument is also discussed in reference to the type of data it is designed to collect in order to answer the various research questions. As McNiff (2002) highlights, there is no such concept as ‘proof’ when dealing with action research, rather an action researcher attempts to provide trustworthy evidence that supports their claims. In this way the instruments need to provide evidenced answers to the research questions, in order for relevant and substantiated claims to be made.

3.6.1 Methods and instruments fit for purpose

To ensure that the research questions posed are eventually answered, the data collection methods and instruments used should also serve to collect the data that they were designed to collect. Thus the data collection methods have been organized in Table 4 below to illustrate which data collection methods were used to answer each of the research questions. In this table the data collection methods for both the reconnaissance and reflection steps within the action research cycle are described according to their purpose and relevance in answering the posed research questions. The data collection methods within Table 4 were implemented during the ‘pre-intervention’ and ‘post-intervention’ phases. The intervention phase (planning and action steps of the cycle) could not be predicted; therefore the methods and

instruments used to collect data form part of the findings of this study and are not presented here.

Table 4. Data collection methods used during the ‘reconnaissance’ and ‘reflection’ steps

Cycle steps	Data collection method	Purpose and how it addresses the research question?
Recon-naissance & Reflection Steps	<p>Semi-structured Interview</p> <p><i>“..logical gaps in data can be anticipated and closed.” (Cohen et al. 2007, p. 353)</i></p>	<p>Served to explore the teachers’ understandings of ‘education for sustainable development’ (ESD) and how they perceived the concept of ESD being implemented within the specific learning area/s that they teach. (R.Q.1 & R.Q.2)</p>
	<p>Document Analysis</p> <p><i>“..It defines a strict and systematic set of procedures for the rigorous analysis, examination and verification of the contents of written data...a research technique for making replicable and valid inferences from texts” (Cohen et al. 2007, p. 475)</i></p>	<p>Involved using the document analysis method to analyze the reflective journals for evidence of planning. Although teachers were asked to do lesson plans, teachers informed me that planning for them was an informal process that did not involve a written plan. Teachers were asked to design and implement a lesson in which they use their understandings of ESD (R.Q.1 & R.Q.2)</p>
	<p>Semi-structured Naturalistic Classroom Observation</p> <p><i>“..researcher can look directly at</i></p>	<p>Teachers implemented their informal plan and revealed their understanding of ESD and how ESD can be implemented in their practice. The</p>

<p><i>what is taking place in situ rather than relying on second-hand accounts.” (Cohen et al. 2001, p. 396)</i></p>	<p>observation method was used here and key actions were recorded by the researcher who took on the role of a non-participant observer.</p> <p>(R.Q.1 & R.Q.2)</p>
<p>Journal reflections and post lesson video stimulated recall interviews</p> <p><i>“..means of enabling student teachers [teachers] to conceptualize the nature of their own professional development..”</i></p> <p>(Moon, 2001, p. 368)</p>	<p>Teachers reflected upon their experiences of considering and attempting to implement ESD in their classroom. Teachers also reflected on their developing understanding of ESD. Teachers through the post lesson interview revealed what they did in their lessons and why they did it in that manner. (R.Q.1, 2, & 3)</p> <p>During a final group interview teachers were asked to reflect on their development process and why they chose to develop in the ways that they did. This interview is the only data collection method that took place during the reflection step and not the reconnaissance step. This method served to answer R.Q.3.</p>

3.6.1.1. A pre-lesson interview

During the first session of data collection during the *reconnaissance* step each teacher was interviewed to explore their level of understanding about ESD. The transcripts of each interview were given to the respective teachers to proof read for accuracy. A tape recorder

was used by the researcher during the interview to record the teachers responses to questions posed. This was done to ensure that what was said was recorded in its entirety.

The purpose of the pre-lesson interview instrument (see Appendix I, Instrument 1a) was to collect data that served to offer insight into teachers' understandings and practice of ESD. The data will therefore serve to inform the researcher, and the teacher-researchers to identify any development in the understandings and practice of ESD. As previously stated the data collected using this instrument will assist in the answering of the first research question. Before the interviews were conducted teachers had been asked not to read up on SD and ESD, as the interview aimed to locate their current understanding, before further outside influence. The pre-lesson interviews within the reconnaissance step took place on the 27th and 29th January and the 4th February 2009. The pre-lesson interviews within the reflection step took place on the 4th, 10th and 17th of June 2009.

Within the reconnaissance step and the reflection step the first session of data collection involved a semi-structured interview, which was used to explore the three teachers' understandings of ESD. This semi-structured interview served to probe teachers' understanding as well as why they understand ESD the way that they do. According to Babbie and Mouton (2001) there are two ways in which a researcher may come to understand another person's meaning. Firstly, a researcher may simply ask the question 'Why?' and secondly the researcher may look for any contradictions offered by the participant. By looking at these two things a researcher may come to better understand what the participants' understandings are and how they came to construct their meaning in that particular way, as well as how much the participant values that particular meaning construction (Babbie & Mouton, 2001). It is important that as these questions were asked the teachers would feel comfortable to answer in the way that they would have liked to and not in the way that they

thought would be best for myself as the researcher or for themselves (Babbie & Mouton, 2001). This honesty was attained by maintaining an open learning relationship between the participants and myself, as the participants were reassured that I was by no means an expert in ESD and its implementation but rather should be seen as a learner in the entire process.

All of the instruments used in the reconnaissance step were re-used in the *reflection* step with the exception of some minor changes to Instrument 1a, thus creating what is referred to here as Instrument 1b. Instrument 1b (see Appendix I) was used during the reflection step within the action research cycle. All other instruments (2, 3 and 4) used during the second, third and fourth sessions of data collection during both the reconnaissance and reflection steps, are identical.

3.6.1.2. Analysing lesson plans

During the second session of data collection during the *reconnaissance* and *reflection* steps teachers were asked to design a lesson in which they felt they were incorporating aspects of ESD into the subject content. They taught a lesson within a learning area of their choice. Teachers were asked to submit their planning documents as well as their lesson activities for the lesson that was to be observed. These documents were not to be shown to the other participating teachers as teachers needed to be independent in their actions at this stage. As the teachers' lesson plans and activities would exist as written forms of data, no data collection instrument was designed for this step of planning. Only a content analysis instrument was designed to identify teachers' understandings of ESD (see Appendix I, Instrument 2). The instrument was to assist in analysing data that provided insight into how teachers intended on practising ESD. Therefore this instrument served to provide data that answered the first research question in part. However as previously stated teachers did not

agree to write lesson plans, instead they preferred and agreed to reflect on their planning of their lessons in their reflective journals, thus the lesson plan instrument was also used to analyse evidences of planning in the reflective journals. The design of lesson activities for the lesson was counted as a planning document.

3.6.1.3. A lesson observation

During the third session of data collection during the *reconnaissance* and *reflection* steps teachers were observed teaching a lesson which they believed integrated aspects of ESD. Each lesson was video recorded. The teachers' lessons were analyzed according to evidence of ESD principles apparent in the teaching approaches employed, content covered and lesson outcomes focused upon.

This analysis served to identify in what way/s teachers interpret the practice of ESD in their lessons. Instrument 3 in Appendix I reveals some themes that were looked for within the lesson, however other themes not thought of emerged from the actual observations. This instrument therefore attempted to collect data that would answer the first research question.

The three teachers were asked to inform me as to when they would like me to observe their lesson in which they attempted to implement ESD. The teachers were required to select the learning area that they would like to use to implement ESD into a lesson. René particularly, delayed the observation as she felt that there was a particular section that she was waiting for, that would lend itself to ESD implementation. This in itself served as an interesting point of analysis. The lesson observations during the reconnaissance step took place on the 19th February, and the 10th and 11th March 2009. The lesson observations during the reflection step took place on the 3rd, 10th and 17th June 2009.

This observation is classified as a semi-structured observation, owing to the fact that, although the ESD principles were outlined within the schedule, it was noted that other unexpected themes may arise and should be recorded (Cohen, Manion & Morrison, 2007). The power of observation is having access to the actual experience and action as opposed to the spoken about action or experience (Babbie & Mouton, 2001; Cohen, Manion & Morrison, 2007)

3.6.1.4. A post-lesson video stimulated recall interview

During the fourth session of data collection during the *reconnaissance* and *reflection* steps teachers engaged in a reflection-on-action activity. Each teacher was videoed whilst they were conducting their lessons. At the end of each lesson, teachers were given a chance to reflect on their lesson by watching the video replay of their lesson. Teachers were asked to stop the video at points where they thought they incorporated aspects of ESD. This method of reflecting via an interview is called video stimulated recall (VSR) interviewing and serves to alert the researcher and teacher-researchers to their own understandings and any newly developed understandings. By asking teachers to stop the video at points where they felt they incorporated aspects of ESD, it assisted myself as the researcher in answering the first research question, which refers to teachers' understandings and practices, more rigorously (see Appendix I, Instrument 4).

The major challenge was to secure time straight after or soon after the lesson, whereby the post-lesson VSR interview could be conducted. If teachers were interviewed too long after the actual lesson, I feared that teachers may lose touch with the reflective thoughts they had during the planning and acting steps, thus lacking a well informed reflection regarding how

they thought they were implementing ESD in their lesson. On one occasion I had to return the very next day to conduct the post-lesson VSR interview, however in both of the other two cases, I managed to secure time at the end of the same school day.

With reference to who observes, it is recognised that although the researcher may be able to identify most incidents of teachers' understandings and practices of ESD, it is also important to review what took place with the teachers present. Video Stimulated Recall (VSR) is seen to serve two major purposes in any research study.

According to Reitano and Sim (2005) VSR firstly provides teachers with the opportunity to develop professionally as they spend time reflecting on their actions and suggesting improvements. Secondly it provides the researcher and the teacher with insight as to the teachers' thoughts about why they performed certain actions during the observed lesson. As Reitano (2004) expresses it, VSR accurately transforms teachers' thoughts into words that may be understood by outsiders. However, one major negative aspect of VSR identified by Reitano (2004) is that of teachers' fixation on physical appearance in the video. Although this was an initial concern for all three teachers, they were given time to laugh about it and move on. Teachers did not appear to be affected by this negative aspect to the extent that they could not properly engage in the interview itself.

Throughout the steps of the research cycle, teachers were asked to keep a reflective journal in which they made regular entries regarding their existing and new understandings, challenges, experiences, limitations, emotions, successes etc. Teachers made reflective entries at crucial points in their developmental journey, which served as a companion to their research and not merely as a form of data collection (Banks & Mayes, 2001). The journal forms part of professional development as it promotes reflective practice through encouraging teachers to record accounts of personal experiences, observations, thoughts and actions over time (Banks

& Mayes, 2001). The main strength of using this particular method of data collection is that the act of data collection is no longer separated from the analysis and reflection process, thus creating a natural action that is more reliable because it is the teacher who collects his/her own data (Banks & Myers, 2001). Reflective journal writing has been appreciated by Culp, Chepyator-Thompson and Hsu (2009) as a tool for critical analysis of events, in order to make meaning of and improve experiences. Reflective journals in this way promote professional development as teachers learn to verbalise their thoughts, critique the meaning and value of these thoughts, and project their thinking and planning upon future actions and the possible outcomes of these. According to Lee (2008), journal writing promotes reflection and thus professional development. Thus journal writing is not only a means of collecting data regarding teachers' thoughts, it also promotes active knowledge development as teachers attempt to make meaning of their experiences by reworking them into logical sentences (Lee, 2008).

3.6.1.5. A final group interview

During the fifth session of data collection during the *reflection* step, all the teachers came together to reflect on their overall experience and ideas regarding the action research cycle. The three teachers were firstly requested to browse through their reflective journals and highlight four to five crucial experiences that they felt they would like to share with the group. They were asked to explain why it was so crucial for them. This served as a springboard for discussion. Amongst other things the three teachers were asked why they had chosen to develop themselves in the way(s) that they did. This served to provide data that would assist me in answering the third research question. This group interview served as

a rounding up session to the research study and provided data regarding the teachers' experiences of the entire action research process.

This final group interview also served to validate data already collected, and added to the data collected. The final group interview added further understanding to the reflective journal entries thus ensuring that the data was analyzed and interpreted correctly. The group interview was also a moral obligation for myself as a researcher as it enabled teachers to reflect in greater depth on their degree of development as a community, thus allowing teachers to go on to develop further in their profession. Teachers collectively reflected upon their development with regards to their understandings about and practice of ESD. According to Cohen, Manion and Morrison (2007) and Williams and Katz (2001), group interviewing is a method which allows individuals who have been working in the same field of interest and/or collaboratively to add more reflective substance to their experiences and interpretations. This serves to benefit the value of the data and the learning and development of the participants. Group interviews allow an opportunity for data regarding individuals' feelings, understandings and attitudes to be captured as individuals within this small community feel safe to share their experiences with the group (Cohen, Manion & Morrison, 2007). Although according to Babbie and Mouton (2001) group interviews encourage the loss of valuable data generation, due to the fact that the interviewees are many, I would argue differently. The main objective of the group interview was to answer the third research question which refers to why teachers chose to develop themselves in the way that they did. These three teachers were collaboratively involved in the intervention phase (planning and action steps). The intervention phase which concerned the teachers' attempting to develop their own understanding and practice of ESD was entered into collaboratively and thus I

capitalised on the collaborative nature of the group interview to understand why they had chosen to develop themselves in the manner in which they did.

Another motivator for including the group interview as a method for data collection was the empowering affect that coming together as professionals to discuss an important topic, could have on teachers (Williams & Katz, 2001). The benefit of teachers sharing their reflective entries with their colleagues is that it offers new ways of thinking about and making meaning of similar and shared experiences, thus creating a platform for further knowledge development (Williams & Katz, 2001). This knowledge development may also add insight into teachers' understandings about ESD and reasons for choosing the development procedure that they did. It may even provide insight into how teachers would modify certain experiences given the chance.

3.6.2. Data collection instrument for continuous reflection across the cycle

Each teacher at the beginning of the action research project was requested to keep a reflective journal throughout the course of the action research cycle. To assist the teachers in understanding the level and benefits of reflective practice a few pages from William Louden's (1992) chapter called 'Understanding reflection through collaborative research' were handed to the teachers for further reading. The reflective journal not only served to provide an account of the development of the teachers' understanding and practice, it also served as a tool of critical reflection to potentially assist teachers in their own professional development. The data that emerged from the reflective journal entries also served to answer all of the three research questions to varying degrees.

Teachers were asked to make frequent entries; these could have included key events/emotions/confusions/challenges/successes/encounters/motivations/surprises/ understandings etc. Teachers were asked not to share the contents of their journals with other participating teachers as the entries needed to be personal and individual. The content of the journals demonstrated teachers' personal experiences and it is for this reason that no one other than the researcher was given access to the physical journals. Teachers were given the opportunity to indicate any content within their journals that they would not like to be used in the study. Teachers were also reassured that their entries would be kept confidential in the sense that their names/identity would not be revealed.

3.6.3. Instruments fit for purpose

The instruments designed needed to ensure that data relevant to answering the research questions is eventually attained. In some cases an instrument has been designed to probe for particular data but due to the desire to keep the development process an open one, the data to be collected and its function in answering the research questions is rather hoped for. The following description serves to explore the instrument design and what purpose they serve in answering the various research questions.

The first instrument (Appendix I, Instrument 1a) refers to the semi-structured interview that was conducted during the reconnaissance and reflection steps of the action research cycle. The main aim of this instrument was to access teachers' current understanding of SD and ESD. This served to gain data that assisted in answering part of the first research question which inquires about teachers understanding and practice of ESD. Firstly biographical questions served to gain some background information from the teacher, to assist in understanding any possible influences on their understandings and interests in this topic of

ESD. The initial questions also served to ease the teacher into a comfortable frame of questioning and answering. The second section inquired about the teachers' understanding of sustainable development, how they came about to this understanding, whether they incorporate aspects of it in their teaching and if they see it as an important activity to do. The second section further inquired about whether they had heard of the term 'ESD' before and what they thought it meant, whether they thought it was important to include it in the curriculum, and if they had to incorporate it into the curriculum, which learning area they would choose. The final activity required the teachers to draw themselves as an ESD teacher and to explain what they had drawn and why. These questions constantly probed the teacher to find out how they understood ESD and why they understood it in that way.

The second instrument refers to the lesson planning that took place during the reconnaissance and reflection steps. Teachers were required to write lesson plans which they decided they would not do, as they preferred to plan in their heads and commented that they rarely followed structured plans. As a result the instrument served to assist in the identifying of ESD principles within the activities that teachers designed for the lessons that they had prepared. The instrument thus lists principles of ESD that may be identified. The reflective journals were also analysed for any conceptual understandings of ESD during the lesson planning stages.

The third instrument served more as a data analysis tool than a data collection tool. The instrument aimed to identify the main teaching approaches used, the skills and activities aimed for during the lesson as well as ESD quality indicators that may have been displayed during the lesson. This data relied upon my eye to identify evidences of ESD understanding, however I had to be cognisant of the probability that what I identified was not necessarily

what was purposefully intended by the teacher. This possibility is what led me to develop the next instrument. This third instrument however aimed to further answer the first research question regarding teachers' understanding and implementation of ESD as the teachers' actions of implementing their understandings took place during the reconnaissance and reflection steps of the action research cycle.

The fourth instrument involved teachers in reflecting upon their action/lesson. It was at this point that teachers highlighted the points in the played-back video whereby they felt that they were implementing ESD. No longer was it my interpretation of their understanding, but rather it was their conscious reflection on their understandings of ESD. This instrument involved a very open approach of asking teachers to simply stop the video-tape at points where they felt they were implementing ESD.

During the planning and action steps (intervention phase) of the action research cycle, the teachers were simply observed and tape-recorded, and any materials that they brought to their sessions were photographed. Due to the fact that the intervention phase of the cycle was unknown to me I did not design any forms of data collection or analysis tool for these steps. The data collected in this phase served to answer the second research question which referred to how teachers attempt to develop their understanding and practice of ESD.

The fifth instrument (Appendix I, Instrument 1b) was very similar to the first, as both aimed to gain an understanding of the teachers' current understandings of ESD. This semi-structured interview once again asked teachers about their understanding of Sustainable development and ESD, how they came to this understanding and whether they implemented these concepts in their teaching. The teachers were also asked once again whether they

thought it was important to incorporate ESD in the curriculum and if they had done this how had they. Finally teachers were asked to draw themselves as an ESD teacher once again. This instrument served to answer the first research question although in a later time frame when compared to the reconnaissance step. The data from this instrument was compared with the data from the reconnaissance step, to gain an understanding of the teachers' understanding and practice of ESD over the six month period of data collection and how or if it had moved in any way.

The sixth and final data collection instrument refers to the group interview (Appendix I, Instrument 5) which aimed to answer the third research question which refers to why the teachers developed the way that they did. Although data answering this question was collected using the other instruments, the main focus of this instrument was to understand why teachers chose to develop their understandings and practice of ESD in the way that they did.

3.7. Data analysis methods

The semi-structured interviews that took place during the 'reconnaissance' step and reflection step were analyzed by identifying themes - for example, teachers' understandings of SD and ESD, the values teachers placed on incorporating such concepts into their teaching, teachers' opinions of what ways they have already incorporated ESD into their teaching, and any others themes that emerged from the data. Under the theme of 'teachers' understandings of ESD', the conceptual framework regarding the principles of ESD outlined within chapter 2 was used to gain deeper insight into the three teachers' understandings of ESD. With regards

to the content analysis of lesson activities that were collected during the reconnaissance and reflection steps, principles of ESD were used to identify elements of ESD in the lesson plan documents as well as any other themes that emerged from the data. Owing to the fact that teachers did not engage in lesson plan writing, the reflective journals were analysed for evidence of lesson planning as well as the resources that teachers had designed for the lesson. During classroom observations which were also conducted during the reconnaissance and reflection steps of the action research cycle, behaviour and interactions, as well as what was presented to the learners was analyzed according to their relevance to ESD. The observation checklist that acted as a data collection instrument also served as a data analysis tool. When referring to 'relevance' to ESD it is in reference to the principles of ESD such as those listed in the observation schedule. The principles of ESD were used to identify attributes of ESD in practice. During the reconnaissance and reflection steps, when teachers engaged in a VSR interview, the data was analysed according to the main themes that emerged. These themes related to the instances in which teachers thought they were implementing ESD principles and why they felt that the methods they were using were effective in doing this. Data from the group interview which was collected during the *reflection* step was categorized according to themes that emerged from the group discussion. Finally reflective journals were analyzed according to teachers' understandings, successes, confusions and any other themes that emerged from the data. The reflective journal data was used to provide supporting data to any of the steps of the action research cycle. Data from the interviews, observations, document analysis, reflective journals and group interview will be used to answer the three research questions posed.

The data has been analysed and separated into three phases. The first pre-intervention phase presents data that was collected during the reconnaissance step of the action research cycle.

The pre-lesson interview, lesson observation and lesson plan analysis, the post-lesson VSR interview as well as reflective journal entries pertaining to this step were all analysed using the ESD principles, and teachers' thoughts, feelings, experiences and values are also identified and explored. The second intervention phase presents data that was collected during the planning and action steps of the action research cycle. Teachers met three times during this phase and were audio tape recorded, while pictures were taken of the resources they brought to share with the group. This data was analysed according to the ESD principles evident, and teachers' thoughts, feelings, experiences, values, plans and actions were identified and elaborated upon. The third post-intervention phase presents data that was collected during the reflection step of the action research cycle. Once again the pre-lesson interview, lesson observation and lesson plan analysis, the post-lesson VSR interview as well as reflective journal entries pertaining to this step were all analysed on the same basis as before. A group interview also took place during this step. This data was firstly analysed according to the main reasons highlighted for the choice of development within the group, secondly it was analysed according to the themes that emerged regarding the three teachers feelings and thoughts about the entire research process. Analysed data of the pre-intervention phase, intervention phase and post-intervention phase are represented in chapters 4, 5, and 6 respectively.

3.8. Research rigour

The data collection instruments used thus serve to ensure that data collected is trustworthy. This desired trustworthiness was attained by firstly using data collection instruments that are

fit for their purpose (Cohen, Manion & Morrison, 2007). This study desires deep descriptive data of teachers experiences, understandings and practice, thus open-ended questions and methods are required to probe for such data. Secondly the use of interviews, reflections and observations offers a number of methods by which data regarding teachers' understandings and practices may be accessed (Cohen, Manion, & Morrison, 2007). More specifically it was realised that certain sessions of data collection run closely together, for example it was seen as pertinent to ensure that the post-lesson VSR interview take place very soon, if not straight after, the lesson observation. Details such as these recognised the sensitive nature of accurate reflection. Triangulation of data collection methods such as interviews, observations and document analysis served to ensure that most accurate representations of the teachers' realities are expressed. This form of triangulation also served to access a much deeper representation of the teachers' experiences of their development, thus serving to answer the research questions as well as to provide teachers with an opportunity to fully reflect on their development. Thirdly the desired transparency of the data ensured that teacher-researchers were given full access to transcripts in order to validate them. Examples of these transcripts may be viewed in Appendix IV. In all three cases the teachers stated that the data transcribed was accurate.

The final group interview also served to validate the data collected during the steps of the action research cycle, as teachers were asked to reflect on their most crucial incidents and their general feelings about the research process that they had engaged upon. Teachers' thoughts, feelings and values were reinforced at this point and thus ensured that previous data had been interpreted as accurately as possible.

3.9. Ethical considerations

3.9.1. Participant access

In this research study it was crucial to consider the best interests and feelings of the participants. When considering how the teachers were to be accessed for the research study, I realised that teachers needed to be willing to participate (Cohen, Manion & Morrison, 2007). The fact that the methodological approach adopted is one of action research and the teachers were required to adopt co-researcher roles, teachers needed to be dedicated to the purpose and activities of this research study.

The way in which teachers were accessed had serious implications on the validity of the data generated, not to mention the fact that if teachers were brought into the study unwillingly it would defeat the paradigm in which this critical research study was to unfold. It is for this reason and for reasons found by James & Van Laren (2004) that it was decided that teachers should be approached first and their level of interest in the research study explored. Voluntary participation also needs to be agreed to on an informed basis as often data collection can be a lengthy activity and thus potential participants need to be made aware of the research process (Babbie & Mouton, 2001). The teachers in my study were approached with a description of the research before they signed an informed consent form. Informed consent refers to a decision made to participate in a particular activity after full information regarding the process, which may influence the decision itself, is given to the deciding participant (Cohen, Manion & Morrison, 2007). James and Van Laren (2004) discovered that asking teachers to allow researchers into their classrooms to observe their practice required more than consent in written form, it requires true willingness to contribute to the research study.

Firstly it was decided that teachers would be approached first regarding their interest and willingness to participate. Secondly teachers were informed of their importance in a research process which aimed not to reveal their lack but rather to reveal how they develop and how they experience their challenges. Thirdly teachers were informed that as they are involved in developing their understanding and practice of ESD through an action research process, they would be involved in developing their research capacity and as a result their professional capacity. Teachers played the role of decision makers and plan implementers as well as assessors of their own actions; this should be seen as an avenue for self-benefit. Fourthly teachers were informed that the duration of the data generation period would only take four weeks. In reality, when it became clear it would take a lot longer than this, teachers were very happy to continue. Teachers negotiated with the researcher the time and day that they wanted data generation to take place. Finally, teachers were given a breakdown of what the purpose of the research was, the methods it involved, as well as the roles that both researcher and teachers were to play and lastly what the expected roles of the teachers would be. Before teachers were accessed and their involvement secured, teachers were knowledgeable about the research study and interested to participate.

Finally the principals of the three schools were approached for permission to conduct research on the various sites. The principals were approached from the point of view of the professional development benefit that the teachers engaging in the research would gain. This approach, although very valid in my case, is suggested as a good access strategy by Walford (2001). In two cases the principals granted access to the school purely on the grounds of professional development prospects.

3.9.2. Confidentiality

In dealing with teachers and their practice confidentiality is a crucial aspect in ensuring a trusting and open relationship between researcher and teacher-researchers. As teachers were exploring and attempting to develop their understanding and practice of ESD it became very important that teacher-researchers be assured of their confidentiality in terms of actions, understandings and opinions. It was therefore fitting to make sure that any information regarding one teacher-researcher's opinions, actions and understandings was not relayed to other teacher-researchers within this study or anyone else for that matter (Cohen, Manion & Morrison, 2007). The only time at which information regarding one teacher-researcher was shared with the other teacher-researchers was when that teacher-researcher chose to share this either during the intervention phase or during the group interview in the post-intervention phase.

As previously stated, confidentiality also extends to the data access itself. Had teachers felt that they had revealed something to the researcher that they would not like to feature in the findings of the research report this inevitably was not included in the report. However teacher-researchers were reassured of personal confidentiality through allocation of pseudonyms and were encouraged to view the process as a developmental one and not an evaluative one. It was the aim of the researcher to ensure that the teacher-researchers felt safe to engage naturally in a self-inquiry process into their own development without the threat of their identity being revealed.

3.10. Limitations of the research design

There are limitations involved in using the research design described. There are social, professional and numerical limitations which all stand a chance of threatening the value of the data collected and conclusions drawn. It is important, however to realize that although this study does not aim to make sweeping generalizations regarding the field of ESD implementation, it does aim to capture the real experiences of teachers who are implementing and understanding ESD, thus offering insight into the possible challenges and successes that arose. To ensure that these three limitations did not negatively affect the data analysis, triangulation was employed.

If one recognises that the participants may be teachers who have been in the profession for many years, it is important to realize the discomfort that they may feel in revealing their possible feelings of inadequacy. These feelings of inadequacy may stem from the belief that this research study aims to reveal what they do not understand about ESD and its implementation in practice. To alleviate this initial tension, the researcher needed to reassure the participants that ESD implementation for many schools may be a new focus and that the phenomenon of implementation and professional development is the heart of the focus. The final limitation refers to the few participants that have been selected. As stated before, this study does not aim to make generalizations yet it does serve to take an in-depth look at teachers' experiences. This may pave the way to understanding what is needed and what confronts one when implementing valuable government motivated initiatives such as ESD. It is understandable that the small number of participants may be viewed as a limitation,

however in light of the depths to which each participant's experience was explored, it is not seen as limiting the effectiveness of this study.

3.11 Limitations of the data

The data is simply limited in its time frame. The data that was collected covered one cycle and a period of six months. At the end of the group interview both myself and the teachers felt that they were just beginning to get into the idea of self-directed development. It seemed as though just as we were getting into it, it was all over. The process requires at least two cycles to get a good sense of how teachers may develop themselves professionally. I also feel that had teachers kept a well entered reflective journal, their progress would have been more directional. Although teachers did not do much written reflecting, their verbal reflection was rich. Perhaps I could have provided more instance and opportunities for verbal reflection. For example each teacher could have been provided with a tape recorder and asked to make a verbal entry every day, just to talk about their ideas and thoughts at the time. The data is vast and triangulated, however had more time been allowed for the planning and action steps of the action research cycle, I feel that more could have been discovered regarding teachers' choice of activities for their own development and even the entire development process itself.

3.12. Conclusion

This chapter served to set the scene regarding the actual data collection procedure and thus the considerations that complemented these. Firstly the contexts in which the data was generated and how these three teachers within their contexts were accessed and elaborated on. Ethical considerations regarding the access of the teacher-participants were described. Secondly the roles of the teacher-participants as well as the researcher were explored across the steps of the action research cycle. Thirdly the action research cycle to be followed in this study was explored as an adapted version of Lewin's (1946) and Coghlan and Brannick's (2001) action research cycles. At this point it is established that the research study completes only one cycle of action research. Fourthly within these steps of the action research cycle, the data collection methods and instruments are described and their appropriateness regarding the data they claim to collect and the research questions they attempt to address are revealed. It is here where I establish that only instruments for the reconnaissance and reflection steps have been designed due to the open-ended nature of the planning and action steps. Specifically the importance of a group interview is elaborated upon as it is seen to increase the research rigour. The fifth focus of the chapter includes an exploration of the data analysis methods used to ensure that the research questions have been addressed. Finally this chapter explores the issues of rigour, the ethical issues, as well as the limitations of both the research design and the data itself, in an attempt to shed light on the quality of this research study and to provide guidance for future studies. The following chapter begins to analyse the three participants' initial understandings and practice of ESD. This analysis takes place in the reconnaissance step and pre-intervention phase of this action research cycle and highlights

the teachers' main principles and practises of ESD as well as the thoughts, feelings, values and considerations that these three teachers have regarding ESD implementation.

Chapter 4

‘The pre-intervention phase’

4.1. Introduction

The purpose of this chapter is to explore the data generated during the pre-intervention phase. To recall from chapter 3, the pre-intervention phase is represented by the reconnaissance step of the action research cycle. From here on the term ‘reconnaissance step’ will be used for coherency purposes. The reconnaissance step involved four sessions of data collection. The data collection sessions served to establish how Jay, Kay and René understood and practiced Education for Sustainable Development (ESD). The analysis of the data partly answers the first research question which is: ‘What are Grade 9 teachers’ understanding and practice of ESD?’ The first research question is answered fully in Chapter 7, as it brings together the main findings for both the reconnaissance and reflection steps. The reconnaissance step produced data that informed the study about the teachers’ initial understanding and practice of ESD before the intervention took place. This chapter is organised into four major sections. The first three sections refer to the three participants and the final section involves a cross-analysis of the three participants in reference to the major question posed. Each of the first three sections will be further analysed firstly according to the teachers’ *understandings* of ESD, which is revealed via an analysis of the teachers’ responses to the questions within the pre-lesson interview. Secondly each of the three sections will be analysed according to the teachers’ *practice* of ESD, which is revealed by an analysis of the lesson planning

documents, the lesson observations and the post-lesson VSR interviews. The third and final analysis of the three sections involves a drawing together of the major findings within the first and second analyses mentioned above. Each data collection session within the reconnaissance step will be analysed using the conceptual and theoretical frameworks indicated in chapter 2.

4.2. An introduction to the three teachers

The following brief description of the three teachers' backgrounds serves to provide insight into each teacher's character and history of teaching. Jay¹⁴ has been teaching for 24 years as a Life Science and Physical Science teacher. She has engaged in teaching Mathematics to Grade 8's. However this was many years ago. Life Sciences is Jay's passion and her classroom displays this. Jay is also actively involved in conservation at a local level, in that once a month she engages in alien plant hacking in her community in an attempt to restore the natural indigenous vegetation. Jay also displayed great love for animals and all life forms as in her classroom she kept guppies [small fish] and two hamsters which the learners loved engaging with. Jay often referred to her class pets in her teaching.

Kay¹⁵ is a novice teacher and has only been teaching for two years. The Grade 9 Learning Areas that she currently teaches include Life Orientation and Physical Education. Kay is qualified to teach Mathematics, she teaches mathematics to the Grade 8s this year. Last year

¹⁴ Jay – is a pseudonym for the teacher at Albany Girls High School

¹⁵ Kay - is a pseudonym for the teacher at Bahemia Secondary School

she also taught Mathematics and Natural Science to the Grade 9s. Kay is a very enthusiastic and energetic individual and loves dancing and acting at a professional level. She also displayed a passion for organic gardening and environmental initiatives however no environmental initiatives were being undertaken at the school where she currently teaches. Kay does not function from her own classroom as she is a mobile teacher who has not been allocated a classroom. At the school where Kay works they do not have a functioning environmental club nor any other environmental projects, in fact Kay explained that the school does not encourage extra-curricular activities due to limited human and physical resources.

René¹⁶ has been teaching full time for almost four years, however she had broken service as a locum teacher since 1997. René currently teaches Grade 9 Natural Science. Although she is a qualified Physical Science teacher she has stated that her passion lies in Mathematics. René has been teaching Natural Science for four and a half years thus the syllabus is by no means foreign to her experience. René during our meetings showed great passion for the environment and displayed this through projects that she had got her learners involved in, in the past as well as newspaper articles that she had collected and distributed to other teachers for their classes. René teaches at a school where although resources are not scarce they are limited to sensible use.

¹⁶ René - is a pseudonym for the teacher at Cashmere Secondary School

4.3. Understanding and practice of ESD

The following analysis is divided into three parts for each teacher. The three parts cover the teachers' 'understanding', 'practice' and 'understanding and practice' of ESD. The part of the analysis that looks at the teachers' 'understanding' is informed by the pre-lesson interview. The part that looks at the teachers' 'practice' is informed by the lesson planning document analysis, lesson observations and post-lesson VSR interviews. It is important to note at this point that 'practice' of ESD to a large extent reveals 'understanding' of ESD. These two have been separated due to the fact that 'understanding' referred to here is revealed during the pre-lesson interview and does not involve action. However 'practice' involves action which ultimately reveals understanding of ESD. The part that looks at the 'understanding and practice' serves to bring together the previous two analyses to understand the relationship between the teachers' understanding and practice of ESD. The fourth section in this chapter is the final cross-case analysis. This analysis serves to highlight the main findings across the three teachers with regards to their general understanding and practice of ESD during the reconnaissance step and how this contributes to the shaping of ESD practice.

4.3.1. Jays' understanding and practice of ESD

The following analysis serves to reveal the main understandings expressed by Jay in response to the questions posed during the pre-lesson interview. These understandings are revealed in the form of words and sentences. The analysis that follows this refers to Jay's 'practice' and it is recognised here that practice refers to the action that may very well reveal Jays' understanding of ESD. By no means is understanding divorced from practice. Rather I

acknowledged that practice in many cases acts as a manifestation of teachers' understandings. Findings from the lesson planning documents, lesson observation and post-lesson VSR interview serve to provide an in-depth understanding of each teachers understanding and practice of ESD.

4.3.1.1. Jays' understanding of ESD

The main focus of the pre-lesson interview was to determine what Jay understood by the terms Sustainable Development (SD) and Education for Sustainable Development (ESD), as well as what she felt was the value of ESD. In putting these responses together a clear picture regarding Jays' understanding of ESD was painted.

The first question regarding Jay's understanding of SD was not directly linked to the term ESD however it referred to SD. The reason for asking this related question was because SD was more than likely a term that Jay had heard of and possibly thought of before since it is a more common term, whereas ESD may be too far removed to ask this question first. I thought that seeing as the two terms were most certainly linked I would need to first access Jay's understanding of SD before I could access her thoughts on ESD.

Jay's response to '*What meaning would you give to the term 'Sustainable Development?'*' stated that she had not thought of an actual definition before now. When she was forced to think about it she linked her understanding of SD to the classroom by stating that SD was about imparting something meaningful to the learners that they could leave school with and use in society one day. Jay later added that SD also meant that individuals lived at peace with their environment, using it in a beneficial way, as is evident in the following quote:

“...something that you can use for yourself and keep on using in the future, so it’s gonna mean something to you. People with the ability to actually live in harmony with the environment. That’s basically...and to use the environment not to disadvantage but, so you can use the environment to actually share and not deteriorate it. ...it’s got to mean something and when the child goes out there they have got to be able to apply it. So in that way it’s sustainable to them...”

(Pre-lesson interview, 27/01/2009)

Jay was asked whether she incorporated this understanding of SD that she had, in her teaching, and if she did to provide an example of how she did. Jay responded saying that this was the way that she taught all the time, as it was more about the skills that she wanted to develop and not so much the actual content topic. For Jay at this point SD involves learners in meaningful learning, whereby they are responsible for their own learning. Jay displays this view in the following quote:

“I...always when we talk it’s always got to apply to something that they know...I always ask them questions...and that’s one of the reasons why I want them to visualise it, because it’s something that’s there that they have brought me and the lesson can be developed from that...they have taken it out of their garden and actually found it....Then it’s becoming part of them.”

(Pre-lesson interview, 27/01/2009)

Jay added that she tried to encourage a love for the environment through engaging the learners in experiences that helped them to appreciate and enjoy their surroundings.

Jay was asked if she had heard of the term ESD before, to which she replied that she had never heard of the term before I had mentioned it to her. In response to her reply I asked that

if she had to make meaning of the term how would she. Jay used her understanding of SD previously explained, to develop her idea of what ESD could mean and meant to her. Jay extended ESD to all education regardless of the subject describing it as something that was there to support learners in finding out more about themselves and their future. Jay more specifically commented that it involved “...*trying to get them to relate to their environment and themselves in particular and trying to see how it is relevant to themselves and their life.*”

(Pre-lesson interview, 27/01/2009)

When Jay was asked whether she thought that ESD should be included in the curriculum she responded strongly saying that ESD should be the foundation of the curriculum as everything that is taught should be done so in a relevant and meaningful way. It was no surprise to me that when Jay was asked in which Grade 9 learning area she would choose to integrate ESD, she responded:

“I don’t know...my idea of sustainable development [referring to ESD] is to integrate it into everything that I teach no matter what it is, so whenever I teach I try to relate it.....I wouldn’t have it as a separate subject...It can’t be separate! It’s got to be part of everything, it’s not a separate subject...it really isn’t!”

(Pre-lesson interview, 27/01/2009)

Jay displays a holistic idea of ESD and the role that an educator has to play. For Jay the role that educators have to play, should involve them in drawing the similarities that exist in each subject to work towards a common goal of meaningful learning and thus her interpretation of ESD at this point. Although at this point Jay appears quite confident that this is what SD and ESD mean, she shows evidence of being unsure and wanting to find out for certain: “...*I look at it and I am still wondering is that what sustainable development is or is it just what I feel it*

is....What is other people's understandings of sustainable development..." (Pre-lesson interview, 27/01/2009) This phenomenon of the synonymous use of the words SD and ESD is recognised within Jay's responses, as in both Kay's and René's responses revealed further on. When Jay speaks about SD inevitably she refers to its implementation in education. The other two teachers display this same understanding further on.

4.3.1.2. Jay's practice of ESD

In order for me to understand Jay's practice of ESD I draw on data from the planning documents regarding the lesson, the actual observation of the lesson and finally the teachers reflecting on the lesson via the post-lesson VSR interview. I attempt to identify ESD principles within. Jay's lesson displays various ESD principles in her teaching. For the sake of brevity three groups of principles and their corresponding examples have been highlighted in this chapter. In order for the reader to understand why three groups of principles have been chosen, I need to refer to the conceptual framework table represented in Appendix II. This conceptual framework shows that ESD can be viewed from three major perspectives: the ESD teacher activities; the ESD learner activities; and ESD content relating to the societal, economic, political and biophysical aspects of the environment. I have chosen these three aspects to form the template of my analysis of Jay's practice of ESD.

The actual lesson that Jay taught was a 45 minute Grade 9 Natural Science lesson that focused on the topic of 'Life Processes'. Jay's class consisted of 24 learners. Jay's classroom walls are covered by posters from magazines, learners' work and articles. The counters are filled with either National Geographic or Popular Mechanics type literature, or animal tanks with fish, plants and hamsters. On the front door as you enter you would

observe that around the chalk board are popular sayings regarding learning that reflects constructivist views.

What is important to realise at this point is that the following analysis involves myself as the researcher, using a conceptual framework to measure how many ESD principles are actually being used in Jay's lesson. The conceptual framework consists of ESD principles that were outlined by the UNDESD (2002) and placed into a table that focuses on three main aspects: teacher activities; learner activities and SD content. The analysis also draws upon Jay's conscious analysis of her own lesson during the post-lesson VSR interview and should be deemed more valuable than my analysis as this reveals her conscious understanding and practice of ESD. This conscious understanding addresses the first research question which asks what the teachers' understanding and practice of ESD are. Therefore where possible for every ESD principle identified below, my personal analysis and Jay's personal analysis of the same ESD principle are both displayed to ensure that at the end of the analysis a deep understanding regarding Jay's practice is attained.

(i) ESD teacher activity

At the beginning of the data collection process Jay was asked to provide a detailed lesson plan showing how she planned to incorporate aspects of her understanding of ESD into her teaching. Jay, was not happy about writing up lesson plans simply because she felt that under normal circumstances (the usual school day) teachers never wrote up lesson plans but rather that the lesson outline was in her head and everything else followed as the lesson progressed. I therefore asked Jay to reflect her ideas in her journal, which Jay had done in this reconnaissance step. Kay and René displayed identical feelings regarding lesson planning. In the first instance Jay showed evidence of lesson planning:

“Lesson Plan: Review graph – check main feature repeated. Review definitions covered for last week – get back from the learners their understanding. Continue with living processes relating it to their experiences around them – make it part of their own knowledge i.e. sustainable development of the learners as individuals. Relating what they are doing to themselves directly – via their own experiences.”

(Journal entry, 18/02/2009)

This was the entirety of what Jay had written in her reflective journal regarding her planning. This entry displays Jay’s understanding of ESD at this point, as she understands it mainly as education that aims to make ‘*learning relevant and meaningful to the learners*’ (an ESD principle). This reinforces what Jay displayed during the pre-lesson interview where she also added that ESD is making learners responsible for their own learning. Once again Jay displays her belief that ESD should gear the learner with tools that will enable them to be effective citizens once they leave school.

During the lesson I observed Jay used concrete examples to make learning meaningful and relevant to the learners. In this way the following example displayed by Jay reveals one of the ESD principles that states: ‘*Teacher participates as a facilitator of meaningful learning.*’

J – I have got, these are sunflower seeds growing, this cactus, do you notice something about this? Let me just hold this up...can you notice something about that cactus?

L – It’s got leaves

J – Okay it’s got leaves, do you notice something else about it?

L – Thorns

J – It’s got spikes or thorns...

L – Its green

J – Its green, okay...[silence] It’s leaning over. It’s leaning over okay.

L – Ooooh...[learners show realization]

J – Okay, why do you think it is leaning over?

L – It’s going towards the sun

J – Its growing towards the sun, so there’s proof that plants actually grow.

(Lesson observation, 19/02/2009)

In other instances throughout the lesson, I observed Jay using concrete examples such as visual demonstrations of fungi, pressed leaves in books, her class pets and relevant stories like eating popcorn, to gain her learners’ attention and determine their zone of proximal development (ZPD). Jay attempts to develop her learners by firstly drawing them into a setting to which they can relate and comment on and therefore learn from, making their learning meaningful and relevant.

During the post-lesson VSR interview Jay draws on the same ESD principle. Jay stopped the tape at the point at which she asked learners about the definition of ‘respiration’, she further probed and asked the learners to breathe in and out. Jay asked the learners if this was respiration. Jay motivated for such an activity as she stated: “*When I am doing that I’m trying to, I suppose sustainable development is trying to make sense and make them realise it’s a part of them and that the notes are a part of them as well.*” (VSR interview, 19/02/2009) Jay refers to meaningful learning here and describes it as a process whereby learners take their experiences and use them to add to their knowledge development.

It is clear by the analysis of the ESD principle above that Jay was aware of the following ESD principle: *'Teacher participates as a facilitator of meaningful learning.'* and managed to implement this into her practice.

(ii) ESD learner activity

In my observation of Jay's lesson I observed that an ESD principle that Jay employed in her teaching was *'encouraging learners to engage in knowledge production'*. By affording her learners the opportunity to contribute in her classroom Jay provided an open atmosphere for learners to contribute their ideas and thoughts. Jay encouraged learners to be responsible for their own learning by giving learners 'self discovery tasks' to do as well as by motivating them to contribute their personal experiences and queries to the class. In these ways Jay showed evidence of *'encouraging learners to be part of their own knowledge production'* once again.

Looking specifically at self-discovery tasks, Jay refers to a learner who was meant to bring a particular leaf to class and had not done so. This leaf was to assist Jay in demonstrating asexual reproduction. Jay refused to bring it from home as she believes that learners should take hold of their own learning experiences. Further on in the discussion a learner comments on a personal experience of her bird laying an egg with no mating having taken place. The learner challenged Jay's definition of reproduction and by allowing the learner to contribute learning from this point became personal, and Jay became involved in answering a personal question using the Science knowledge available.

J - In reproduction you get the animals now that are going to reproduce, they are going to essentially copy themselves and reproduce themselves in young and yes you need a male and female and you have reproduction in that way. Now what

was I telling you [points to the learner that was meant to bring the leaf] I was telling you to bring that leaf wasn't I? Okay I said that is a very special leaf, you got to bring me some even if its tomorrow...I've got some at home but I'm not gonna bring it you must bring it. Bring the leaf and we are going to see what can happen, because sometimes you don't need to have a male and a female. Ya?
[Looks over at girl who has raised her hand]

L – Once my bird laid an egg and it was the only one in the cage.

J – That's very interesting...[learners laugh] that's very interesting. Is the egg part of the reproduction process? Do you think you can get a baby chicken out of that egg?

L – [unsure]

J – No because it hasn't been fertilized. The male hasn't been there. Girls, those eggs that you eat, a lot of them the females are in those cages...those are unfertilized eggs, it's a big cell, unfertilized eggs. When you crack open an egg and you see a little red spot and you say eeh theres a bit of blood in there...that's actually a fertilized egg and that is sexual reproduction.

L – Aah Sis! [class roars with laughter]

(Lesson observation, 19/02/2009)

During the post-lesson VSR interview Jay also drew on the ESD principle pertaining to 'learner knowledge production'. Jay constantly referred to ESD as that which prepares learners for the world out there. Jay stopped the tape at the point where she considered a learners' comment that men's ears never stop growing and where she asked the learners whether it would be possible to do an experiment to prove this. Jay felt that this was an

exhibit of ESD incorporation as it used learners' knowledge as a basis for further knowledge and skill development. Jay focused on experimental procedure and its role in learners' lives:

“See now here I was bringing in scientific method because again its part of it, sustainable development, so it's part of their thought process...For them to actually understand what an experimental procedure is about...Because basically that is what they got to do...What good idea, how do we design the experiment, what are the variables, what do we have to include? You see now they so chuffed because they brought it up so they felt ownership of it because they had brought it up”

(VSR interview, 19/02/2009)

Jay reveals above that not only are learners' inputs being used to develop a concept or skill further, the learners feel motivated to contribute their thoughts in further incidents of learning. Jay expressed this example above as a sustainable practice for life-long learning as learners take on responsibility for their own learning.

The above analysis of the ESD principle: '*encouraging learners to engage in knowledge production*' displays Jay's conscious awareness of this principle and conscious efforts to incorporate it into her practice.

(iii) ESD content relating to the societal, economic, political and biophysical aspects of the environment

My analysis using the conceptual framework, shows that Jay used a variety of ESD principles in her lesson. Even though the topic content of her lesson did not lend itself directly to content regarding issues of SD from an environmental, economic or political perspective, Jay managed to address an issue of SD.

Although ESD refers largely to the teacher activities and learner activities, as shown above, it also refers to ‘issues of SD content’. Jay drew on one specific example that is close to her heart.

J – It stores water inside it, girls this is green [points to the fleshy part of the cactus].

Is this a leaf?

L- No....it’s the stem.

J – Right. Good it’s the stem, and what happens, you take a cactus and you won’t find this cactus there. Mrs ----- pulled it up, a cactus is an alien, what does that mean?

L – It’s not grown in South Africa

J – Right, it does not come from there, [learner shouts out “Not native!”] Not native okay, not indigenous, and it will grow and grow and the worst is you take that leaf and you chop it up and it will grow...every single “leaf” is a stem [makes quotation marks with fingers], it’s gonna produce a cactus, okay so when you get a cactus plant they will grow. I am going to give you an example...of by the way have you checked your leaves? Are they growing?

(Lesson observation, 19/02/2009)

Jay had an opportunity here to explore the environmental issue of alien plants encroaching upon the indigenous vegetation, yet fell short of doing this in this particular lesson. However in reflecting on what was posted on a pillar outside her classroom, it may be due to the fact that learners are already aware of the issue. On the pillar outside Jay’s classroom are Mexican Sunflowers wrapped around the pole with a notice informing learners that these pretty looking

flowers are in actual fact alien plants that negatively affect the survival of our indigenous species. Jay is very motivated and involved regarding environmental concerns outside her teaching. In this specific example shown above Jay showed evidence of considering ‘*content that covers biophysical systems, their potentials and limits*’, this being an ESD principle pertaining to SD content.

In analysing the lesson taught using the comprehensive ESD conceptual framework, it is clear that the ESD principles that Jay has displayed include: rationality and open mindedness; encourages critical and creative thinking; participates as a facilitator of active, meaningful and relevant learning and questioning; encourages learners to become part of knowledge production; encourages learners to take part in guided discovery; and finally introduced learners briefly to an environmentally focussed issue regarding SD (alien plants). Jay does show consideration for the biophysical aspect of the environment here. At this point one may ask: ‘So why the need for an intervention?’ Although Jay displayed many ESD principles in her practice, there were some that she did not display. As the three teachers come together in the intervention phase, it becomes quite apparent that together they have a lot to offer each other in terms of understanding and practice of ESD. Jay represents one part of a very important learning community.

4.3.1.3. Jay’s understanding and practice of ESD

In order to see the juncture between Jay’s understanding of ESD and her manifested¹⁷ understanding (her practice of ESD), I need to bring the analyses of the pre-lesson interview

¹⁷ Manifested – refers to an outwardly observed action or dialogue which has the ability to reveal something hidden or unspoken.

and of the other three data collection sessions (lesson planning content analysis, lesson observation, post-lesson VSR interview) together.

In the pre-lesson interview Jay expressed that she understood that SD and similarly ESD was about imparting something meaningful to the learners that they could leave school with and use in society one day. Jay added that SD and ESD also meant that individuals lived at peace with their environment, sharing it and not destroying it in the process. According to Jay ESD is more about the skills that she wanted to develop and not so much the actual content topic. The skills Jay referred to involved being responsible for one's own learning and being passionate about the environment by identifying how it is relevant to themselves and their future. For Jay this could be achieved by presenting learning experiences that are meaningful and relevant and encourage a love for the environment. Jay felt that because of the way she understood ESD to apply to all that is relevant and meaningful, ESD is a concept that should run across all disciplines as it should form the foundation of the curriculum.

When it came to analysing Jays' practice however, she displayed a more elaborated version of her understanding of ESD. This may be due to the fact that the data collection sessions offered a more conducive and practical environment in which she could express her true understanding of ESD. All that Jay revealed in the pre-lesson interview regarding her understanding of ESD was displayed in her lesson. However more was added that Jay had not previously mentioned.

In Jay's reflective journal she confirmed her understanding that ESD aims to make learning meaningful and relevant; make learners responsible for their own learning; as well as equip learners to be effective citizens once they leave school. In my analysis of Jay's lesson I identified the following principles: guided questioning; relevant and meaningful teaching and learning; engaging learners in knowledge production; referral to an issue of SD (alien plants);

responsibility for one's own learning through self discovery tasks; engaging learners in social issues; engaging learners in critical thinking, as well as a new principle not listed – the development of scientific literacy skills. Jay addressed both the social and biophysical aspects of the environment in her practice.

In the post-lesson VSR interview Jay points out her conscious attempts to implement ESD principles, thus revealing her understanding of the actual ESD principles themselves. Jay identified: meaningful and relevant learning; critical reflection regarding media; human well-being; life-long learning; taking responsibility for one's own learning; creative thinking; learners become involved in knowledge production; and finally two new principles that Jay felt should be included as ESD principles: improving one's self-image and addressing learners' misconceptions.

What is clear here is that at the fore in Jay's understanding and practice of ESD is the meaningful and relevant aspect of education. Jay uses a number of methods to ensure that ultimately what learners are receiving is meaningful. Jay does this by considering learners' knowledge through questioning and using their knowledge to develop new knowledge. Jay also encourages critical thinking by questioning her learners, getting them to think about their world around them, thus making learning meaningful, once again. Jay reveals her understanding through her practice and shows a heightened awareness regarding her practice.

4.3.1.4. The role of reflection in establishing Jay's understanding and practice of ESD

At this point Jay had engaged in reflection during the pre-lesson interview (reflection-for-action), during her lesson (reflection-in-action) and during the VSR interview (reflection-on-

action) (Schön, 1983). Jay had also made three reflective journal entries during this reconnaissance step.

After the VSR interview Jay was asked whether being asked to plan a lesson in which she integrated ESD affected her perception of what it meant to integrate ESD. Jay responded that it made her more aware of how she tries to teach already. Jay further stated that ESD integration was always in her teaching but now she was just more aware of it. *“Especially like if we going along in the lesson, I am thinking ‘oh yes that’s sustainable development’ whereas before it never entered my mind, it really didn’t.”* (VSR interview, 19/02/2009) Such a response indicates Schön’s (1983) concept of reflection-in-action.

Reflective opportunities aim to provide teachers with an opportunity to become empowered implementers of ESD, as teachers reflect on their active experiences and thus develop themselves professionally (Vonk, 1991). It is not a surprise however that, teachers are not too enthusiastic about reflecting in writing as this is a time consuming practice. Jay displayed her limited enthusiasm for reflecting in her very first journal entry: *“I can’t wait to see the end of the 4 weeks (No more reflections! [Jay refers to written reflections] I really hope I can keep them up”* (27/01/2009). In a later very short entry Jay simply stated that all she could do was write the date as she did not possess enough time to reflect. *“O.K, got as far as the date and then?? Doing too many things at once!!”* (20/02/2009). It must be acknowledged that this is a limiting factor to development, and a very real situation and feeling of teachers in their busy schedules.

Jay kept a reflective journal which has been used to support the data that was collected during the cycle. At first Jay reported feelings of impatience and lack of motivation to keep a reflective journal, however as she moves on in her reflections there is strong evidence to show that she used her reflective journal as a springboard for her thoughts and developing ideas.

Jay used her reflective journal to make short notes of events where she had heard the term SD being used in a new or different way. “...they talked about sustainable development – in the context of the ecosystem and sustainability of the various biomes.” (01/02/2009). Jay also used her reflective journal during cycle one to briefly outline her thoughts about the lesson that was to be observed and how this was to address ESD.

Throughout step one, and especially during the pre and post lesson interviews, Jay engaged in an active construction of her understanding of ESD. Jay spoke about and in the process refined her understanding of ESD. At this point one may say that Jay has a good grasp of the teaching and learning strategies advocated for in the ESD principles. However engagement in ESD issues from an economic, societal, political and biophysical perspective is still something that needs to be developed within any given lesson. It may not be fair to make such a statement however, considering the requirements of the school curriculum itself and time as a limited resource. Of course there is only so much that can be integrated in one specific lesson.

Jay’s reflective journal entries at this point involved surface report-back type reflecting techniques as she showed signs of not being too sure of how to reflect. However looking at the level of reflection that took place during the VSR interview, Jay engages in higher levels of reflection as she showed evidence of reflecting on-action and in-action as well as of placing value on various incidents with regards to their relevance to ESD. Such higher level reflecting is recognised by Boody (2008) who claims that there are three levels of reflection: in, on and for-action. The next section of data analysis reveals Kay’s understanding and practice of ESD.

4.3.2. Kay's understanding and practice of ESD

The following analysis reveals both Kay's verbalised understandings of ESD and her understandings of ESD manifested through her practice.

4.3.2.1. Kay's understanding of ESD

When Kay was asked what she understood by the term Sustainable Development, she responded at length as I noticed her searching to find a more concise definition that was digestible. At first Kay answered the question by providing two examples of SD practices within an education setting. Firstly Kay stated that the first topic or concept she would impart to her learners would be hygiene and fitness, teaching learners to sustain their physical well being through sustainable hygiene and fitness training practices. Secondly Kay provided an example of an activity that she had already designed for her learners, which involved them keeping a diary of their diet and exercise plan. These two examples provided display Kay's personal interest in healthy living and how she values this as a way of addressing learner SD. Kay at this point understands SD as the development of learners in a sustainable fashion. Kay does recognise the fact that she is relating her conceptualisation of SD to education. *".. I think I'm streamlining this to education."* (Pre-lesson interview, 4/02/2009)

In a second attempt to define SD, Kay acknowledges the environment in her explanation.

".. okay it incorporates your physical surroundings and incorporating the learner and the teacher together with your environment, and not just doing what is required of you today. It's a life-long process, so it has to be a cycle, it has to be a process that keeps going that like from five days from now you haven't forgotten what you did the previous lesson, so it's a continuous process that is sustainable."

(Pre-lesson interview, 4/02/2009)

When Kay was asked how she came to develop the understanding that she had of SD she commented that she felt she always had that understanding, but that her interest and love for her surroundings and Physical Education (PE) probably steered her in the direction of conceptualising it in that way. Kay was asked to reflect on whether she incorporated SD in her teaching and responded that although she found it difficult to incorporate SD into Mathematics, she felt that she could and has done it in her PE lessons. The example that Kay provided was that in her PE lessons she had spoken to the learners about “*why does your grass grow on certain areas and why does it not grow on certain areas...*” (Pre-lesson interview, 4/02/2009) In this way Kay felt that she had incorporated SD to a very small extent as she stated that incorporation was “*quite challenging*” (Pre-lesson interview, 4/02/2009). Kay found it challenging to incorporate SD into a Learning Area where the content did not specifically cover SD issues.

Kay placed great value on incorporating SD into the curriculum as she felt that there was a lot more to education than “*just your classroom content and your knowledge,*” (Pre-lesson interview, 4/02/2009) but rather it was important to link the content to one’s surroundings and actual life experiences. In this respect Kay revealed a further understanding of SD and really perhaps it is ESD that she is thinking about here, that SD/ESD involves relevant learning. Kay revealed her value for relevant learning and its role in sustainably developing learners to a point of meaningful learning that could sustain them when they leave school. “*So it can’t be isolated, like I am teaching this section in maths, I am teaching logs and that’s it...how does it apply to your life?*” (Pre-lesson interview, 4/02/2009)

Kay claimed that she had never heard of the term ‘Education for Sustainable Development’, stringed in that particular way, however she had heard of the term SD. Kay’s conception of

SD which is captured in the context of the school sheds light on her understanding of ESD as she merges the two terms and uses them interchangeably. This becomes quite evident when Kay is asked for her meaning of ESD. *“It’s weird because I have the perception that education, or sustainable development should be incorporated in every learning area...it sounds like ESD means it’s only one subject on its own.”* (Pre-lesson interview, 4/02/2009)

Kay understands ESD as a subject whereby SD is the main focus.

Kay shows her value for ESD when asked whether she felt it should be included in the curriculum, Kay responded that it should be incorporated into every learning area whereby an attempt is made to link SD to the content topic being taught. However when asked which learning area she would choose to incorporate ESD into, Kay responded that she would find it difficult to incorporate it into Mathematics.

“I felt with Natural Science okay because probably I have this narrow perception of the environment, sustainable development, that’s it...But for now that perception is I can only integrate it with Physical Education, with Natural Science, with Arts and Culture as well...But for now I feel if I had to plan a lesson it would be much easier integrating sustainable development in Physical Ed and Natural Science.”

(Pre-lesson interview, 4/02/2009)

Although Kay acknowledges that ESD should be integrated into every learning area, she feels that she would only find it possible to incorporate ESD within Physical Education and Natural Science.

Kay used an example from her own teaching to describe her understanding of ESD as well as the role that such an educator would play. Firstly Kay felt that an ESD educator would need to use the environment around the learners to teach, connecting them to a sense of and

appreciation for the environment. Secondly Kay used her own teaching as an example of how an ESD educator could integrate ESD into their lesson. As opposed to simply teaching the learners the techniques used in basketball, Kay felt that this was an unsustainable practice as even if learners had the knowledge of the different techniques, if they were unfit or weak these techniques would be useless. Kay felt that a way in which she had incorporated ESD was by gearing learners in their fitness and ankle and arm strength first, ensuring that they had the endurance required to play a game of basketball. Kay then focused on the techniques that would need to be learned, thus the learners would become actively engaged in the game, learning it via experience and thus making it a sustainable practice.

4.3.2.2. Kay's practice of ESD

In order to understand Kay's practice of ESD I draw on data from the planning documents regarding the lesson, the actual observation of the lesson and finally the teachers' reflecting on the lesson via the post-lesson VSR interview.

Kay was asked to keep a reflective journal that would punctuate the development process over the four weeks of data collection. Kay had kept a reflective journal but had misplaced the journal and was not able to submit it after the group interview at the end of the action research cycle. Kay started a new reflective journal, however it contained little content and none pertaining to the planning of her lesson. When Kay was asked for her lesson plan she stated that she had not written up one because the lesson that she was to teach was an assessment activity lesson in which learners were required to come up to the front of the class and report on their oral: "*I am an idol*". Kay did reflect on her choice of lesson during the VSR interview in which she stated:

“Firstly because it’s during exam times, we were under exam restraints so that was the only class I was able to see, I would have wanted it to be a more hands-on lesson that you would have watched...”

(VSR interview, 10/03/2009)

When Kay was asked what she would have done if she could have done it differently, she replied that she would have chosen to teach a lesson on the topic of ‘careers and the workplace’, whereby learners would get into groups and play an employer-employee scene of their occupation choice. Kay then stated that the learners would look at drawing up their own CVs and talk about the different Universities.

During the VSR interview Kay informed me that although she had no option but to show me an assessment-type lesson she still felt that the lesson was a significant one to observe at the time. Generally Kay felt that because the lesson required learners to reflect on who they are, their career and their ambitions, this lesson displayed attributes of ESD. I could not ask Kay in this instance to stop the video in places where she had incorporated ESD as she already stated that this lesson was a stipulated assessment that needed to occur. Rather I asked Kay to stop the video in places where she identified ESD principles or where she identified areas where ESD principles could have been incorporated.

The class that Kay asked me to observe was a Grade 9 Life Orientation lesson of 37 students. Kay does not have her own class so instead of her students coming to her classroom in which she is permanently based, Kay moves around finding other teachers’ classrooms that are vacant during her teaching time. Within the classroom that Kay taught during her lesson, were simply chairs, double desks and a green board. No additional posters or models were present. Kay began the lesson simply by recapping the examination paper and the major

sections involved and what percentage the exam and the course mark would count. Kay then took her place at the front of the class behind the main desk, as learners, mostly volunteers, came up to do their presentations which required them to present on why they are an idol.

(i) ESD teaching strategies

During the lesson observation I observed that Kay displayed ‘*sensitivity towards human rights and social justice*’ in two ways. Firstly Kay painstakingly reinforced the need for learners to keep attentive during their fellow learners’ presentations. In fourteen cases Kay had to reprimand noisy inconsiderate learners. Kay demanded respect for the presenters to the point where she gave five demerits to learners who were unruly. Secondly Kay took careful consideration to ensure that both groups of girls and boys were reprimanded when needed. “*Shhh, just wait. He’s very soft girls so just pay attention*”; “*Hai, That’s enough...you all whispering there, and the boys in the back.*” (Lesson observation; 10/03/2009) Kay displayed her value for gender equality in another instance when a male learner reported that he wanted to be a cook and the class began to mock him, Kay responded: “*You do know that the best chefs in the world are male?*” (Lesson observation; 10/03/2009) This consideration for human rights and social justice is a character trait that Kay possesses and thus cannot be seen as an active consideration in an attempt to implement ESD. Rather these are the ESD principles that Kay already intrinsically possesses. In the pre-lesson VSR interview Kay did not show any conscious consideration regarding ‘*sensitivity towards human rights and social justice*’ indicating that perhaps Kay did not see this as ESD related.

Kay attempted to integrate skills across learning areas, which Kay identified as an ESD principle, although this is not recognised as a principle within the ESD conceptual framework. I would add that perhaps the conceptual framework is not complete as it is and added insight

may be offered, such as that already suggested by Jay and Kay thus far. Kay also showed conscious consideration for '*meaningful learning*'.

(ii) ESD learning strategies

In my observation of the lesson I observed that the nature of the assessment itself encouraged a principle of ESD as learners learn '*social and communicative skills*'. Although this is true it is not an indication of Kay's understanding of ESD, simply because the assessment was a set assessment, the design of which was independent of Kay's input. Due to the fact that the lesson mostly involved learner orals, there is limited comment regarding the conceptual analysis of the lesson observation.

During the pre-lesson VSR interview Kay asked the video to be stopped at the point where Kay asked the first learner to come up to the front of the classroom and present an oral. Kay stated that the assessment did not require learners to come up to the front and do their presentations orally. However Kay felt that by asking them to present their tasks orally they were in fact being '*engaged in oral communication skills and self esteem*'. Such skills according to Kay qualified as ESD, as these skills would be those used once the learners left school and entered into the corporate world.

“...by giving them this chance of coming in front and speaking, it also helped them to get a little bit of self confidence which they will probably leave school and not remember anything they learned in Maths or Science, but being able to stand and speak in front of people would be something you could take with you forever.”

(VSR interview, 10/03/2009)

The fact that Kay identified communication skills and social skills as a likely ESD principle, confirmed my analysis of the lesson observation as I stated that this principle was evident in her lesson.

(iii) ESD content relating to the societal, economic, political and biophysical aspects of the environment

Although there was no taught content covered in this lesson, Kay did show ‘*consideration for indigenous ways of knowing*’ in a casual comment made to a group of girls at the back of the classroom. “*Oh...one of the girls at the back there are pregnant...* [Learners respond in shock] *There the wasp.* [Kay refers to a traditional myth that a wasp hovers over those that are soon expecting]” (Lesson observation, 10/03/2009). The ESD principle regarding indigenous ways of knowing refers specifically to content of a social, economic or environmental nature. In this way although no content was viewed from the perspective of Indigenous Knowledge or Alternative Knowledge Systems, Kay shows evidence of valuing indigenous and alternate ways of knowing.

Overall Kay displayed very few ESD principles, however the principles that she did display included: teacher displaying a commitment to human rights and social justice; learner develops communication and social skills; content covered considered indigenous ways of knowing; and teacher participated as a facilitator of meaningful learning. The final principle was identified by Kay, but not recognised as an ESD principle, and referred to an integration of skills across learning areas.

4.3.2.3. Kay's understanding and practice of ESD

In order to see the connection between Kay's understanding of ESD and her manifested understanding – in other words her practice of ESD, I need to bring the analysis of the pre-lesson interview and the other three data collection sessions (lesson planning document analysis, lesson observation, post-lesson VSR interview) together.

During the pre-lesson interview Kay revealed her verbal explanation for her understanding of ESD. Kay found it difficult to verbalise her understanding and resorted to an example to assist her. Kay referred to hygiene and fitness and motivated that this refers to ESD as it teaches learners how to sustain their physical wellbeing. Kay expressed that ESD incorporates bringing the learners into closer contact with their environment. For Kay ESD should link to more than just the curriculum content but also to learners' actual surroundings and experiences. Kay understood ESD to be a separate subject yet stressed that it should rather be incorporated into all learning areas. However Kay did qualify that although she felt that ESD should be incorporated into all learning areas, she could not see how it could be done in Mathematics, yet Physical Education, Natural Science and Arts and Culture lent themselves quite easily to ESD.

In analysing Kay's practice, there was very little opportunity to observe Kay's manifested understandings as she had no part in the design of her lesson. However Kay did reveal that she would have seen asking learners to draw up their Curriculum Vitae and talking about the different universities as incorporating ESD. My analysis of the lesson which I observed revealed that Kay had considered the following ESD principles: social and communicative skills; human rights and social justice; as well as considering indigenous ways of knowing (which may be considered as another new ESD principle).

Kay's analysis of her own practice during the post-lesson VSR interview reveals the principles that she identified to be ESD related. The principles she identified were: self-image (a new principle suggested by Kay to be an ESD principle); career opportunities (another new principle that Kay identified to be ESD related); basic mathematics literacy skills; meaningful and relevant learning; and communication skills. This analysis reveals Kay's anthropocentric understanding of ESD, as she relates ESD to the development of learners in preparation for the 'corporate' world out there and makes very little reference to the responsibility of the individual to the world out there. At this point she understands ESD to be all about sustaining the individual in terms of health and emotional stability, as was revealed in the pre-lesson interview.

4.3.2.4. The role of reflection in establishing Kay's understanding and practice of ESD

Throughout Kay's engagement in the reconnaissance step, constant reflection took place. Firstly within the pre-lesson interview, Kay reflected on lessons that she had taught previously, and how she felt that she was incorporating ESD. With this sort of reflection Kay was engaged in constantly developing her definition and understanding of SD and ESD. During the pre-lesson interview Kay also showed evidence of attaching her personal interests and values to her definition of ESD. *"...so I feel because of having the love for that, that has probably influenced even my meaning, the way I feel and the way I think about sustainable development."* (Pre-lesson interview, 4/02/2009) Remember that Kay used the term SD and ESD interchangeably as she automatically defined SD within an education setting.

Kay found it difficult to keep a reflective journal as she was quite occupied when it came to activities outside the classroom. At first Kay kept a well accounted journal, however she

misplaced this and had to start anew. Kay's newer version lacked a lot of detail. For this reason a large portion of Kay's reflections derive from other sources such as pre- and post-interviews.

Kay at one point in the pre-lesson interview reflected introspectively to say that she felt she was probably defining SD too narrowly as she could only see how ESD could be integrated into Physical Education, Natural Science and Arts and Culture. This kind of reflection showed that Kay is aware that change may occur and is open to it. Although Kay's very skinny reflective journal included only four entries, all four entries simply reported what had occurred and no in-depth reflection took place. "*Lesson 1: This was when it was during our exams, I had to incorporate our assessment into the lesson.*" (Reflective journal, 18/06/2009) Kay did not reflect on her feelings, thoughts, challenges or even successes in her reflective journal. It became apparent that Kay's source of in-depth reflection presented itself within the pre- and post-lesson interviews as well as during the group discussions during the reflection step.

In one instance during the VSR interview Kay responded in a particular way to a question asked, but further on in the interview, when the question was posed again, an opposite response was given. Kay showed evidence of deep reflection which Boody (2008) identifies as the 'problem solving process'. According to Boody (2008) the 'problem solving process' is one of the four types of reflection that exist. This type of reflection is evident when the individual shows signs of unease and hypothesis formulation. Kay in this instance attempted to form her hypothesis regarding what examples in the video could be deemed ESD focused.

K - Stop! [laughs] It's a smally but um, I don't...okay not sustainable development, but trying to be a bit holistic, um so although it's an LO lesson, I probably taught

them a small skill about maths, basic calculation of converting your 70% into 100%.

H – You see that as incorporating aspects of ESD?

K – A little bit of it.

H – Okay, when you said ‘not sustainable development’ what did you mean when you said that?

K – Well maybe it is, but not to a large extent, ah coz then again the definition and understanding of sustainable development would probably be changed. But...ay you making me think now [giggles]. But...no but...it *is* [places emphasis] sustainable development because it’s not just one thing you...you leading students through a series of stuff and it’s just, it’s an LO class but it’s not focusing only on LO. As you can see there’s a bit of Maths so, ja it is sustainable development.

(VSR interview, 10/03/2009)

As Kay reflected on instances in the lesson where she identified ESD principles being implemented, she drew on Van Manen’s critical reflection (Boody, 2008) as she engaged in all three levels of reflection. Firstly she recounted the incidents: this is described as first level reflection. Secondly she placed value on the incidents, and thirdly questioned the value of these incidents critically.

“I could have just asked learners to write about yourselves in your books and I could have read it myself and assessed them, so by asking them to come out to the front and present it themselves, will also play a part because you also learning your speaking skills, communication skills...I’ve noticed something with some students’

right, some of them came up to me and they were really shy to speak in the front. So as I said before, by giving them this chance of coming in front and speaking, it also helped them to get a little bit of self confidence which they will probably leave school and not remember anything they learned in Maths or Science, but being able to stand and speak in front of people would be something you could take with you forever.”

(VSR interview, 10/03/2009)

Kay questioned the idea of asking learners to come up to the front and present their orals. In doing this she convinced herself that this was a sustainable practice and she did so by providing critical reasons as to why and how the learner was being developed.

The VSR interview also served as a reflection-on-action and reflection-for-action tool, as Kay commented that: *“I think after each speech we could have had...not a long discussion or maybe just a minute or two just to reflect on, um what they had said”* (VSR interview, 10/03/2009) When asked how this would make the experience more ESD focused Kay replied that it would make the presentation more *“real-life”* as learners would have to explain how they came to know or identify that they had these particular characteristics that they spoke of. Throughout cycle one, Kay and the other teachers were engaged in activities that drove them to reflect on their experiences and ideas and how they felt about these.

4.3.3. René’s understanding and practice of ESD

The following analysis serves to identify what Rene’s understanding and practice of ESD are. This is achieved by bringing together her verbal expression of her understanding of ESD

which is revealed in the pre-lesson interview and her manifested understanding of ESD which is revealed in her practice.

4.3.3.1. René's understanding of ESD

René was asked what she understood about the term 'Sustainable Development'. René responded that the term referred to recognising that we as humans need to take care of our planet. More specifically, René added that it involved realising that we are dependent upon renewable and non-renewable resources for developments in industry and for survival as a whole. René goes a step further stating that this consideration is a human obligation to future generations. When later asked if she could formulate a definition for SD in a sentence, René responded: "*Um...ensuring the use of natural resources in a responsible manner, especially non-renewable resources*" (Pre-lesson interview, 29/01/2009). René later commented that this was a definition she remembered from a Grade 8 text book. René commented that she felt that many people when focussing on SD tend to look towards global warming, however she felt this was too narrow as it did not address issues such as biodiversity maintenance and conservation of natural resources and ecosystems.

When René was asked what influenced her current understanding of SD, she referred to many instances of exposure. The first instance René referred to was the Grade 9 syllabus that she had taught the previous year. In another instance René found a Geographical Kidz magazine which looked at 'going green' and sustainable development. René had used this magazine as a resource for her understanding and teaching. René found herself teaching Grade 10 Physical Science and Grade 8 Chemistry, both of which she stated required her to teach about the atmosphere and global warming to some extent.

“I did a lot of learning in this whole process, there’s a lot of stuff that I didn’t know in terms of fossil fuels and um I was very very limited in my knowledge until I did research and I had to prepare for my lessons....rather the ignorance that I had, um it egged me to learn more and in that to teach.”

(Pre-lesson interview, 29/01/2009)

René also mentioned that there were two main motivators for her to become interested in SD and dedicated to including it in her teaching. Firstly the fact that newspapers constantly featured articles that covered issues of the environment and management of resources and secondly that “*if the Vice-president of America can be so passionate about it then there’s something to be said about that.*” René was referring to the Movie titled the “*Inconvenient Truth*” (Pre-lesson interview, 29/01/2009), where Al Gore addresses the rising trend of global warming.

René was then asked whether she incorporated sustainable development in the subjects that she taught. René said outright, not in Mathematics as she felt it was not possible, however when it came to Physical Science and Natural Science she did. As far as René was concerned the Natural Science syllabus naturally included SD and thus it was not even a question as to whether or not she incorporated it in her teaching. However when it came to Grade 10 and 11 Physical Science René responded that she made an effort to incorporate SD in the curriculum content even though it is not required. When asked how she incorporated SD in her teaching, René referred to environmental worksheets that she made for Grades 8, 9 and 10, usually these were copies of newspaper or magazine articles that she felt were valuable at the time. René coupled these worksheets with assessment tasks for the learners to engage in.

“I made it grade appropriate...the purpose was to educate not more to assess... Mr ***** who is the head of department in Technology and Geography and he gets this delivery, this newsletter.... I took it I grabbed it I gave it to my Grade 10’s.... browsed through it and saw some stuff about electricity and water resources and about hybrid cars, I told them without looking at it, take this, read it, because I guarantee you I am giving you one question in the exam on it and I kept my word.”

(Pre-lesson interview, 29/01/2009)

It became quite evident to me that René went to the extra length to access articles that spoke about environmental and social issues and to distribute the knowledge resource to other teachers and their learners. When René was asked why she thought it was important to incorporate SD in one’s teaching, she responded that firstly it was her job professionally and secondly her passion. René described a sense of moral obligation on her part, for she felt that if it were something that she would want her children to know then it should be something that is imparted to her learners.

René was asked whether she had heard of the term ‘Education for Sustainable Development’ before, to which she responded that she had only heard of it at the EECF meeting where I first approached them with the possibility of being involved with research that would focus on ESD understanding and implementation. René had never heard of the term before this as she had never seen the word ‘education’ affiliated with the term ‘sustainable development’.

When René was asked what she understood by this term ‘Education for Sustainable Development’, she responded vaguely saying that it gave her the impression that “*it’s necessity to have education in that particular discipline of sustainable development*” (Pre-lesson interview, 29/01/2009). Although the direct response to the posed question sheds very

little light on how René actually understands ESD, the two questions that followed shortly, shed more light on her conceptualisation.

When René was asked whether or not she felt that ESD should be incorporated in the curriculum, she responded “*definitely*” yet she stressed that it should not be pursued as a separate subject, but rather it should exist within the framework of Science. The way René explained her idea was that ESD would take up a particular portion of the Science curriculum. “*I think you know that I really do think that education in this discipline is very very important.*” (Pre-lesson interview, 29/01/2009). This comment revealed that although René did not see ESD as a separate subject, she also did not see it as something to be integrated into all subjects. Rather the reference made to “*this discipline*” and “*it could possibly be, um a large portion of a particular curriculum*” (Pre-lesson interview, 29/01/2009) show that René sees ESD as a portion of content that may be integrated into suitable sections in the curricula of the Science disciplines.

When asked which learning area she would choose to implement ESD, René explained that Natural Science and Geography would be most suitable as both are Science disciplines. Geography, René felt, focused a lot on issues of sustainable development. It is very clear that René understands ESD in terms of content that covers sustainable development issues in the curriculum.

4.3.3.2. René's practice of ESD

In order to understand René's practice of ESD I draw on data from the planning documents regarding the lesson, the actual observation of the lesson and finally the teacher's reflecting

on the lesson via the post-lesson VSR interview. René's lesson displays various ESD principles in her teaching.

At the beginning of the lesson René organizes the classroom whilst the notices are being read over the loud speaker. René gets two boys to put up the posters on the classroom wall. One Black African boy and one Indian girl hand out the worksheets for the lesson. René then asked students to open up their books to Biodiversity as this was the section they were busy with the previous lesson. The classroom was filled to its capacity with students, chairs and desks. There were very few resources available in the classroom besides a few posters that learners had mostly created and one on 'Environmental Responsibilities'. There were approximately 38 students in the Grade 9 Natural Science class.

As may be seen in the lesson plan document further on, René covered many topics and concepts regarding biodiversity, biodiversity loss, conservation of natural resources, natural cycles and other sustainable development topics. René started by recapping a term that had been explored in the previous lesson, the term 'biodiversity'. Learners were further asked why biodiversity was important, to which learners gave various responses. On the topic of the importance of biodiversity, René spoke about the fynbos in Cape Town, with specific reference to the rooibos plant and its medicinal and commercial uses. The remaining of the lesson involved in-depth discussions regarding the first and second worksheets displayed below and the concepts within, such as eco-system balance, habitat loss, endangered and indigenous species, etc.

It is important to note that René took time to scan through the Grade 9 Natural Science syllabus for a section that she felt she could use to incorporate ESD. For this reason it took René a while to contact me for her first lesson observation. This outlines one of the ESD principles mentioned in Appendix II which states: *'Teacher takes time to examine the current*

curriculum for topics relevant to local sustainability'. The topic of the lesson was mainly biodiversity, but other sub-topics were covered under this main topic such as: biodiversity loss, conservation of natural resources, and cycles in nature such as the water cycle. In this way the content of the lesson that René designed covered biophysical systems, their potential and limits. In this way the biophysical aspect of the environment was included in the lesson.

(i) ESD teaching strategies

In the lesson, I observed how René engaged learners in critical and creative thinking as she posed her learners with a realistic scenario.

R – If I had toif we had a huge forest over here and we decided to chop it down, deforestation to build up a big shopping mall, am I doing good?

L – No!

R – Aren't I doing good for you? I am providing entertainment for you?

L – No, we won't be here.

R – Why?

L – Maybe because there won't be trees and trees are the aspect of life.

(Lesson observation, 11/03/2009)

Such a problem posed to learners engages them in debate regarding contentious issues such as property development and encourages learners to think about possible solutions to similar existing problems.

During the post-lesson VSR interview René displayed her participation as a facilitator of meaningful learning. René's substantiation for making worksheet 1 below with the pictures

and written explanation was that she felt it was a way of bringing learners closer to the actual animals affected, otherwise they had never seen them before and the entire message is removed.

“... they are able to identify and understand the concept better I suppose, as it gives specifics rather than general theory. Like we took them, we took our Grade 8’s to the bird park last year and they spoke about the blue swallow...the guide showed us that this would be the last time we would ever get to see it in a public place because after that it was going to go to a breeding programme because it’s actually endangered. So you know when they see specific examples and are exposed to it in reality...”

(VSR interview, 11/03/2009)

In this way René acknowledged her role in making learning meaningful and relevant, and providing learners with the opportunity for guided discovery. In much the same way, René allows the learners to discover concepts and ideas throughout her lesson as she provides them with significant freedom to respond and add to knowledge being produced in the class, in fact, in many ways the learners decide the flow of René’s lesson.

(ii) ESD learning strategies

I observed René ‘encouraging her learners to ‘*engage in their own knowledge production*’. René moved on to look at food webs as an example of how ecosystems may become imbalanced as a result of biodiversity loss. René challenged learners by asking a question that required them to reflect critically. The question posed was: “*The sheep eats the grass and you eat the sheep. Okay, let’s look at this simplistic view of this entire setup. What happens if there are no more sheep?*” (Lesson observation, 11/03/2009) René led the learners by

probing them in their thinking, eventually to the point where learners realised that if one organism were to be removed all individuals in the food web would be negatively impacted upon. Learners were required to think beyond the notes and as a result René promoted reasoning skills and critical thinking about relevant issues.

Throughout the lesson, René used questioning techniques to get learners to participate in their own knowledge production. Both questioning techniques and learner knowledge production are principles that are advocated in ESD.

During the pre-lesson VSR interview René stopped the tape at the point where she asked learners what was meant by the term ‘biodiversity’. René explained that she felt that knowledge was being developed as learners were freely allowed to participate in responding. *“In terms of giving their own interpretations ...normally they don’t participate on such a great level...and I saw a part of them that I’ve never seen before, you know in the way they responded.”* (VSR interview, 11/03/2009) René showed evidence of concern regarding learner participation when it comes to grasping sustainable development concepts and thus it is recognised that ‘*learner knowledge production*’ is aspired to in this lesson.

R – They tend to answer as a group which is wrong

H – Why do you say it’s wrong?

R – It’s a recipe for chaos, but on the other hand I think it’s good, because they comfortable...if they feel more comfortable they are free to answer in their own way...”

(VSR interview, 11/03/2009)

In both my own and René's analysis of the lesson, learners' engaging in knowledge production was identified as an ESD principle that was clearly present in René's practice.

(iii) ESD content relating to the societal, economic, political and biophysical aspects of the environment

When I approached René about her planning documents for her lesson, she stated that she didn't really do lesson plans, but what she had done was to fill out the common form that is issued to them by the school. René had also prepared three worksheets for the lesson that she handed to me.

The lesson plan was not detailed and René explained that it wouldn't be because when she planned her lessons she simply had the concepts in her mind that she needed to convey: how she would convey that, she did not always know. According to the lesson plan, René planned to cover biodiversity and its impacts on the environment; preservation of biodiversity; the carbon, nitrogen and water cycles; and finally global warming. The lesson plan also shows that she intended to use charts and worksheets that she prepared to convey the concepts to the learners. René used three other documents in her lesson. The first was a worksheet on South African endangered species. The second document was a worksheet that focused on habitat destruction and the major causes and impacts. The third and final document was an assessment worksheet focusing on answering application questions with regards to the changes in ecosystems.

René's reflective journal did not inform the planning documents, as no entries regarding her lesson preparation were present. The above worksheets were chosen and designed by René to display how she interpreted ESD integration in her lesson. For René, key words include: biodiversity, endangered, ecosystem, habitat destruction. All of these refer to the

environment and the sustainability of the environment as well as to human impact on the environment. Thus the content regarding ecological systems was at the fore of René's understanding of ESD, and perhaps practice, as the section was being covered in the curriculum at that specific time.

This social aspect of sustainable development is addressed and the impact of human technological developments (industrial and farming) on the environment and thus natural resources is recognised. Later on this becomes evident again as René reads about the impact of technology on the environment and society.

“Many of our water systems for example rivers, streams, ponds and lakes are polluted by factories found at human settlements; polluted water affects the way plants can grow.”

(Lesson observation, 11/03/2009)

During the pre-lesson VSR interview René was asked to stop the video at points where she felt that she was implementing ESD in her lesson. René's immediate response to this was that she felt that the entire lesson covered ESD. In this way it becomes evident that the content covered was seen as SD and as a result ESD because it was placed in an education setting.

During the pre-lesson VSR interview, in many cases René requested the tape be stopped to draw on SD concepts that were covered. In this way once again René's focus on content and the Natural Science content inevitably is the key focus. The first instance occurred during the video where René asked the learners why it was important to conserve the fynbos, and another instance was when learners reflected upon the imbalance of the food web and the impacts of this. In mentioning these instances René acknowledges that content which covers the biophysical systems, their potential and limits, ultimately addresses ESD.

“I think that’s sustainable development in terms of renewable resources. You need to understand the difference between the two, what affects...impacts a lack of it might have.”

(VSR interview, 11/03/2009)

The above was said by René as she stopped the video at the point where she was explaining the difference between renewable and non-renewable resources.

The major principles that come out in both my own and René’s analysis of the lesson include: encouraging learner knowledge production; providing opportunities for guided discovery; teacher takes on the role of ensuring meaningful learning; content covered was culturally appropriate and locally relevant; content covered considered the biophysical systems, their limits and potential; content covered the technologies (farming) societies use to necessarily ‘exploit’ biophysical systems and the environments they create in the process; and finally - although not stipulated as an official ESD principle - the teacher attempted to develop beneficial values regarding SD.

4.3.3.3. René’s understanding and practice of ESD

In order to see the connection between René’s understanding of ESD and her manifested understanding – namely her practice of ESD, I needed to bring the analysis of the pre-lesson interview and the other three data collection sessions (lesson planning document analysis, lesson observation, post-lesson VSR interview) together.

During the pre-lesson interview René attempted to reveal her understanding of ESD verbally. She referred to SD and ESD in a similar way, simply placing more emphasis on the education

aspect in reference to ESD. René understood SD as the realisation of human dependence on renewable and non-renewable resources and the use of these resources in a way that considered future generations. René felt that ESD is a pertinent concept that needs to be given attention within the framework of the Science disciplines. René did not feel it could be integrated into all disciplines, yet should not be taught as a separate subject. René's conceptualisation of ESD focuses largely on humans and their impact on the environment in this way René takes on a seemingly environmentalist stance.

In analysing René's practice, I searched for René's manifested understandings of ESD. In René's lesson plan she revealed her focus on content, in addressing ESD as she focused on concepts of environmental sustainability such as: biodiversity, endangered, ecosystem, habitat destruction etc. In my analysis of René's lesson I identified the following ESD principles within her practice: Teacher searches the curriculum for content relevant to ESD; biophysical systems, their potentials and limits; conservation of natural resources; reasoning and critical thinking skills; questioning techniques; learner knowledge production; impacts of society and economy on the environment; impact of technological developments on the environment; creative thinking skills; policy regulating the social use of bio-physical systems and the environment; and engagement in debates around sustainability issues.

In René's analysis of her practice she first said that she felt that the entire lesson addressed ESD as the content concepts themselves relate directly to issues of SD. René specifically identified the following activities to be principles of ESD: culturally appropriate and locally relevant content; create a sense of environmental responsibility in learners; meaningful and relevant learning; instances of guided discovery; encouraging learner knowledge production; content covered considers biophysical systems, their limits and potentials; content covered

considers the technologies (farming) societies use to necessarily ‘exploit’ biophysical systems and the environments they create in the process.

In considering René’s verbal explanation regarding her understanding of ESD which had a strong SD content focus and then considering her practice, it is clear that René largely understands ESD in terms of SD issues related to the impact that man has on the earth’s resources and ecological systems. Over and above her explanation that she offered in the pre-lesson interview was the reference that she made during the VSR interview to making learning meaningful, encouraging learners to produce knowledge and to select content that is culturally appropriate and locally relevant.

4.3.3.4. The role of reflection in establishing René’s understanding and practice of ESD

René engaged in two types of reflective activities. The first type of reflective activity existed in the data collection process and the second type of reflective activity took place as reflective journal entries. It must therefore be recognised that the mere act of data collection within action research type studies, stimulates a natural reflection on, in and for action (Schön, 1983). The following analysis attempts to illustrate these instances of reflection from the data available.

In the pre-lesson interview René was already showing signs of deep reflection in her response to my request to feel free to add anything that she felt was not touched on by my questions. René introspectively said that she herself was inclined to relate SD solely to the issue of global warming. It was at this point that René suggested that she may need more education on the topic and welcomed it as she felt that she had no opportunities for exposure to education on this specific topic.

“I think even myself have the shortcoming in that I tend to associate sustainable development, more often than not, with global warming, the reduction and the need to reduce global warming and I think that is one of my um shortcomings or drawbacks um when in actual fact I think it encompasses way more than that. I think I might need a little more education in this department, I’m not really exposed to workshops and I haven’t got the chance to go to them, there aren’t any that I know about,”

(Pre-lesson interview, 29/01/2009)

The second opportunity for reflection occurred when during the VSR I asked René whether merely asking her to integrate ESD into her lesson changed or influenced her perception of what ESD meant. René responded that originally she understood ESD to be a “*specific topic on its own*” however she felt that when I indicated that I would wait for her to decide when would be appropriate for me to observe her, that this must mean that “*I shouldn’t have to specifically teach it as a topic on its own.*” (VSR interview, 11/03/2009) When I further probed René, asking her how she sees this issue now she responded that she saw ESD as that which was “*limited to Science*” (VSR interview, 11/03/2009)

René reflected upon her actual lesson during the VSR in two incidences. Firstly René reflected upon the fact that she felt that my mere presence may have caused her to take advantage of every way in which she could push in an ESD concept or principle. This shows evidence of reflection-in-action as my presence made René more aware of her goals to implement ESD in her lesson.

“, to be honest I think I went off the topic a little bit, because I was struggling a little bit more to concentrate a little more on ESD, um maybe I was a bit biased in terms of your presence here...um to be honest I think I might have put more emphasis than needed to be done.”

(VSR interview, 11/03/2009)

This is important in attempting to attain a realistic idea of the impacts of lesson observation and its possibilities for professional development.

The second instance of reflection occurred as René attempted to reflect upon her teaching strategy. René felt that the learners had a wide variety of responses, many of which she felt she could not pursue, which she would have loved to have done. In this respect René acknowledged the importance of recognising learners’ prior knowledge and perhaps even existing alternative knowledge systems (although she does not make specific reference to alternate knowledge systems) when embarking on the development of knowledge around the topic of sustainable development.

“and I think we can feed off that knowledge or lack of knowledge in some cases. That will be fuel for more investigation into this particular field. I think there is a vacuum in terms of their...in the knowledge of sustainable development and that we need to feed into that”

(VSR interview, 11/03/2009)

This level of reflection is of the highest kind identified by Boody (2008) as ‘critical reflection’. René begins to suggest possible avenues for investigation as well as possible solutions to getting learners more cognitively and emotionally (refers to moral obligation) involved in exploring topics related to sustainable development. As René engages herself in

deep critical reflection based on her understandings and practice, she takes on the responsibility for her own professional development. This is evident in Sarsar's (2008) claim that by adopting such a reflective practitioner approach, a natural consequence of such an activity is self-directed professional development.

After the cycle was completed, René informed me that she had misplaced her reflective journal and had filled in entries about experiences and feelings that she could remember. René also expressed that keeping a regular journal was taxing on her time. Although René's entries were more frequent and in depth than Kay's, little reflection took place here. One of René's first entries stated that she was nervous about the first meeting and not sure about partaking in the Action Research as she felt that she could not provide a "*positive influence*" to the research. René also recorded feelings of being inspected. However after the initial meeting with me René reported that it was not as bad as she had thought it would be and that I had managed to make her feel comfortable. René reflected on her first lesson observation:

“Kids excited – were prewarned

- on best behaviour

- good participation

- given insight into their definitions of ESD

- interesting!!”

(Reflective journal, 11/03/2009)

René commented that with regards to the post-lesson interview she could not believe that it took so much time to complete due to the fact that she had so much to say. René spent a large portion of her reflective entries on noting how ESD came up in her everyday

surroundings, either through television programmes, newspapers and expositions that she attended. René commented: “*Maybe it was always there but I am only noticing now – Why – taking things for granted – never know what’s in front of us until given enough incentive to pay attention.*” (Reflective journal, no date) A verbal comment that René had made to me on collection of the reflective journal, confirmed the feelings that the other two teachers displayed about reflecting. René commented that she enjoyed reflecting verbally via conversation and responding to questions, however due to the very busy nature of her lifestyle she found it increasingly difficult to dedicate time to reflections at crucial incidents in the research process. This is noted a key point to consider when assessing the realistically the benefits of reflective writing for professional development of in-service teachers.

4.4. A cross-analysis of three teachers’ understanding and practice of ESD

In looking at all three teachers, it became quite evident that all had heard of the term ‘Sustainable Development’ before yet none had heard of the term ‘Education for Sustainable Development’. As a natural consequence of the above the teachers tended to develop an initial clear understanding of SD and place this understanding within an education setting, thus deeming it synonymously as ESD. This is a very appropriate method of making meaning of ESD and offers insight into how teachers may attempt to make meaning of seemingly new concepts. This became evident when during the post-lesson interviews the teachers referred to instances in which they incorporated SD and never ESD. This was not seen as an issue as this understanding was not flawed, yet important to note is that the

teachers worked from a zone of familiarity, whereby they became familiar enough with the concept ‘Sustainable Development’ to move forward and build upon their understandings.

It was interesting to note the teachers’ ideas of integrating ESD into specific learning areas. Jay was of the opinion that integration of ESD could occur in any learning area, as her understanding of ESD was not exclusively the content being conveyed but rather also the skills. According to Jay similar skills could be conveyed through any learning area. Kay was of a similar opinion as she felt that ESD was something that should not be subject specific, although she did acknowledge that integration of ESD into mathematics would be problematic for her. In this respect it may be said that although Kay felt that ESD should be integrated in any learning area she could not see how it could be managed. René on the other extreme felt that ESD could only be integrated in a learning area that was Science related. In this way René revealed that her understanding of ESD was content specific and later revealed that it related to knowledge of renewable and non-renewable resources and how to conserve these to ensure use for future generations. These insights show how teachers viewed ESD in practice as that which could be more easily achieved through learning areas that were closely aligned with SD issues. Teachers needed to identify a place for SD in their learning area before they could see themselves as addressing it in their practice.

It seems apparent that for all three teachers, SD and ESD are valued and important concepts to be incorporated into the taught curriculum. When the three teachers were observed a number of ESD principles were identified. As mentioned within the body of this chapter and at various sections throughout, the first analysis regarding the lesson observation involved an outsider researcher identifying existing ESD principles, whereas the VSR represented an insider researcher reflecting on their own data, thus making the ESD principles identified those which the teacher was consciously aware of.

Across all teachers that were observed, the following ESD principles were identified:

Commitment to tolerance, rationality and open mindedness; teacher encourages critical and creative thinking; teacher participates as a facilitator of active, meaningful and relevant learning and questioning; teacher encourages learners to become part of knowledge production; teacher encourages learners to take part in guided discovery; and finally introduces learners to environmentally focussed issues regarding sustainable development; teachers show sensitivity towards human rights and social justice, teachers develop social and communicative skills; teachers show consideration for indigenous ways of knowing; develops reasoning skills and problem solving skills; promotes an understanding of the link between society, technology, politics and the environment; promotes an understanding of how natural biophysical systems are utilised for human gain; covers content regarding the technologies societies use to necessarily 'exploit' these bio-physical systems and the environments they create in the process; engagement in debates around contentious issues related to sustainable development; assisted learners in taking on the attitude and values required for sustainable development. It appears that collectively teachers have a good starting block from which they may propel their understanding and practice forward. By teachers reflecting on their understanding of SD they were able to implement this into their practice where they saw possible. It seems that teachers rely heavily on their contextual surroundings and past experiences of SD in order to see a way forward for ESD.

The group Zone of Proximal Development (ZPD) represents the understanding of ESD that the group of three teachers have. At this point although it appears that collectively the teachers have a healthy understanding of ESD, it is important to realise that individually they only share some of these principles, not to mention that these principles are those that the

teachers may not necessarily be conscious of, which places a question mark over ‘understanding’ at this point.

Perhaps a more accurate representation of the teachers’ understanding exists when identifying the ESD principles that the teachers themselves identified in their own practice, as this represents their conscious understandings. The following ESD principles were collectively identified by the three teachers: relevant and meaningful learning; critical and creative thinking, scientific literacy skills, removal of misconceptions (not present in the existing conceptual framework); consideration of human wellbeing; active and responsible learning as well as involving learners in knowledge production; integration of subject content and skills, develops learners’ communication skills; teacher provides opportunities for guided discovery; teacher attempts to make the content covered culturally appropriate and locally relevant; content covered considered the biophysical systems, their limits and potentials; content covered the technologies (farming) societies use to necessarily ‘exploit’ biophysical systems and the environments they create in the process; and finally - although not stipulated as an official ESD principle - the teacher attempted to develop beneficial values regarding SD.

At this point it is accurate to say that the group ZPD has advanced, however interesting to note is how the group ZPD influences individual ZPDs further on. This may be observed more conclusively in Chapter 7. The group ZPD may be seen to play a crucial role in determining the ZPD for individual teachers, as the group understandings offer a resource and support for further individual development and innovation. This may only be accurately commented upon in the final chapter.

4.5. Conclusion

This chapter served to provide insight into the three teachers' understanding and practice of ESD. This analysis serves in part to answer the first research question: 'What are Grade 9 teachers' understanding and practice of ESD?' Owing to the fact that this data analysis provides insight into teachers understanding and practice at the first step in the cycle, it introduces the work of the next chapter. Chapter 5 analyses the three teachers' interactions and their attempts to develop their understanding and practice of ESD further. Thus it is crucial that each teacher's current (reconnaissance) understanding and practice be established to accurately identify what each brings to the collaborative intervention phase represented in chapter 5. The findings of chapter 4 findings also provide a point of reference when considering the post-intervention phase, or reflection step, in chapter 6.

Chapter 5

‘The Intervention Phase’

5.1. Introduction

This chapter serves to explore the data generated during the intervention phase. As outlined in chapter 3, the intervention phase is represented by the planning and action steps of the action research cycle. From here on the terms ‘planning step’ and ‘action step’ will be used for coherency purposes. Across the planning and action steps the teachers met three times. The first meeting involved teachers in the planning step of the action research cycle. The first meeting revealed to one another their understandings and practice of ESD and developed a group understanding, as well as plan for their further development. The next two meetings formed the ‘action’ step and involved the teachers meeting to share and develop their understandings further. Teachers reflected on the intervention phase of the action research cycle in their journals to a very small extent and to a large extent via the post-cycle group interview, the data of which will be presented in this chapter due to its relevance in answering the second and third research questions. Reflection took place throughout both ‘action step’ meetings as well. The following chapter is divided by subheadings that refer to the planning and action steps in the action research cycle. Throughout each step of the intervention phase the teachers reveal the methods of developing their understanding and practice of ESD and I draw the readers’ attention to these instances, as well as highlight how and if their understanding develops through their own intervention. In this way I address the second research question of this study: ‘How do Grade 9 teachers develop their understanding and practice of ESD?’ The group interview provides insight into why the three teachers chose to

develop themselves in the way(s) that they did, thus addressing the third and final research question.

5.2. Planning step of the intervention phase

5.2.1. The context of meeting one

This planning step began when I phoned all three teacher participants to organise when we could all possibly meet for the first time as a group. I managed to secure the 11th April 2009. I decided, in agreement with my participants to organise the meeting at the Durban Botanical Gardens. This would serve as a geographical central point for all three participants as well as a neutral meeting place. On the 11th April all three teachers and myself met at the Durban Botanical Gardens. The atmosphere was very informal, with tea, coffee and snacks provided. The aim of this meeting was three-fold. Firstly the meeting aimed to get everyone acquainted and to create a feeling of partnership between the three teachers, as they all derived from three different school contexts and were now coming together to work as a team, each contributing towards a common focus. Secondly the meeting aimed to offer an opportunity for the three teachers to share their understandings of ESD and thus move towards developing a group understanding of ESD at this point. Finally, the meeting aimed for teachers to start ‘planning’ around how they intended on developing their understanding and practice of ESD further. Although I had planned a three-fold purpose for this initial meeting, the avenue in which the meeting went was ultimately directed by the teachers themselves. During this step of the action research cycle, both myself and the teachers adopted a co-researcher role, however I tried as much as possible to sit in the background as teachers took charge of their

own development. I did this by only offering comment once I had been probed by one of the teachers at the time.

5.2.2. Teachers get acquainted

Due to the fact that the teachers did not know each other I started off the meeting by asking them to introduce themselves, by stating how long they had been teaching for, a description of the schools they worked at, the disciplines that they taught and their personal interests. I followed this introduction by introducing myself again to all three teachers. I felt that it was important to participate in order to make the atmosphere a comfortable one. To get the teachers into a more sharing and relaxed mode of communication, I further asked the teachers to each reflect on their experiences of the reconnaissance step of this action research cycle.

Kay specifically reflected on the benefit of watching yourself after the lesson. Kay felt that when watching the video she could identify where she could have improved upon her lesson and where she did not manage to incorporate that which she had hoped to. Kay even commented on her posture and body language as a significant point to note and address in the future. Kay further shared with the group what she had done in her lesson and the significance of it. Jay followed Kay's sharing by explaining briefly what her Natural Science lesson encompassed. Jay commented that by looking back at her lesson, she felt that she could pinpoint instances of SD and thus the reflecting on the video helped her to become more aware of how she does already incorporate ESD. René reflected on her experience of observing herself in the video, by commenting that now she could see what her learners were talking about when they complained that she spoke too fast. René also reported that she felt

quite nervous being observed, however the learners were enthusiastic which made her feel that the lesson went well.

It appears by the teachers' responses above, that the VSR interview during the reconnaissance step, provided the reflective opportunity that fed back into the teachers' professional development. Teachers used their self-reflections to identify points in their practice that they would like to improve upon. Finally as part of the group I shared my experience of collecting data from the three teachers during the reconnaissance step. By this point the three teachers and I felt comfortable enough to continue with the meeting in an open and sharing manner.

5.2.3. Developing a group understanding of ESD

The second request that I posed to the three teachers was to share with the group what they understood about ESD. Kay explained that she felt ESD "differs in certain contexts" and justified this statement by providing an example from Physical Education and Mathematics.

"...like um when I am teaching Phys-ed, um sustainable development would not then be just taking the soccer ball and giving it to your learners, and saying to them right now go and play soccer. Um, on the grounds at time we would speak about you know what guys it's not always about playing sport, its also about your lifestyle, it's also about your eating habits..."

Kay concluded this example by explaining that ESD was about giving learners something that they would take with them after they matriculate and use in their daily lives to develop further and function adequately in society. The second example referred to a Mathematics lesson that Kay had taught before. Kay had instructed learners to each make a cake and divide it amongst thirty learners in the class equally. The value of such a lesson was

explained by Kay to be the relevant teaching of fractions. Learners not only had to use cooking skills but they also had to find a way of judging thirty equal parts. According to Kay, ESD is something that is expressed differently depending through which discipline it is being conveyed. ESD is also an education that is relevant to learners and prepares them for function in the ‘world out there’. Kay felt that applying certain concepts to learners’ lives was a skill that all teachers aspired to but not all teachers necessarily saw this as SD (Kay is referring to ESD here).

Jay was second to share her understanding of ESD. One aspect she mentioned touched on an earlier point that Kay had shared, which was relevant learning. Jay felt that whatever was taught needed to be “*a part of their lifestyle*”. Jay found it challenging to verbalise her understanding as she saw ESD as that which referred to ‘sustainable living’, thus ESD involved an integration of many different aspects all around us. Jay felt that this understanding of ESD was something that she had always imparted in her lessons, it was only now that she was being made aware of it that she saw many more avenues for its integration.

René stated that she could only understand how ESD could be implemented into the Science disciplines. As far as René was concerned, ESD had firm foundations in the discipline of Science.

“It pertains to the scientific aspects of life where we talk about conserving our natural resources in terms of fossil fuels, energy sources and water and basically, um, especially unrenowable resources. It basically stems from the discipline of Science.”

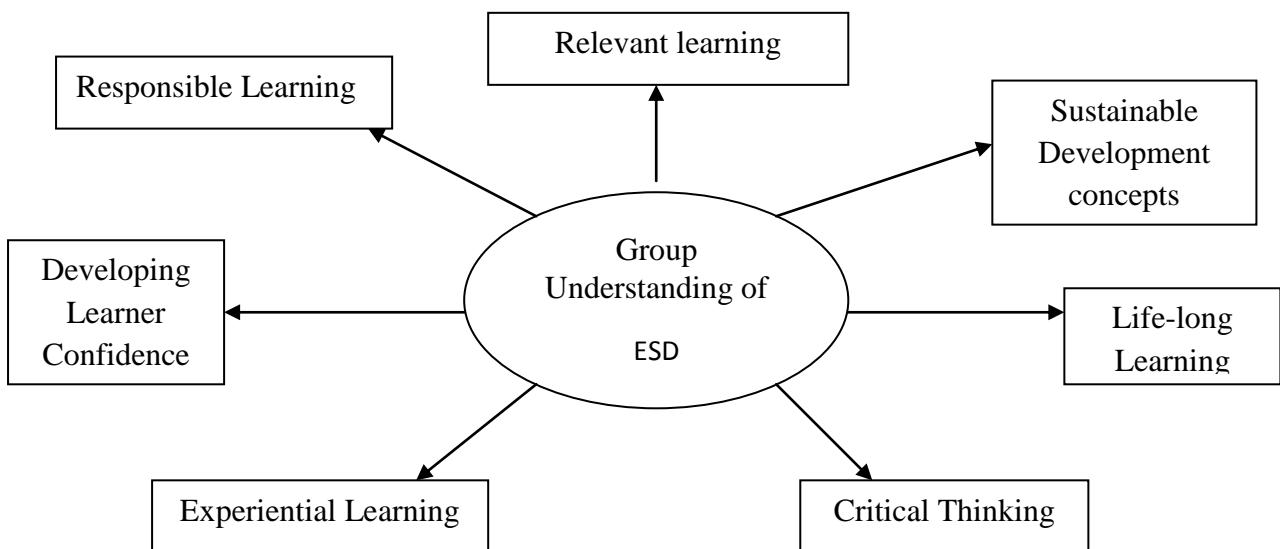
Jay and Kay both stated that René’s concept of ESD was topic-specific. By topic-specific they were referring to the idea of ESD being integrated into a specific type of discipline due

to its appropriateness. Jay and Kay felt instead that ESD could be integrated into any discipline as it was “basic life skills” and involved applying knowledge, skills and values to their lives to assist them into their future. Kay added that it was important to not just base learning on text books but rather to “*take it outside the content*”.

Whilst listening to the teachers’ discussion, I decided to draw up a diagrammatic representation of the main concepts that they collectively claimed represented their understanding of ESD. It appeared that the teachers understood ESD as encompassing: content on SD such as renewable and non-renewable resources; life-long learning; relevant learning; responsible learning; critical thinking, experiential learning; developing learner confidence.

Diagram 1 below was shown to the teachers. The teachers agreed with the diagrammatic representation and chose not to add to the diagram at this point.

Diagram 1. Diagrammatic Representation of the Group Understanding of ESD



The Diagram 1 above represented a combined perspective of ESD at this point. What is important to realise is that often during the reconnaissance step, the teachers emphasised only

two or three of the areas shown above. The aim of the intervention was to ensure that at least individual teachers would move from an individual ZPD to this group ZPD shown in Diagram 1 and in some cases, beyond.

5.2.4. Deciding on a plan to develop their understanding of ESD further

It became quite clear, due to consistent engagement in conversation, that the three teachers felt that their gathering together to talk about their understanding and practice of ESD was a very important resource in developing their understanding and practice further. This preference to talk and discuss became apparent in the action step meetings that followed. Each teacher felt that they had something to offer the group in terms of their past experiences, lessons taught, articles read and conversations shared. Jay commented that she found that when she was involved in implementing the different Independent Examinations Board (IEB) and Joint Matriculation Board (JMB) education systems, what assisted her was the interaction that she had with other people.

“I have had a broad base with the education systems and exam boards, but I find on my own you actually need to have interaction. When I can say you know my problems are not that bad, everybody else has the same problems, and I think it helps us as teachers.”

(Planning meeting, 11/04/2009)

Kay agreed with Jay that teacher collaboration is very beneficial as she had previously commented that often one tends to think that everyone else thinks like you do. Both Jay and Kay felt that by interacting with other people it assisted in providing a broader view of how

something may be understood. Kay expressed that “*you get this opinion that everyone just thinks the same as you.*” (Planning meeting, 11/04/2009)

As I listened to the comments being made, I decided to focus teachers on the aim of the meeting which was to have teachers plan a strategy for development regarding their understanding and practice of ESD. I did this by re-stating the question that I had previously asked in a different way.

“So now you three sitting here together, if you had never attended a workshop on ESD, have you? [all three teachers respond: ‘No’] How would you anticipate developing yourselves beyond this point? Because even now sitting here within the last twenty minutes, you’ve been developing your ideas, what would be a possibility for a way forward?”

(Planning meeting, 11/04/2009)

The way in which the three teachers interpreted the question was ‘What could you do to successfully implement ESD in schools?’ At this point I left the teachers to carry on addressing this focus as I felt that perhaps this was where they wanted to dwell for now, therefore I did not re-state my question. In leaving the teachers to explore their ideas, the three teachers began to reveal what they felt an ESD educators’ role would be in implementing ESD. This shed light on and developed a further understanding of the practice of ESD. The proceeding conversations outlined below began to outline what the three teachers saw as ESD implementation. At first this may not seem like teachers are planning, however I would argue that they were providing a blueprint of where they felt their attention needed to be in order to be seen as an ESD educator who is effectively implementing ESD.

(i) ESD – Teachers emphasise the changing of attitudes towards sustainability

According to Jay it was important that:

“you as a teacher, it’s not just what you talk it’s how you do it... And it’s made me realise that now the kids are actually looking and realising that what I say and what I do as well, and it’s made them more aware of it too.”

(Planning meeting, 11/04/2009)

René added that she felt that children do not do what you tell them to do but rather what you show them. René felt that by starting this influence of SD in pre-school and primary school, individuals would be more likely to exhibit the desired attributes later on in life. Jay commented on her experience of trying to make ‘going green’ a trendy catch phrase. Jay attempted to change the staff and learners’ mindsets towards sustainability practices such as recycling and re-using. Jay expressed that one of the factors that limited her in her actions, was lack of participation from authorities above her.

René agreed that it was learners’ actively involving themselves in actions that addressed issues of sustainability that would help change learners’ mindsets and values regarding SD. *“I really think that with good education we can go somewhere and its constant reinforcement of the knowledge and the practice that would instil in these kids the kind of values that we are looking for.”* (Planning meeting, 11/04/2009) René reflected on her attempt one year to explain to a Matriculant class the importance of Arbor Day and to get them involved in raising money to buy trees to be planted. René felt that this was her duty as these Matriculant students throughout their high schooling career may have never been exposed to this information. A further suggestion made by René, was that every learner in every school

should be exposed to the film called “An Inconvenient Truth” which reveals the effects of unsustainable development.

Jay spoke of her extra-curricular commitment to the ‘Enviro-Club’. The Enviro-Club is a club represented by learners who are set on engaging in activities that assist in the betterment of the environment and the educating of other individuals about the environment and how to conserve it. Jay expressed that before she had to chase learners in the Enviro-Club to perform their duties; however now as time has progressed, the learners are actually taking on their responsibilities and actually embracing these.

“So they just keep bringing things up and now teachers are getting interested. So I have got all these sources now, it’s not just me which is so nice because I have got all these hundreds of pairs of hands now.”

(Planning meeting, 11/04/2009)

Such an example conveyed the idea that with learner engagement in related actions that address environmental issues, learners soon become motivated and take on other activities, themselves.

Jay and René revealed the value that they placed on gearing learners’ and staffs’ mindsets towards SD. All three teachers agreed that by engaging learners in the action of addressing environmental issues, learners would eventually become more responsible towards the environment. The discussions that took place, predominantly between Jay and René, revealed an ESD concept that had not been mentioned or displayed in the reconnaissance step. This principle now became a conscious ESD principle for the three teachers: *‘Learners work with others to bring about more sustainable futures’*. This principle involves an active component of *‘action for the environment’*. The teachers also expressed the ability for

experiential learning to change learners' mindsets and thus actions. Jay elaborated on the value that experiential learning has on developing learners' attitudes, values, knowledge and skills.

“because we now have what they term ‘poor teaching time’ and this is totally against my grain, and I just, and poor teaching time means you got to stay in the classroom, you cannot go on excursions and I am thinking – No!... I find that the students benefit when we go on excursions...But I mean the weaker classes that’s where they just bloom.”

(Planning meeting, 11/04/2009)

Here Jay also placed value on the experience of discovery learning and this she identified as ESD. Through the teachers discussion regarding the role that teachers should play in implementing ESD, insight is provided into their understanding of how ESD could and should be implemented, as well as how through conversation they developed a more concrete and contextualised understanding of ESD.

Another aspect that all three teachers felt impacted heavily on the learners' ability to adopt the appropriate values, was the influence of technologies. René even commented that technology contributed towards the “degradation of society” to which Kay agreed. Jay added that technology had the ability to make learners less critical in their thinking and less able to connect with their environment around them.

“With that Earth Hour from half past eight to half past nine, and the kids were horrified with me: “Mrs ----- what are we going to do for an hour?” and I said “Look at the stars?”...You know? All they know is Mixit¹⁹, what can they do without

¹⁹Mixit – A cellular phone facility that allows cellular phone owners access to a chat room where they can type short messages to their contacts, much like an internet chat room.

all this technology...what it's done, its drawn them further away from the basics and understanding what sustainable living is.”

(Planning meeting, 11/04/2009)

The solution as far as these teachers were concerned, would be to make learners interact with their environment, engaging them in an appreciation for the necessity of a SD. The teachers thought that by developing an appreciation for the environment, learners will one day choose more sustainable ways of development within the work sectors.

(ii) Teachers plan a development strategy

After much discussion I asked the teachers the following question: “...*would you say that you understand ESD? Or do you think that there is still a place for you to move?*” (Planning meeting, 11/04/2009). Kay responded that she felt her understanding could be broadened, “... *there's always space for broadening, um like from getting your opinion [refers to the group] it actually broadens my understanding as well, so yeh I am hoping that it would be broader*” (Planning meeting, 11/04/2009). Jay reflected on the value of community learning in her response to Kay's comment. She stated that she felt that she had already learned so much by engaging with other teachers that had their own ideas on the concept of ESD.

“..you actually need to have people who think differently to you, to actually, because you always think oh well I think this way, and then you have this other opinion and you sit back and think oh hang on it actually fits in. Instead of that now and this is my idea and that's yours, it's now ours.”

(Planning meeting, 11/04/2009)

Kay emphasised further the value of coming together in a group to develop an understanding regarding topics such as ESD, as she expressed that “*with having different interactions with*

different people it challenges exactly what you are thinking.” (Planning meeting, 11/04/2009)

Teachers basically reflected that they felt that it was necessary to interact further in order to develop their understanding. However they showed difficulty in knowing how to plan a strategy that would assist in their further development. The following dialogue reveals this initial difficulty:

H – Could you three get together in this cycle to help each other develop further?

J – I am just trying to think about it in the broad base now.

K – It’s kind of broad now, how do we do it together?

J – Yes

R – What are we looking for?

H – Would you like to develop yourself further as a group?

K – Yes, definitely but how are we going to do that as a group, because as Jay says she can do it in Life Science, I can do it in LO, but to come together as a group... which would be nice and we would want to do that, How, that’s the question, how?

H – That’s my question too [all laugh]

R – Would you like us to share our ideas on how we implement it how we promote it, how we encourage?

H – That would be, I think that would be up to you.

(Planning meeting, 11/04/2009)

The first evidence of a planning strategy coming together surfaced when René suggested that sharing ideas could be a method for development. Jay added that getting three different viewpoints could be a great method for development, but also showed evidence of needing to “*think of a broad plan of what we could do.*” Initially Rene felt that all would be required was a little more conversation at this first meeting, however Kay convinced her otherwise. Kay felt that another meeting would be necessary after each teacher had done some reading up on the concept of ESD. This newly learned information could add to each teachers’, individual understanding of how to incorporate ESD.

“Okay would it mean like, okay I haven’t read anything on Sustainable Development thus far...what I would do is I would read and if we do meet the next time, um is it gonna be like...let’s say I take my new phase organiser for LO find new ways or more ways of incorporating sustainable development?”

(Planning meeting, 11/04/2009)

When Jay responded that she felt that this had already been done, René disagreed saying that she felt they could all go a little bit further and Kay reiterated her desire to read first then discuss. Jay thought on the other two teachers’ comments and agreed that more interaction within the team would be good for further development.

The meeting ended soon after the three teachers had agreed that they would like to do some reading and return for another meeting in the near future. The teachers did not at this point see any need for intervention from outside individuals and felt that they simply needed to read and return with their newly learned information to share with the other teachers. I left the teachers to exchange their cell phone numbers and arrange another date. The teachers opted for a picnic within the Durban Botanical Gardens setting for their next meeting which took place a month later.

5.2.5. Teachers' reflections regarding the planning step

To gain insight with respect to what the teachers thought about this planning meeting described above, I turned to the teachers' reflective journals. Two of the three teachers informed me at the end of my research study that they had in fact lost their reflective journals. As a result they had handed in very summarised versions of their key experiences, although the group interview offers more insight into the teachers' experiences holistically. Kay had reflected that it was the first meeting with the other two teachers and found that the most significant point of this meeting was that she and Jay shared a different understanding about SD to René. Jay confirmed this in her journal where she wrote that, "*Kay and I seem to be definitely on the same line.*" (Reflective journal, 13/04/2009) Jay showed a sense of confidence after having spoken with Kay who shared her views on relevant learning. Jay now was certain that "*as Kay said - to make what I teach part of the learners' life experiences*" (Reflective journal, 13/04/2009) was a crucial aspect of ESD because it was a value that was shared.

At this point Jay reflected that she felt that the act of reflecting was becoming an interesting activity, as she could now see how she was incorporating SD. Jay did however express her concern that she was not sure at all whether or not she was reflecting in the way that was required, but then commented that perhaps there was no specified way. Jay even stated that she was excited for my arrival because "*I could see the potential to develop myself, but I was also petrified – did I really want to analyse myself? Would I like myself afterwards and would I be willing to make changes if I had to?*" (Reflective journal, 13/04/2009) However further on in Jay's reflections she commented positively that "*God has put Hayley in my life to challenge me to fulfil my potential.*" (Reflective journal, 13/04/2009). Throughout Jay's

reflections she displays her passion for her learners' development. This passion and focus explains why although the teachers have been asked to reflect on their understanding and practice of ESD, they constantly refer to the learners as a point of reference and the point where innovation is implemented. René's journal had no entries regarding the planning step meeting.

5.3. Action step of the intervention phase

5.3.1. The context of the first action meeting

This first meeting took place within the action step of the action research cycle. The teachers understood that the purpose of this meeting was to look at developing their knowledge about and practice for ESD. However it became apparent that although teachers had agreed to meet to develop further, none had done any in-depth reading regarding ESD specifically. René however had collected a few articles that she felt related to issues of SD and thus contributed towards a developing understanding of ESD within the group. A possible reason as to why the teachers did not do extra research around ESD, was touched on by Jay who stated that "*I am trying to do research on this evolution, to get more information, it's just T-I-M-E, you know that's what we need, what a 72 hour day and to actually put everything together*" (Action meeting 1, 11/05/2009). Jay revealed that she did not have time to even do her own 'research' regarding interests of her own, like evolution.

All three teachers and myself placed ourselves on a laid out blanket on the grounds, helping ourselves to juice and biscuits. The atmosphere felt relaxed and by now the three teachers were conversing quite openly. In fact it may have been that they felt more comfortable with each other than what they felt with me. As supported below by Jay's statement, the teachers

at the beginning showed uncertainty as to where to begin and were concerned with what was expected. I sat back and allowed them to work through these fears together. There were three major themes that the teachers focused upon in this first meeting. The three themes were: sharing knowledge; methods of ensuring ESD implementation; and factors influencing ESD implementation.

5.3.1.1. Sharing Knowledge – A strategy for development

Jay opened up the discussion stating her fears: *“I am like my kids. I am thinking am I doing the right thing. I still have that fear, it’s so stupid. I always say ‘oh please man just go and do it’ Now I am feeling the exact same way”* (Action meeting 1, 11/05/2009). René identified Jay’s uncertainty and launched into a discussion about some newspaper articles that she had read. René at this point felt that there was a lot to be shared and learned from the media and that by increasing one’s knowledge on local sustainability issues, one’s ability to address ESD is also increased. René educated both Jay and Kay about the sewage being pumped into the lagoon and the impact of heightened e-coli count in the water as well as the effects that overfishing has had on local ecosystems. René stressed that the media always had something relevant and pertinent on SD and that this could be used as a teaching resource. René refers specifically to the Grade 9 subject content that she was currently teaching. The content covered fossil fuels and natural resources. René pulled out the eThekweni article that served to inform the public of solar heating systems and their benefits economically and ecologically. René felt that this would be a great article to incorporate at this point in the Grade 9 curriculum.

The three teachers then discussed recycling. Jay informed Kay and René about how paper recycling works. René then pulled out another newspaper article posted by eThekweni's energy office which shared ideas about what climate change is and how the public can help reduce the impacts of climate change. The point that René tried to make was that recycling assisted in the reduction of the effects of climate change. It was not clear whether she was advocating that this be an active project running in the schools or whether this was something that should be conveyed to learners. However recycling was an initiative that René and Jay were already involved in at their schools and one which Kay was very interested starting. René then drew Kay and Jay's attention to the final newspaper article posted by Transnet. This article informed the public of Transnet's attempt to reduce energy usage in the workplace. René commented that this was something that she would use with her Grade 9's. This article brought together a focus of the environment, economy and society.

Jay felt that although René was focussing on the content aspect of ESD, with regards to articles that highlighted issues of SD, ESD involved a little bit more than content within the Natural Sciences.

Kay agreed with this, although both did not choose to elaborate on what they meant specifically by "*goes across the board*". René responded that she agreed that there were many more ways of spreading an awareness of SD, by talking about pollution, recycling and climate change. René did not suggest in what ways this could be incorporated in one's teaching. One resource that Jay felt was worthy to talk about was that of 'Sharenet'. Jay informed Kay and René of the head office in Howick which sells resources that educate about the environment and issues of sustainability. Jay later in the meeting also informed René and Kay of her visit to WESSA in Umgeni Valley. Jay informed Kay and René about the solar heater that she saw there and how effective it was in heating. René added that solar heaters

offered a great benefit to the long term both financially as well as the fact that solar heaters were subsidised by the government according to government policy. This meeting was proving to be a sharing session, of ideas, experiences and resources. Jay also informed them of the project that she got her learners to engage in. This project looked at how an energy saving light bulb killed the water weed in the classroom fish tank. The learner investigated the effects of a normal light bulb on water weed, against an energy saving light bulb. This project encouraged critical thinking about the interconnection between technology, science and the environment.

The above illustrates how the three teachers jumped from one idea to the next. This journey was supported sometimes by what the teachers had read, experienced or heard about. Jay at this point proved to be a great resource of knowledge regarding environmental centres and organisations that both Kay and René could turn to for further resources on SD.

5.3.1.2. Methods to ensure ESD implementation

The three teachers also engaged in conversations that focused on possible methods that teachers should employ to ensure ESD implementation. The methods that the teachers spoke about included: action taking regarding SD issues and educating the school community about SD issues. Within the method of educating the school community about SD, the teachers focused on the task of gearing learners' and teachers' attitudes and sense of responsibility towards SD. Both action taking and educating the school community go hand in hand and it may be argued that these two methods really should be collapsed into one method of 'active learning'

In reference to ‘action taking’, the teachers referred to taking an active role in reducing waste and energy usage and in the process educating learners of the benefits of the methods used. René commented that it is necessary to change the mindsets of the learners, by involving them in real experiences, “... *we show our kids, we get a lot of stuff on our grounds, basically invaders... show them, you know instead of teaching them, take them out, show it to them, make them understand*” (Action meeting 1, 11/05/2009). Jay added that a way in which she encouraged active role taking was through the Enviro-club where she encouraged her learners to re-use and recycle materials. René spoke about her initiative to give lollipops to learners who brought cans to school. Jay commented that a good idea would be for her to go down to her local sports club and collect all the left over beer and soft drink cans, this would educate the local club as well. Jay and René felt that more needed to be actively done outside of the taught curriculum to raise awareness of SD issues.

Jay also introduced an idea of a reward system in the taught curriculum, as an avenue for action taking. Jay commented that one of her learners had done a project using recycled paper and she had chosen to give her an extra mark for doing so. René commented: “*That’s a good idea, give extra marks for ways you can reuse*” (Action meeting 1, 11/05/2009). Jay suggested that when learners get asked to make models that they are also requested to re-use materials to make their models.

In reference to ‘educating the school community’ Jay introduced Kay and René to her idea of an advertising pole. Outside Jay’s classroom is a concrete pillar which Jay used to place plastic bottles and other recyclable materials on to educate passing learners of the waste products that we produce and what can be done with these. For Jay a method of implementing ESD was by educating the school community on sustainability issues such as recycling. Jay continued to inform Kay and René about Collect-a-can and the fact that ‘Red

Bull' cans are not aluminium and therefore are not accepted by Collect-a-can. Jay told René and Kay of the 'research' she had been doing on the internet and how much she had found out about plastic which she promised to forward to both teachers. This formed part of resource and information sharing.

Jay spoke of the need to not only focus upon changing learners mindset, but to also look at changing or informing the mindsets of the teachers who are meant to implement such an innovation. A way in which Jay suggested that teachers be addressed was to:

“... grab a Friday afternoon and talk to the teachers. To make them aware of the fact that don't be frightened of it, it's actually already in your syllabus, you know because that's what it is, a lot of them say ooh no sustainable development, ooh no it's not part of our syllabus, but it is. It's there, it's in there just look through it.”

(Action meeting 1, 11/05/2009)

René agreed that it was important to make teachers aware of their responsibility as curriculum implementers to identify SD in the curriculum and bring that across to learners. Jay added that if teachers could change their own mindset first then they could influence the mindsets of their learners who will in turn influence their family at home. René added to this by stating:

“It all starts with the educator, you got to educate the educator and change the mindsets to allow them to appreciate, for example, artworks that use recycled materials.”

(Action meeting 1, 11/05/2009)

Jay commented that one way in which this mindset could be influenced was by creating an eco-image whereby recyclable materials are seen as trendy. Jay makes reference to a

technology fashion show that she remembered being held at her school. The learners were responsible for designing clothing that was made from recyclable materials.

Jay attempted to sum up what had been discussed in the meeting thus far.

“So I think there was a two-fold there, we ourselves actually look at the kids, the kids themselves are influenced, and then the parents, then we ourselves I think we do our bit, show other educators what we are doing, and just hope that eventually something is gonna click in.”

(Action meeting 1, 11/05/2009)

I approached the three teachers asking how they were choosing to develop their understanding of ESD. Jay responded that due to the fact that they felt they only had control over their immediate classrooms, the only way in which they could develop was from that point of focus. It appeared as if Jay did not interpret the ‘development of their ESD understanding and practice’ only in terms of the development of their knowledge, but also in terms of how they ‘developed and promoted ESD in their practice’ using the knowledge they already had. René responded that they were choosing to develop their understanding in a general way because it was difficult to use specific examples of how to implement ESD, when different teachers specialised in different subject fields. *“So I think it would be nice to look at it in terms of the framework of addressing this issue like we are addressing it now, across the board, to try and find the common ground in terms of all educators, not just Science educators”* (Action meeting 1, 11/05/2009). This showed evidence once again that the teachers had interpreted the activity of ‘development of their understanding and practice of ESD’ as ‘developing and promoting ESD in their practice’.

It appeared that the teachers were strongly focused upon a plan of action for ESD implementation, rather than focussing upon the development of their knowledge regarding ESD. Perhaps the teachers felt that their challenge was not in the ‘understanding’ of ESD but rather in the ‘practice’ of it. I summarised this idea in a comment addressed to the three teachers:

“I am just listening to you guys talking about developing your own understanding of ESD, I think you have got to a point where you feel comfortable with your understanding [all three teachers nod] and um now you are starting to talk about how you can rope in the school to actually take it on...”

(Action meeting 1, 11/05/2009)

5.3.1.3. Factors influencing ESD implementation

The teachers spoke about factors that they felt could contribute towards ESD implementation or could inhibit such implementation. These factors included: teacher motivation; dedicating time for ESD address; department support; and qualified teachers to implement ESD.

René commented that teachers often lack motivation to implement certain innovations, such as the environmental policy that was developed specifically for the school, but was not being implemented. Jay added that “*The syllabus and what you are told to do, you get slapped over the knuckles if you don’t do it*” (Action meeting 1, 11/05/2009).

René had thought of an idea to implement ESD further by banking five minutes of each lesson of one particular day in the week, an entire period could be made available for “environmental studies”. The limiting factors she identified with this idea was the lack of

permission from the Department or the principal and the lack of informed teachers who teach these periods. Jay offered a solution to the problem, which would be to “*get the kids to brainstorm what they have done the previous week, how would that be related to each of the subjects... Now what we have learnt, how can that relate to ESD?*” (Action meeting 1, 11/05/2009) So instead of the teachers doing all the work, learners would be encouraged to identify aspects of ESD within each of their subjects, this would encourage critical thinking.

Jay and René shed light on the driving force behind self-directed professional development. According to René one educator would need to be involved in educating the entire staff as she felt that without the staff’s assistance, the initiative of creating a period for environmental education would not be successful. In this way René suggested that the approach be a bottom-up approach, whereby teachers become the initiators and implementers of ESD. Jay acknowledged that there would be resistance amongst some staff however René commented that with perseverance these teachers could be won. “*Ja, but you persevere... Have it structured and make sure that whoever is in charge of it must have all the facts, and then move on from there...*”

Finally it was decided among the group that another meeting needed to transpire within the action step of this cycle. This decision was prompted by the teachers and supported by myself. At a particular point during this first meeting René commented: “*That’s the thing I wanted to say, we have spoken about our understanding of it [referring to ESD]. We are far from perfect so we also need to be educated, I think that is where you, where we need the direction from you*” (Action meeting 1, 11/05/2009). At this point in the meeting René requested that I come in as a resource for their development. I was not about to decline as I saw myself as a co-researcher in this step of the cycle. During the intervention phase I had shifted from facilitator to participant-observer as I acknowledged that I may very well be seen

as an external resource to the three teachers. It was also due to the fact that I knew that Kay and René did not have access to the internet that I decided to offer the teachers some resources. *“I wonder if you guys would like me to, it’s just a suggestion so tell me whether you would like it or not, to put together some reading materials...”* (Action meeting 1, 11/05/2009). It was agreed that the materials would be dropped off on Tuesday at each of the teachers’ schools, to be read and discussed in two weeks time. I chose a reading that was simple to understand and which stipulated the kinds and levels of reflection and their benefit in professional development. I chose this reading as it provided good insight into the importance of reflection and I wanted teachers to develop beyond this research study.

Jay offered her school as a meeting place, which both Kay and René agreed to as they were interested to see her laboratory that she always spoke of. As a final gesture I requested that the teachers feel free to bring along any resources to share, to the next meeting, or if they had these resources ready by Monday they could contact me and I would collect them and make copies for everyone to drop off on Tuesday. The former transpired.

5.3.2. The context of the second action meeting

All three teachers met in Jay’s laboratory at her school. Jay introduced both Kay and René to her lab, which they both found to be very busy and interesting. The meeting began when I requested that the three begin by talking to one another about the things that they brought to share as well as what they thought about what they had read. The three teachers highlighted what stood out in the minds with regards to what they read and further embarked upon a general discussion about ideas for ESD implementation. Once again teachers showed comfort in sharing their experiences as well as new information learnt.

5.3.2.1. Teachers thoughts about the ESD readings

The readings that were supplied to the three teachers and included materials extracted from McKeown's (2002) ESD Toolkit and the SADC's (2006) draft materials designed to support the UN Decade of ESD. Jay commented that the readings confirmed what it was that she was thinking of in terms of SD. In my observation of Jay's understanding and practice of ESD, there were many ESD principles that Jay already displayed before intervention, however there were many that were not. Jay felt that the explanation for SD provided in the readings reaffirmed her existing understanding of what SD entailed. Jay felt relieved that she could identify herself as being on the right track and was further comforted by the section in the readings that claimed that there is no one definition for SD but rather that it is context specific.

“I must say I did enjoy those readings that you gave us. I think beforehand I was still not quite sure about whether I was doing the right thing, there I could see oh yes that's right... so it gave me a bit more confidence. Because you are affecting kids and you don't wanna sort of do the wrong thing. To realise that it's not actually defined, it really isn't.”

(Action meeting 2, 17/05/2009)

Jay further reflected on the question that had been asked a while back, as to whether ESD should be incorporated into all learning areas or whether it should be incorporated as a separate subject. Jay felt that more so than ever it (ESD) needed to be incorporated into all learning areas due to the fact that she felt that all teachers needed to be aware of SD within their subject. *“If you keep it separate, they tend to sort of put it in a box and not put it there”*

(Action meeting 2, 17/05/2009)

Kay reflected on the ‘overall goal of the decade’:

“To integrate the principles, values, and practices of sustainable development into all aspects of education and learning. This education effort will encourage change in behaviour that will create a more sustainable future in terms of environmental integrity, economic viability, and a just society for present and future generations.”

(UNESCO, 2005)

Kay felt that this was a good goal however she wondered whether we were even close to achieving such a goal. Kay was of the opinion that if each school could focus on at least one aspect within this goal then we would surely be a little closer to attaining SD. Kay used their school environmental policy as an example. According to Kay the school environmental policy was ‘fantastic on paper’ however when it came time to implementing it, very little was done. Kay however did feel that if at least one aspect of the policy could be addressed then this would still make a difference.

The readings proved to be a point of motivation for Kay as she stated that she felt as though it was her responsibility to make a start on implementing ESD and making a difference in general. The article also managed to improve Kay’s level of excitement for ESD implementation.

“This article changed, it just made me a bit more excited than I am already, because if there’s anything to do with the environment or prevent harm to it I’m there, but it says you know what you can’t sit and do it on your backside, you got to get up and do it so it’s gonna be tough,”

(Action meeting 2, 17/05/2009)

Kay also commented on the question of how ESD should be incorporated into the curriculum. Kay suggested that due to the vast amount of ESD content that existed, it would perhaps be a good idea to not only integrate ESD in the learning areas, but also to consider incorporating a separate subject as well to supplement what is not covered in the learning areas.

At first René commented on the depth of information that she gathered regarding the history of ESD and the national and international laws that were passed. René was comforted that the readings shared that it is easier to identify ‘what SD is not’ rather than ‘what it is’.

“the fact that there is no concise definition, it extends to all realms of society, and um yes I think it’s made me more enthusiastic of the subject... it’s made me realise that I have a lot to learn, and it’s made me realise how truly important the consequences of a lack of Education for Sustainable Development can have.”

(Action meeting 2, 17/05/2009)

René did share that the readings made her feel that “*There’s a desire to do our fair share, to serve society... we should pull out all the stops and make sure that it becomes part of our curriculum*” (Action meeting 2, 17/05/2009). It was this further reading that led René to say that she finally felt that ESD should be taught as a separate subject. René in the reconnaissance step had stated that she felt that ESD should be addressed in a separate subject. After meeting with Kay and Jay for the first time she shifted saying that she could see how it should and could be integrated into other learning areas, yet limited this integration to certain Science related learning areas. Now in the second meeting after having read the readings provided, René felt that ESD certainly required a separate subject on its own, due to its intensive nature.

“Because it’s so, it’s so intensive, so intensive there’s so many different avenues that you can look at it from and so many different perspectives, like they were speaking of eradicating poverty... it talks about educating the female population...., which impacts directly on sustainable development...”

(Action meeting 2, 17/05/2009)

5.3.2.2. Teachers share examples of their own ESD practice

The three teachers sat and began to reflect on instances in which they could or already had implemented ESD. During this exploration the teachers expressed the limiting factors that they would surely encounter and also provided motivating support to their colleagues in contemplating the barriers. Jay felt that the major barrier that faced many learners was that they had lost touch with the environment due to their attachment to technology. Jay felt that in order to influence learners to consider sustainability, they needed to be exposed to the environment and feel connected with it and eventually responsible for its maintenance. Jay felt that with the rise in technology this becomes very difficult. “... *we can influence the kids, but then they have got to take it from there as well, and it’s to stimulate them, it’s to say you got to get excited about it as well.*” (Action meeting 2, 17/05/2009) Jay later on elaborated on an example of how she got learners to be involved and excited about environmental issues. Jay reflects on her “*whole bag of goodies, when we are doing reproduction...*” Jay felt that learners needed to realise the importance of remaining faithful to one partner in the light of the HIV/AIDS pandemic in South Africa today. Jay said that by bringing in HIV tester kits and by involving learners in relevant demonstrations, learners would begin to take these issues seriously. One demonstration Jay explained:

“It’s just basically acids-bases and it’s indicators, and what you do is you set up a whole lot of test tubes with water in them, and in one test tube you put bicarb... then you got to watch carefully which one [referring to learner] picks it... Then I give them [referring to all the learners] a straw and they just put the straw in theirs and take it out and put it into their friends and some of them say no-no-no they not going to do that. Then I come with my indicator and I say to them right, line up, you are at the clinic now, I was amazed, you know how stressed they got?”

(Action meeting 2, 17/05/2009)

René and Kay found this to be very relevant and interesting. René pulled out a Tetra Pak resource that she had obtained from Tetra Pak last year. The newsprint incorporated a variety of relevant information on the environment titled: ‘The Tetra Pak Green Squad Earth Champion Guide 2008: High Schools Guide’. In this guide was a ‘green anthem’ that Kay found very interesting and could see right away how this could be integrated into the curriculum. Kay, being a dancer and very interested in the arts, commented that “... *with this anthem you can get guys that are even interested in rapping and get them to rap it at assembly.*” (Action meeting 2, 17/05/2009)

The three teachers were becoming more specific about ESD implementation, by providing examples in which they had practiced ESD. Jay shared a very relevant example of SD in an indigenous community. Jay shared that she had attended a meeting that was related to the topic of SD and it was there where she learned of a community that faced the problem of requiring firewood. Instead of finding trees to chop down they collected paper and designed dense paper bricks that were eventually used as firewood. Jay felt that this was SD because “*they were actually solving a community problem*”. Jay provided another example, this one referring to the making of compost and worm farms. Both these techniques allow for

sustainable crop growth and therefore Jay felt should be deemed a sustainable source of food for communities. This story inspired René to share what she had watched on TV about the avocado industry and how they use the avocados for food. Those that are not suitable for wholesale are squeezed into avocado oils, and that which is deemed inedible is transferred to a compost heap. *“It would be ideal to take the kids on an excursion and show them how recycling has been utilised in industry.”* (Action meeting 2, 17/05/2009) Jay responded to René’s idea by handing her a contact list compiled by the ‘Richmond Marianhill Conservancy’. This conservancy works to address sustainability at an industry level and therefore Jay identified the relevance of providing René with a list of contacts who she felt may be able to assist René in her idea.

The three teachers’ discussion took a turn towards initiatives that they had previously mentioned in the first action step meeting and began to share their successes and limitations with regards to these. René recapped on the initiative of collecting cans and the rewarding of a free lesson to the class that collected the most cans. René reflected that the very next day only one learner out of forty odd learners actually brought a packet of cans. Kay and Jay assured René that this was good, although only one learner was reached, it was something. René posed a question to both Jay and Kay regarding what they thought of dedicating time to educating learners a few minutes each day or once a week on sustainability issues. Jay responded positively stating that what she had tried to do was get the Enviro-club representatives to spend five minutes speaking to their class during registration. The reason she did not adopt the idea of spending five minutes at the beginning of each lesson on teaching sustainability issues was because when she had approached her head of department, she said *“... she nearly had a cadenza on the spot”* (Action meeting 2, 17.05/2009). Jay shared that where she could not implement ESD in the taught curriculum she reached the

learners in different ways. She placed sustainability articles outside her door and found that many learners stopped to read what was new on the door or on her concrete pillar outside her classroom.

5.3.2.3. Teachers share their personal difficulties of implementing ESD

The three teachers all felt that what would be difficult to obtain is support from colleagues and management regarding their ideas of ESD implementation. Kay added that *“it’s very difficult I know in my school, you say whether it’s a club or anything, they say ‘oh no more work, more paper work. It’s so difficult to change mindsets.”* (Action meeting 2, 17.05/2009) Jay agreed that teachers would only be more optimistic once they entered a “paradigm shift” and that this initial mountain would be all that would stand in the way of future implementation. Kay offered a bit of encouragement regarding the lack of support as she stated that once people could see that you were stressed out they would offer their assistance and you could take it from there. However Kay stressed that *“But you have got to be the captain, you have got to steer the ship.”* Jay agreed with Kay’s thoughts and added that what she would then need to do is *“... pick up on the enthusiastic people and work with that, because if the subject head is unenthusiastic it gets dropped”* (Action meeting 2, 17.05/2009).

5.3.2.4. The teachers motivate for the post-intervention phase

One concern that I had about the fact that this was an action research study, was that not only did the teachers need to be involved in their own development, but they also needed to see the benefit in their engagement with the action research process. It was for this reason that I

inquired whether the three teachers saw it as beneficial to continue on to the reflection step of the action research cycle. Although I had planned for this step, I needed to determine whether teachers saw its benefit for their own personal professional development. Kay responded that she felt she had an understanding of SD prior to her engagement with this research study, but rather that the engagement with the pre-intervention and intervention phases (i.e. the reconnaissance, planning and action steps) made her more conscious of how they were already incorporating and could incorporate ESD. The point that Kay was trying to make was that she would not be preparing a special lesson for me to observe but rather she would teach a lesson that she would normally teach and this would naturally incorporate ESD. Jay supported Kay, stating that she felt that she had gained a lot but could not see why another lesson observation would be necessary. René offered a different point of view which eventually influenced Jay and Kay to want to engage in the final phase of the action research cycle.

René felt that because she was entering a section of relevant content with her Grade 9s that this would be a perfect opportunity to incorporate all that she had learnt. Bearing in mind that René still felt that it was crucial that the lesson be Science oriented in order for ESD to be addressed. René expressed her desire to teach her Grade 9 Natural Science lesson on ‘the World’s reliance on coal’: “... *so for me I am going to incorporate a lot of this stuff* [refers to what she has learnt during the planning and action steps of this cycle] *over and above what my normal load would be, so for me it would make a difference in that way*” (Action meeting 2, 17.05/2009). A strong motivating force, that influenced Kay and Jay that it may possibly be beneficial to engage in the final reflection step, was René’s referral to both *retrospection* and *moot point*.

“Secondly even though you [refers to Jay and Kay] might disagree I think if you had to analyse it, in retrospect I think you will see that it has made a difference in term of your teaching, even though you say that your understanding is solid. For me it would make a difference, and thirdly this entire scenario, us meeting for Hayley’s project, is going to be a moot point. I think that if we don’t do this last step, but for me I think if you are going to come and observe a maths lesson, I feel it will be absolutely fruitless. For me, a part of me still believes that it is Science,”

(Action meeting 2, 17.05/2009)

After this motivation, both Jay and Kay immediately informed me of exactly when I could come and observe them next.

5.4. Reflecting on the intervention phase

5.4.1. Teachers’ thoughts on their choice of intervention

The original idea of the group interview was to provide a final reflective opportunity for all three teachers. The teachers were asked to reflect on the meetings that occurred during the planning and action steps of the cycle on numerous occasions; however this was largely not carried out. The group interview therefore provided reflective data regarding this intervention phase (i.e. planning and action steps). These reflections below have not been placed in chapter 6, which represents the ‘reflection step’ because these particular reflections selected below do not serve to evaluate the effect of the intervention as do the reflections in 6.6. These reflections rather serve to add insight into the teachers’ thoughts during this intervention phase, to provide reason as to why the three teachers chose to develop themselves in the

way(s) they did. This data was generated due to three questions that I had posed to the teachers during the group interview, posed on the basis of my concern that the reflective journals would not appropriately display the teachers' in-depth reflections of their experiences of the intervention phase and their reasons for engaging in this phase in the way that they did. The group interview also served as a final post-cycle reflection, which is reported on later in chapter 6.

Three questions were posed to the teachers in an attempt to answer one of my major research questions: 'Why do Grade 9 teachers develop their understanding and practice of ESD in the way(s) they do?' The first of these three questions asked why the teachers had chosen to develop themselves in the way that they did. The second question related to the first and inquired about what resources the three teachers used for their development. The final question sought to know what it was that teachers would have changed to improve upon their process of development. This final question was asked to provide evidence as to any limiting factors that may have caused the three teachers to develop themselves in the way(s) that they did.

In response to the question as to why the teachers chose to develop themselves in the way(s) that they did, Jay responded outright that "*it just developed*", suggesting that the process of development was not a structurally planned one. This is corroborated by the fact that there was no evidence of structured planning during the planning step of the intervention phase of the action research cycle. Kay added deeper explanation to Jay's comment which Jay agreed strongly with.

"I think it just developed from the way we went. I think initially we weren't sure what and where we were going, it was just, we thought that if we could meet again we could contribute more, we could learn more, so we accordingly went with the

flow. We went through the process and the good thing is I know that each one of us, it wasn't just your project [referring to Hayley], we felt that it was something beneficial to us as well, so therefore we wanted to do it right till the end."

(Group interview, 10/07/2009)

René added that she felt that the main purpose in all of their minds was to reach a common understanding by bringing together the three interpretations, which she felt that they had more or less achieved. René also commented on the "*rich learning experience*" of going through the readings that were provided. René expressed her value of outsider intervention to a particular degree as she felt that she had existed in a closed frame of thinking until she read further on the varying interpretations of ESD.

"... you know where I thought I understood it, this is what it is, it couldn't be more than that, but there's so much more to learn from the participants [referring to Jay and Kay] as well as from the leaflet on the readings you gave us"

(Group interview, 10/07/2009)

From René's remark it may be worth considering whether external influence is pertinent when an innovation is so new to innovation implementers. This study attempted to provide teachers with the power to develop their own understandings and practice for ESD. However what was not considered was whether teachers felt comfortable with absolute control over their own development. René in numerous cases sought external assistance from me as the researcher, however none of the teachers showed evidence of seeking assistance from other external individuals.

The second question I posed to the three teachers requested them to list the resources that they used during the Intervention phase. Kay responded simply that "*one would be the data*

you gave us and us” (Group interview, 10/07/2009). Jay emphasised that “*us*” was the main resource that they used to move along in their development. René added that the media offered an excellent resource to extend their understanding of SD issues and how these articles could be incorporated in their teaching. *“It could be the media as well. ESD is quite prevalent now in today’s times, um there are many facets of life in industry and commerce that encompass this as a baby project...”* (Group interview, 10/07/2009) Although the teachers did not elaborate on how ‘Us’ was a resource, throughout the meetings it is clear that as teachers shared their stories and experiences they provided advice, support, motivation and insight into how ESD could be understood and implemented either in the taught curriculum or as extra-curricular projects.

The final question that was posed to the three teachers asked what they would have liked to have done that they didn’t do. René felt that she could have used the media more than she had. René stated that the media had articles regarding SD issues every day and felt that more could have been done to collect these resources. Jay offered a solution and comfort assuring René that there was absolutely no way that she could collect all the articles on her own. Jay shared a project that she did with her learners to get them involved.

“You must actually go and let other people share the work too, because I had a project with the kids in advertising, about collecting over a eight week period information from the newspapers, and I made a newspaper project and you could do it specifically for ESD, and then each kid can do it and they find out and you learn as well, and you got your resources because you got a class of 30 and you put every single one into your library. You can then alternate with your classes and let the project run throughout the year and get them enthusiastic.”

(Group interview, 10/07/2009)

Kay felt that the one thing that she would like to change was to feel as enthusiastic as she felt now, a lot earlier. Kay commented that when she gets back to school after the vacation period that she would contact René to assist her in the collect-a-can initiative because her learners were probing her for the collect-a-can bins so that they could start bringing cans to school. Kay felt that part of her development would be to implement these types of initiatives into her school. *“... taking this forward all that I’ve learned, it’s in here now [points to her head] and I want to put it forward and it’s between the three of us now... we need to now distribute this knowledge...”* (Group interview, 10/07/2009).

5.5. Conclusion

This chapter served to focus on the intervention phase of the action research cycle. The intervention phase which involved both the ‘planning’ and ‘action’ steps of the action research cycle provided insight into answering the second research question: ‘How do Grade 9 teachers develop their understanding and practice of ESD?’ The data shows a strong reliance on collaborative discussions regarding what teachers had read, experienced or heard. The teachers used each other as springboards to generate ideas about appropriate ESD implementation methods within their own specific contexts. The teachers showed the need for outside help as once they had reached the point of exhausting their own knowledge they began to look outside to add to their meaning construction. This chapter revealed the main concepts that teachers deemed important when attempting to understand and implement ESD. The chapter also reveals why the three teachers chose to develop their understanding and practice of ESD in the way(s) that they did, thus addressing the third research question. This

was done by importing data from the post-cycle group interview into this chapter, focussing specifically on the teachers' given explanations for their choice of intervention design. chapter 6 which follows serves to identify the three teachers' understanding and practice of ESD after the intervention. Chapter 5 offers insight into the journey that the three teachers have travelled to finally get to the point of ESD understanding and practice reported in chapter 6's findings.

Chapter 6

‘The post-intervention phase’

6.1. Introduction

The purpose of this chapter is to explore the data generated during the post-intervention phase. To recall from chapter 3, the post-intervention phase is represented by the reflection step of the action research cycle. From here on the term ‘reflection step’ will be used for coherency purposes. The purpose of this reflection step of this action research cycle was to explore how the three teachers understood and practised ESD after engaging in their self-directed professional development during the planning and action steps of the action research cycle (the intervention phase). The intervention phase is seen as engaging the teachers in self-directed professional development because teachers were constantly placed in the roles of co-researcher, planner, designer and implementer. The teachers were given freedom to develop themselves in the manner in which they chose. Their nature of their choice however, questions the role of self-directed professional development and will be further discussed in chapter 7.

The analysis of the data focuses on addressing the first research question which inquires: ‘What are Grade 9 teachers’ understanding and practice of ESD?’ This research question considers both the understanding and practice of the three teachers revealed during the pre and post-intervention phases and is fully addressed in Chapter 7. The reconnaissance step produced data that informed the study about the teachers’ initial understanding and practice

of ESD before intervention took place. This reflection step produces data that informs the study about the teachers' final understanding and practice of ESD after intervention. The data analysis will be broken up into five major sections. The first three sections refer to the three participants' understanding and practice of ESD, the fourth section involves a cross-analysis of the three participants in reference to the major question posed, and the final section discusses data from the post-cycle group interview. Each of the first three sections will be further analysed according to the teachers' verbally expressed and practically manifested understandings of ESD and the role that reflective practice played in revealing their understanding and practice. The fifth section which involves the post-cycle group interview serves to address the third research question: 'Why do Grade 9 teachers develop their understanding and practice of ESD in the way(s) they do?' Each section will be analysed using conceptual and theoretical frameworks as developed in Chapter 2.

6.2. Understanding and practice of ESD

The data collection sessions of this reflection step (pre-lesson interview, lesson plan document analysis, lesson observation, post-lesson VSR interview) are identical to that of the reconnaissance step in chapter 4; the only addition is the final group interview. At first when Jay was asked whether she felt it necessary to continue with the reflection step, she stated that she felt it would produce no new data and would not add in any way. However after some convincing from René, Jay reconsidered and reflected that perhaps it would be beneficial to her and to the research at large. The reflection step continued once I was sure everyone was keen to continue.

This chapter aims to reveal new or changed understandings and practices as well as persistent understandings and practices that are carried through from step one through to this final reflection step of the action research process. In the following sections I will discuss the findings in terms of Jay, Kay and René respectively.

6.2.1. Jay's understanding and practice of ESD

The data that is presented for Jay is divided into four parts for conceptual flow. Firstly Jay's verbalised understandings of ESD are revealed via an analysis of the pre-lesson interview. Secondly Jay's practice, which is not divorced from understanding but rather manifests understanding, is revealed by analysing Jay's lesson planning documents, actual lesson, and the post-lesson VSR interview. The third part to the analysis involves bringing together both Jay's verbalised understanding and practice to get a holistic picture of Jay's understanding and practice of ESD. Finally I look at the main theoretical framework of this research study to determine what role reflective practice played in Jay's understanding and practice of ESD. This format is followed in both Kay and René's cases and will not be restated.

6.2.1.1. Jay's understanding of ESD

When directly asked what she understood by the term 'sustainable development' Jay tended to refer to it in terms of education. Jay understood SD to be the imparting of relevant information to the learners. Relevant information was classified as that information that learners could relate to and use now or in their immediate future. Jay also related SD to her Natural Sciences subject, stating that sustainable development would be "*...to do the scientific method and make it relevant.*" (Pre-lesson Interview, 3/06/2009)

Jay informed me that she always thought that whatever learners were engaged with had to be relevant and related to the environment. This is Jay's method of teaching which she feels ties in with the concept of SD. This understanding of SD persisted from the reconnaissance step and was not seen by Jay to be some understanding that she had recently come to through the intervention phase. However Jay does comment that she feels she understands this initial understanding more intensely:

“I think from the full understanding that I have now it had to be from the reading and the research that we were given. Also all of a sudden I have had so many meetings that I have just recently gone to and sustainable development has been part of it, so it has been a lot more spoken about...”

(Pre-lesson interview, 3/06/2009)

In an attempt to gain deeper insight into Jay's understanding of SD, I asked her if she incorporated SD into the subjects that she taught and if so if she could provide examples. Jay confirmed that she did incorporate SD into her teaching and revealed the ways in which she understood that she was doing so. Jay commented that she has always incorporated SD. However she was now more aware of this. Jay shared her experience of using the Mexican sunflower (an alien invader plant species) to explore 'flowers' with the Grade 12's and 'biodiversity' with her Grade 8's. In both cases Jay educated the learners about the invasive nature of the Mexican sunflower as well as using it in teaching concepts that were in the Grade 12 and Grade 8 curriculum.

When Jay was asked about her understanding of ESD, Jay felt that her understanding had not changed much, although she acknowledged that she had learned more about how others may define it. Jay uses her understanding of SD to assist her definition of ESD:

“Making people aware of the environment, how they interact with the environment, of course especially now, since they are so technologically advanced we are no longer in contact with the environment, so it doesn’t mean much to us. It’s to get them back in contact, so whatever we are doing it’s to relate to exactly what they are doing.”

(Pre-lesson interview, 3/06/2009)

Here Jay makes specific reference to the environment and how it is connected to the learners’ consciousness and actions. Jay shows a strong desire to get learners to reconnect to their environment and become more aware of where things originate as opposed to only ever seeing the final processed product. According to Jay, by taking time to realise where things come from and how this impacts us, learners will realise the value and impact of certain processes. Jay was asked whether she thought it necessary to incorporate ESD into the curriculum. Jay revealed that in one of the readings provided it stated that learners each hold skills that they need to use and apply their knowledge and she felt that this was one of the reasons why she was so passionate about the Science Exposition because it taught learners how to think and how to analyse information.

Jay felt that when it comes to implementing ESD, Life Sciences and Natural Sciences were the easiest in which to incorporate ESD, owing to the curriculum’s holding so many areas whereby SD and issues related to SD were discussed and learnt. Later on however Jay adds that she feels that ESD can be incorporated into any subject as long as the teachers encourage critical thinking about relevant issues. *“So to examine things critically, and not, and be critical with everything, bring about principles of critical thinking [Jay points to a list of critical thinking principles on her wall]”* (Pre-lesson interview, 3/06/2009).

6.2.1.2. *Jay's practice of ESD*

This section of the chapter reveals Jay's practice of ESD. Understanding is not divorced from her practicum rather it is her practice that further reveals her understanding. To recall, in order for me to understand Jay's practice of ESD, I draw on data from the planning documents regarding the lesson, the actual observation of the lesson and finally the teachers reflecting on the lesson via the post-lesson VSR interview, and I attempt to identify the existence of ESD principles. Jay's lesson displays various ESD principles in her teaching, however, to draw on an example of each principle would require an excessively long analysis. For this reason three groups of principles and their corresponding examples have been highlighted in this chapter as they were in chapter 4. To recall from chapter 4, these three groups included: the ESD teacher activities; the ESD learner activities; and ESD content relating to the societal, economic, political and biophysical aspects of the environment. However, unlike in chapter 4, Jay did not display any examples of ESD principles pertaining to the third aspect of ESD: 'ESD content relating to the societal, economic, political and biophysical aspects of the environment'. Thus, unlike with Kay and René, Jay's data is organised into two groups of ESD principles, not all three.

The reflective journals were intended to provide a data source that provided insight into the lesson planning. Owing to the fact that Jay did not keep a frequent record of her thoughts, emotions and experiences, data regarding the planning stage was sourced from both the pre-lesson and post-lesson VSR interviews, and an SMS²⁰ sent by Jay.

The first sign of planning that Jay revealed existed in an SMS that she sent to me on my cellular phone. It read:

²⁰SMS – An acronym used colloquially when sending short text messages via cellular phone

“This Thursday be there about 13:40. I will be going over a test they did last week and I try to get them to see why they wrote the answers they did. It’s not just about putting the correct answer down. My idea of sustainable development – understand why you put the answer down and then you won’t make the same mistake in other tests.”

This SMS revealed Jay’s attempt to justify why she had chosen me to observe the particular lesson. This was not the only data on Jay’s engagement in the planning of her lesson. During the post-lesson VSR interview, Jay mentioned the importance of getting learners to reflect back on why they put certain responses down, as well as the relevance of certain test questions for their daily lives.

“I actually, when I thought of that I thought that’s actually a good idea, because when I am going back over it, what I have done when I set the test, a lot of it is actually directly related, like that breakfast thing... I think when I hand back a test as well, I think that’s also one of the most important lessons, because they trying to go through it and see where they misunderstood,..”

(VSR interview, 3/06/2009)

Jay revealed that her main focus for the lesson was the development of study skills and reasoning skills. *“I am trying to get them to look at something where they can work it out that’s why I was trying to get them to follow it through.”* (VSR interview, 3/06/2009) Jay had revealed before that she did not practise detailed lesson plans, rather she would hold a general idea in her head and work forward from there. It becomes apparent that the most used type of reflection involved reflection-in-action during her lessons and reflection-on-action during the

post-lesson VSR interview and reflective journal entries, but very little reflection-for-action (lesson planning).

I then observed the lesson and attempted to identify principles of ESD that I could see in Jay's lesson. Jay's Grade 9 class had been involved in writing assessments for their term mark. Owing to the timing Jay had decided that the lesson she would present to me would involve her returning the test to the Grade 9 Natural Science learners and going over their responses. The ESD principles identified in Jay's practice and the examples that support these have been organised below according to the three aspects of ESD.

(i) ESD teacher activities

Jay encouraged her learners to be critical of how they had been marked, and how they had attempted to answer questions, as well as the value of the information they received. With regards to the value of the information they received, she reminded her learners to be critical of everything that they read and to not merely accept it. *“Girls I must tell you if you look at some text books, some of them still get histograms and bar graphs confused. If you see it then you can write to them and tell them excuse me sir but you have a histogram and it should be a bar graph”* (Lesson observation, 3/06/2009).

Jay confirmed my identified focus on ‘*engaging learners in critical thinking*’ in the VSR interview. At the point where learners were guided to go over their test and make a circle around the question that they felt was marked incorrectly, Jay stopped the tape.

“I think you go through it to make them realise that they can query something... I think that's also important for them to realise that teachers are not perfect in that way. Then when they come you can say ‘Well done you added that up right, I am so

glad you got that mark and some of them are honest and say Mrs ----- I don't think I got that mark... ”

(VSR interview, 3/06/2009)

By learners' realising that errors do occur, they may become more critical about what they are given, questioning the validity of it more readily.

(ii) ESD learner activities

During the lesson, I observed that Jay's main focus was to ensure that '*learners develop reasoning and study skills*'. "*Right, let's go through this now, have a look, now girls remember it is not just saying oh it was B and I put A, you have got to work out why you did that* ” (Lesson observation, 3/06/2009). She addressed one of the multiple choice questions regarding scurvy and explained to learners that in order for them to answer the question correctly they needed to know two things. Jay dissected the question for the learners, ultimately showing them both how they need to analyse questions and how they need to learn their facts.

Learning with understanding as opposed to rote learning was encouraged by Jay as a more efficient study technique. She pushed for learning with understanding as she reflected on the diagram that was given in the test.

“**J** – Okay now, this one girls. When you learn do not just learn off-by-heart.... [she places an OHT of the image under Question 2 – the digestive system of the human up on the overhead projector]. Right was this the picture that was in your book?

L – No.

J – So first of all it was a slightly different picture, so if you learned it in sequence too bad...”

(Lesson observation, 3/06/2009)

Jay showed the importance of learning in a more sustainable manner, to ensure understanding so that a question could be analysed in a more informed way, not merely by rote-learned content. Another sustainable way of learning was displayed as she looked at how understanding root words in Science could assist the interpretation of information. The specific example involved the term ‘epiglottis’. Jay broke the word into ‘epi’ and ‘glottis’ and asked learners to give the meaning. Jay used these definitions to locate where on the diagram the epiglottis could be found. In this manner she developed reasoning and study skills, showing learners that if they invested time in digesting the information they could interpret the information correctly bringing about the correct responses.

Jay confirmed my suspicion regarding her dominant focus for the lesson. The dominant focus that Jay mentioned in the VSR interview was that of the ‘*development of study and reasoning skills*’. For Jay the main reason for choosing this lesson was to look at how learners could develop their understanding of how to answer questions correctly in the future, and as a direct result Jay felt that she would need to show them how to think logically about the content and questions. This would equip learners in the future to think about how they might analyse situations logically.

Jay commented that she felt that by learners going through their tests and understanding where they had gone wrong it encouraged reflection and conscientiousness about their “logic”. “*Now there I think I am trying to get them to think it through, so again that’s what I think is part of Sustainable Development*” (VSR interview, 3/06/2009).

Jay explained that by showing learners how to think logically, i.e. teaching effective study skills, learners may tackle questions more effectively during the examinations. Apart from the ESD principles displayed above, Jay also referred to examples of relevant and meaningful learning; concern for human well being; encouraging learners own knowledge production; teacher commitment to open mindedness; and encouraging questioning

6.2.1.3. Jay's understanding and practice of ESD

During the pre-lesson interview Jay verbalised her understanding of ESD. Jay saw ESD as involving learners in instances of relevant and meaningful learning. Jay commented that since she read the reading pack that I had given her during the intervention phase, she further understood ESD as a process of bringing the learner into closer contact with his/her environment and of relating what they are doing in the subject to the environment around them. According to Jay Life Sciences, Natural Sciences and Geography lends itself easily to ESD implementation. Jay however qualified this by stating that ESD can be incorporated into any subject so long as the teacher encourages critical thinking around relevant issues. Jay understands that ESD should incorporate teaching and learning methods that consider the learner and their context.

When observing Jay's lesson I observed the following ESD principles being revealed in her practice: study and reasoning skills; teacher commitment to learner wellbeing; deductive reasoning and critical thinking; relevant and meaningful learning; development of scientific literacy skills (a principle suggested by the teacher to be included); using questioning techniques; developing attitudes related to ESD; teacher commitment to open mindedness; teacher recognises learners' human rights and encourages a participatory democracy; teacher

acknowledges learner prior knowledge in making learning relevant and meaningful; and finally learners engage in knowledge production. These principles identified by myself and supported by the literature (UNDESD, 2002) reveal Jay's learner-centred method and her view that ESD should consider the learner's context and experiences when attempting to develop learners further.

In Jay's analysis of her own lesson she identified the following principles as ESD principles present in her practice: developing study and reasoning skills; encourage critical thinking and questioning; incorporate instances of relevant and meaningful learning; develop basic literacy; develop scientific process skills; development of personal and communication skills; teachers concern for learner well-being; encourage learners to take responsibility for their own learning; develop logical thinking skills; encourage application of knowledge; consider learners; prior knowledge. Jay seems conscious of the ESD principles that she has incorporated, however she has also suggested some very relevant principles that have not been outlined within the ESD conceptual framework as ESD principles, such as scientific literacy and basic literacy skills.

Considering these three sources of data, it appears clearly that Jay majors on making learning meaningful to learners and engaging learners in dialogue that connects them to the world around them. Jay valued learner input and considered their knowledge in her attempt to get learners to develop their knowledge further. In many instances Jay used questioning techniques to probe learners into a critical thinking frame of mind. Jay once again did not emphasise SD content and issues related to it, rather she focused on the development of skills that would assist learners to function in the future as considerate thinking citizens.

6.2.1.4. *The role of reflection in establishing Jay's understanding and practice of ESD.*

During this reflection step, Jay engaged in reflection during the pre-lesson and post-lesson interview and outside of these activities in her reflective journal. In some instances in the post-lesson VSR interview, Jay also showed evidence of reflection-in action. The reflections present in Jay's reflective journal generally displayed examples of professional development regarding ESD, holistically.

After Jay's second lesson, she wrote in her reflective journal about how she would reconsider her mental model of what an ESD educator is or should be. Jay felt that instead of only having arrows directing from the sources of information to herself, the arrows should also flow from herself to the sources of information. Jay added that the arrows directing from the sources to her would represent the first stage and could involve her actively going out to access this information. The second stage would represent her going out and sharing that internalised information. Jay engaged in reflection-on-action (Schön, 1983) to design a model that displayed a plausible model for functioning as an ESD educator.

In two instances in Jay's journal she refers to two projects that she ran at two different schools which she felt displayed some characteristics of ESD. The first she reflected on was 'Project Baby' which involved learners in simulating the condition of being a mother to a child of their own. According to Jay the purpose of such a project is to expose learners to challenges and difficulties that face young mothers, thus discouraging learners from engaging in unsafe sex. *"After returning to school/teaching, after having my children, I realised how unprepared I was, to how my 'working' and 'personal' life would be affected, so I started with project baby."* (Reflective journal, 7/06/2009) Jay felt that crucial to this project was the support she received from the staff and management of the school.

The second project that Jay reflected on was her ‘newspaper project’ where she encouraged learners to collect Biology related articles from a variety of newspapers for up to eight weeks. Jay expressed that the project was relevant to herself and her learners as they learnt a lot of new information. Learners were involved in sorting the articles either according to themes or dates. This activity motivated learners to find out what was going on in the world, analyse the articles in order to sort them and to keep an open critical eye regarding the media. Jay commented that in a previous school in which she worked, there was little support and freedom for projects such as these. Jay felt that if staff and management do not provide encouragement or support with regards to initiatives outside and even within the curriculum, it can make initiative implementation a very difficult task. However with regards to the school that Jay was teaching at, she felt that management gave her considerable freedom and allowed her to develop in different ways.

Jay used her reflective journal in many instances to reflect on her style of teaching and pedagogy.

“I think my aim, overall, in teaching, is to get the learners I teach, to have the learners appreciate the wonders of the world around us... The further they get away from ‘nature’ the less they will be able to ‘empathise’ with the consequence of their actions and so be prepared to do something about it.”

(Reflective journal, 07/06/2009)

Jay commented that she loved practical work and excursions as she motivated strongly for the benefits of experiential learning. Learning, according to Jay, is not about the best resources that technology can buy, rather it is about how to make learning more relevant and

meaningful. Jay's view is supported by two of the principles outlined by the UNDESD (2002) in chapter 2.

During the pre-lesson interview, Jay revealed that her understanding of SD had always existed, however it was due to the questioning regarding the topic that developed her conscious understanding of the term. Jay commented that she was a lot more reflective about SD and ESD since the beginning of the research and felt at an advantage above others trying to grasp an understanding, "*I feel at an advantage because I have been thinking about it now...*" (Pre-lesson interview, 03/06/2009) It seems that the prolonged exposure during the intervention phase encouraged Jay to reflect more on ESD, giving her time to conceptualise it in her practice. Jay also revealed that she felt enthusiastic about her professional practice as learners responded positively to her initiatives by bringing their personal experiences to the classroom, which she recognised as 'sustainable development' (Jay was actually referring to ESD). Jay reflected that a lot depended upon the teacher and the way that they taught, as to whether they implemented ESD or not. This shows that Jay understands that principles of teaching and pedagogy need to meet the ESD principles in order to successfully implement it.

Jay commented that she felt it was her responsibility to develop herself further both inside and outside the classroom. Jay's thinking echoes Runyan's (1991) idea of an empowered teacher being someone who is actively involved in their own professional development. Although Jay did not keep a regular account of her experiences in her reflective journal, she felt that she was reflecting all the time. This constant reflection developed her professional ethic and development as described by Vonk (1991) and contributed towards her excitement around the theme of ESD implementation in her practice. In the instances shared above, Jay showed evidence of reflecting in action (Schön, 1983) when she decided to raise certain issues regarding the test and answer certain questions in her lesson while teaching. Jay not only

constantly reflected on (Schön, *ibid*) the lesson that transpired and where she had incorporated ESD, she also reflected for action (Farrell, 1993), in an instance for example where she explained why she had chosen the lesson to be observed and what benefit it would serve.

6.2.2. Kay's understanding and practice of ESD.

The following analysis of the reflection step for Kay reveals a lesson similar to the first, however Kay shows evidence of having considered ESD more closely with regards to the type of assignment given to learners to present during the lesson.

6.2.2.1. Kay's understanding of ESD

The following analysis of the pre-lesson interview reveals Kay's verbalised understanding of ESD. In response to the first interview question: "What do you understand by the term sustainable development now?" Kay admitted that her understanding was now broader than what it was previously. Kay elaborated on this by reflecting on an assignment that she had recently designed with her colleagues. Kay felt that ESD involved incorporating the skills of other disciplines into a common project that had an environmental focus such as recycling. Kay summarised that her understanding of the two words 'sustainable development' meant "*sustaining whatever resources we have... over a long period of time. By doing these projects, and by education we can sustain that*" (Pre-lesson interview, 17/06/2009). Kay naturally extended her understanding of SD to education at this point.

Kay felt that she had initially had her own correct understanding of SD, however when asked when she developed the understanding that she had recently revealed, Kay strongly

acknowledged the influence that the involvement with the steps of the cycle had on her developing understanding. Kay revealed this as she said: *“Although I knew what sustainable development was, I think this entire process [referring to action research] with you has made me a bit more critical about how does sustainable development incorporate into [education] and it has made me more aware ”* (Pre-lesson interview, 17/06/2009). She added that with regards to her practice, she would never have thought to design an assignment based upon the theme of SD, but that it was due to the engagement in the process of the steps of the cycle that she considered it. Kay added that her engagement with the other teachers offered her new ideas of how to incorporate SD/ESD. Generally she felt that *“the group discussions was very very beneficial to me...”* (Pre-lesson interview, 17/06/2009).

When Kay was asked whether she incorporated SD in her teaching she replied that this was what she was going to do in her lesson as she attempted to link graphs and statistics (which was their next section) with a sustainability issue such as ‘recycling’. *“... at the moment this assignment linked very directly to sustainable development, and I think that the assignment that we did think up is the basis for greater things in sustainable development”* (Pre-lesson interview, 17/06/2009). Kay added that she felt that her learners now had a greater understanding of what SD means, indicating that she is focusing a lot more on this concept within her teaching due to action research. She suggested further ways of incorporating SD into the curriculum as she suggests that language teachers could design comprehensions based on articles that focus on environmental issues. Another way could be by focusing on environmental issues for five minutes of each of your lessons. Kay’s responses revealed that she placed a lot of importance on the incorporation of SD into the curriculum.

Although the second interview question regarding teachers’ understanding of ESD is different from the first interview question which inquired about their understanding of SD, often the

teachers saw them as the self same concept. Kay naturally attached education to the concept of SD and as a result responded similarly to the questions regarding her understanding and practice of ESD.

When Kay was asked about her understanding of the term ‘Education for Sustainable Development’, she proceeded to compare her understanding of the two terms: ‘Education for Sustainable Development’ and ‘Sustainable Development Education’. This comparison was mentioned in the readings that the three teachers were given during the intervention phase of this action research cycle. Kay commented that Sustainable Development Education implied a separate subject that taught around the issues of sustainability. However Kay favoured the idea of ESD as she felt that it involved all discipline teachers attempting to incorporate issues of sustainability into their taught curricula. With this Kay felt that more support needed to be given regarding how teachers could manipulate the existing curriculum to incorporate these issues, further suggesting ‘programme and phase organisers’ be developed for this purpose (see chapter 7 for further comment).

Kay was reminded of her previous understanding of ESD, which involved preparing learners for careers and sustaining their health. She responded that her understanding had become a lot more defined in the sense that she saw that teaching Mathematics was no longer about teaching numbers but rather about preparing the learners to be functioning citizens in society. Kay felt that this may be achieved when sustainable principles are incorporated into a Mathematics lesson:

“She [referring to a learner] is not probably gonna be an expert in Mathematics, but the principles she learnt in that Maths class about her surroundings, is gonna come out. So I think in actual fact is sustainable development. The emotions and the

characteristics, or the values and ethics you were taught in Maths will actually come out more...”

(Pre-lesson interview, 17/06/2009)

Kay placed a lot of emphasis on developing learner attitudes towards SD, as she felt secondary was the content that was taught at school. Of primary concern to Kay were the skills, attitudes and values that would sustain learners in society. An interesting new slant to Kay's understanding of ESD was revealed when she was asked which learning area she would choose to incorporate ESD into. She acknowledged that although previously she had motivated for cross-curricula incorporation of ESD, she felt that it was far easier to incorporate ESD into Science. This revealed Kay's content focus on the principles of ESD, as opposed to the teaching and learning principles within ESD, as she visualised ESD in terms of Science and its content topics that may relate to ESD. Kay placed content regarding issues of SD above skills, attitudes and values which could be developed in any learning area. This new conceptualisation developed after Kay's interaction with René, who often focused on SD issues and addressed them in her teaching. These two seemingly contradicting responses made by Kay reveals that although she is aware that ESD incorporates principles of teaching and learning such as critical and creative thinking, numeracy, problem solving etc., she is also aware that it incorporates issues of sustainability such as resource use and biome destruction. What was evident in Kay's response was that when asked whether she incorporates ESD her thoughts firstly went to what issues of sustainability she was incorporating in her teaching.

“As much as I can say it can be incorporated into every single learning area, it is difficult. It requires a lot of time, a lot of thinking, but I feel with Science, Natural Science, Life Sciences and even Geography, coz the section that are raised are quite vast and is directly linked to global warming, water conservation..... To Maths here

and there it can be done, to Life Orientation it can be done, and to English, but not to a large extent... ”

(Pre-lesson interview, 17/06/2009)

6.2.2.2. *Kay's practice of ESD*

The following analysis of the lesson planning documents, lesson observation and post-lesson VSR interview reveal Kay's practice of ESD. The data has been organised into three groups of principles and their corresponding examples have been highlighted. These three groups include: the ESD teacher activities; the ESD learner activities; and ESD content relating to the societal, economic, political and biophysical aspects of the environment.

Evidence of Kay's lesson planning was found in the pre-lesson interview and the designed assignment pages but not in the reflective journal. Kay stated that the original idea was to design an assignment that would allow any learning area teacher to mark the assignment with ease. It was thus decided that the topic or theme of the assignment would be one that concerned all areas. It was here that Kay suggested that a SD issue be chosen, one that learners could work with and relate to. This was how it was decided that 'recycling' would be the topic of choice. “, *we took the problem in our country, which is our resource being depleted, and then we tried to say okay how are we now gonna try and put NS in this? How are we now gonna put Mathematics in it? How are we now gonna put economics in it?*” (Pre-lesson interview, 17/06/2009) Kay stated that it would become quite evident in the lesson that was to follow, how the assignment linked directly with the next section in Mathematics, which looked at graphs and statistics.

Kay indicated that she would require her learners to present their findings of their research during the lesson that was to be observed next. The learners would each communicate how

much of each type of waste they had collected in one week, explain how they dispose of their different types of waste, and finally provide feedback on whether they think it is important to recycle and why. The questions that Kay and the other teachers designed required learners to collect data, construct a graph based on that data, analyse the data and make conclusions based on the data.

The fact that the school was currently in examinations made Kay request that she incorporate ESD into a Grade 8 Mathematics lesson instead of Grade 9. Due to the realisation that the circumstances did not allow for a Grade 9 Mathematics lesson to be observed in due time, it was agreed that a Grade 8 lesson would be appropriate. It was also noted that it would have no effect on the results of the data, as Grade 9 was originally selected simply due to its flexibility in curriculum. Grade 8 is just as flexible in nature.

Eleven learners presented their findings and answered various questions posed by Kay. Some of these questions included: (1) When your gardeners come and they clean and de-weed, where do you deposit that? (2) If you had to start a recycling project at home, just with the dirt that you have, would you be able to carry out that project from your house? (3) Why do you think it is important to recycle? (4) Name one thing you do at home to keep the environment clean. (5) Identify one initiative you can take your family through. (6) How does this assignment relate to Maths?

Before I organise the lesson observation and post-lesson VSR interview data according to the three aspects of ESD below, I feel it is important to insert Kay's opening comment in her analysis of her lesson. Kay felt that she was instrumental in choosing the topic that would cut across many learning areas. Kay also expressed her delight in the relevance that this project had towards ESD.

“... ESD linked, it linked very directly in the sense that it was a recycling project where they had to draw their graphs and analyse their data. So I feel it linked quite directly because it was a holistic assignment that we planned so that it was able to be marked from a Science perspective and a Mathematics perspective...”

(VSR interview, 17/06/2009)

According to Kay, by incorporating the topic of recycling which informed learners further about resource exploitation, and incorporating skills from other disciplines, this was a worthwhile activity that would end in educating learners for SD. The ESD principles identified in Kay’s practice and the examples that support these have been organised below according to the three aspects of ESD.

(i) ESD teacher activities

The lesson observation revealed to me that through Kay’s own questioning techniques she aimed to ‘*encourage the development of critical thinking skills*’ about SD and attempted to appeal to their attitudes. Kay also engaged her learners in SD actions. “*Normally I dispose of it all in one bag. I don’t keep glass, plastic and other. I think it’s necessary to do recycling because you are saving the Earth’s resources by recycling*” (Lesson observation, 17/06/2009).

Kay encouraged her learners to think more reflectively and critically about their actions. “*... if you had to go back and think about the way you managed the dirt. Do you think it is a good method? Do you think it is a method that would be easily adapted by your family...*” (Lesson observation, 17/06/2009).

During the VSR interview Kay also paid much attention to the ‘*development of critical and creative thinking*’ through her questioning techniques. Kay displayed this desire for critical thinking as she stopped the video at the point where she asked the second learner that

presented, whether they disposed of waste in the same bag. Kay commented that she tried to question their methods to see whether what they were practising was due to convenience or due to environmental consciousness.

“And, that’s also what I wanted to find out as I said, I think I asked everyone who came to the front about that question, and I think it also makes them critical because a bag is given, and you know that that paper can be recycled. Why are we throwing everything in one bag when we can have separate bags for separate materials and it can be reused, recycled...”

(VSR interview, 17/06/2009)

Kay stopped the video again at the point where she asked the class how we as humans have contributed towards the ozone layer. Kay expressed that for the first time learners were required to take Natural Science content knowledge based on the depletion of the ozone layer and apply it to a more relevant understanding of how their actions could serve to curb our negative impact.

“I like the fact that they were able to tell me exactly how we are damaging the ozone layer, and I feel that was quite important because in NS they learn it and they just regurgitate it in an exam, but now they were able to reflect, put it into practice and think about it critically as well.”

(VSR interview, 17/06/2009)

Kay displayed an emphasis on the application of knowledge and the important role that critical thinking plays in learning in a sustainable manner as opposed to rote learning, which promotes learning that is potentially removed from the learner.

(ii) ESD learner activities

The lesson observation revealed that through specific questioning, Kay ‘*encouraged learners to become part of knowledge production*’. Kay asked another learner why it was important to recycle. The learner responded that by not recycling we were damaging our ozone layer. In this instance Kay probed the learners further by asking how it damaged the ozone layer. Learners responded that it was due to CFCs, burning fires, smoking, and car fumes, yet none spoke about industry and how recycling could curb the carbon emissions. This link was not made by learners nor probed by Kay. However later on one learner made the connection on their own adding to the classes’ knowledge production. “*I think recycling is very important because we use less of the Earth’s natural resources, and recycling takes less pollution and raw materials. We reduce waste which is better for the environment*” (Lesson observation, 17/06/2009). This showed that the assignment allowed the opportunity for learners to contribute towards knowledge production.

In many occasions learners added information that was not requested of them, however which the assignment allowed for. In another incident the eighth learner to present commented that they thought that it was very important to recycle as it “*... reduces energy wastage, air pollution and water pollution, by recycling the needs for conventional waste disposal and greenhouse gas*” (Lesson observation, 17/06/2009). The tenth learner to present added to this knowledge production by commenting that “*It is important to recycle because it is estimated that every tonne of recycled paper saves seven trees.*” (Lesson observation, 17/06/2009)

Through questioning learners Kay showed that she valued ‘*learner knowledge production*’ within the class. The first instance was evident in the VSR interview when Kay asked that the video be stopped at the point where a learner complained that throwing peels in the garden made the garden look dirty. Kay saw herself as adding to knowledge production by informing

learners that a very discreet compost pit could be developed to avoid such problems. Further in the VSR interview, Kay pointed out that learners were also very important knowledge contributors and that this was to be seen as important in the light of ESD. Kay noted that at the point where she had asked learners why they thought it was important to recycle, learners gave a different response and substantiation for their response, every time.

“Again there I asked him the question, ‘Why do you think recycling is important?’ I think I, with every presentation I got a different response... I feel like within every presentation sustainable development has come out of it, because the entire topic you could say was based on sustainable development.”

(VSR interview, 17/06/2009)

By asking learners this question in the assignment, learners were required to either draw from their own understanding and/or draw from their interpretation of what they had read in literature. Both my own and Kay’s analysis of her practice revealed that Kay consciously practised the ESD principle that involves learners in their own knowledge production.

(iii) ESD content relating to the societal, economic, political and biophysical aspects of the environment.

Besides encouraging learners to develop and contribute towards their own knowledge production, Kay also attempted to develop their understanding of the ‘*enviro-economical aspects of sustainable development*’. Kay asked her learners how the assignment related to Mathematics, to which the learners mentioned numeracy and mathematical skills, like graph drawing, adding, subtracting, converting, rounding off etc. Kay then brought the classes’ attention to the interrelatedness of Science, Economy and the Environment. “*Aren’t we talking about our economy and the way this country is going and the preservation of*

resources?'' (Lesson observation, 17/06/2009) Kay attempted to draw her learners' attention to the allocation of cost and benefits to the social use of biophysical systems like growing trees for paper and how recycling can curb such costs and harmful actions on the environment. Hence Kay addressed two principles of ESD that focus on the actual SD related content taught and how it attempts to focus on the economical-environmental issues of sustainability. During the VSR interview Kay did not mention the interrelatedness of the environment, economy and society, however the mere fact that she drew the connection during the lesson, shows that Kay saw this as an important connection to make at the time.

The mere nature of the assignment and the manner in which Kay and her colleagues went about designing the assignment displayed attributes of conscious development of ESD, as Kay and the other teachers took time to *'analyse the curriculum for an opportunity to incorporate a topic that would reach across all learning areas and apply to local sustainability'* (an ESD principle). They decided that recycling was a very relevant topic today considering the current issues of resource use and global warming and decided that an assignment could be designed to incorporate this aspect of SD. Learners were expected to develop numeracy skills, and engage in guided discovery as well as sustainability actions. As a result of carrying out the assigned task, learners together produced knowledge about the types of waste that was mostly generated and what could be possibly focused on and actively done to change this situation.

In a general reflection near the end of the VSR interview, Kay commented that she felt that the assignment had tested their mathematical skills convincingly. However, she was more interested in how they felt about recycling and SD generally. One thing that served to discourage Kay was that she expected a lot more in terms of impact of the assignment on learners' attitudes and actions. Kay consoled herself by referring to what Jay and René had

said once, that change was a very slow process and was not about to occur over night: “*I think in term of one assignment, is not going to change their mindset, it needs to be a follow up now... it has to be consistent, like the next assignment with the next topic.*” (VSR interview, 17/06/2009)

6.2.2.3. Kay’s understanding and practice of ESD

During the pre-lesson interview Kay verbalised her understanding of ESD. According to Kay ESD involves all disciplines and it is up to each teacher to incorporate issues of sustainability into the taught curricula. Kay explained that ESD was about using education to support the sustainable use of resources, and that her assignment displayed this to a great extent. Kay acknowledged that she had a broader understanding than she had previously and reflected on the assignment that she designed to support her claim. She understood that because her assignment incorporated the development of skills from other disciplines and recycling it strongly exhibited principles of ESD. She felt that such an activity required more teacher support in terms of how one would go about manipulating the curriculum to incorporate SD issues. Kay reflected on her previous motivation for a cross-curricular approach to ESD, and admitted that although this is what she would advocate for, it seemed far easier to incorporate ESD into Science. This reveals Kay’s shift in focus from ESD principles that refer to teaching and learning to ESD principles that focus on content regarding SD issues.

When observing Kay’s lesson I identified the following ESD principles in her practice: learners engage in guided discovery; learners engage in active learning; teachers analysed the curriculum for topics related local sustainability; developed numeracy skills; learners engaged in sustainability actions; teacher displayed tolerance and rationality; teacher showed

sensitivity towards human rights; teacher encouraged questioning and promoted critical thinking skills; teacher appealed to learners' attitudes; teacher focused on the development of communication skills; learners were encouraged to think creatively and contribute towards knowledge production; teacher motivated for relevant and meaningful learning; learners developed reasoning skills, organising skills and problem solving skills; teacher focused on developing learners' understanding of the enviro-economical aspects of SD and the cost and benefits of the social use of biophysical systems. It was evident that this lesson, as opposed to the first, placed great emphasis on incorporating SD into the curriculum. Kay's non-verbal actions (practice) revealed more of her understanding about ESD than her verbalised explanation.

In Kay's analysis of her own lesson she identified the following principles to reflect ESD principles: informed learners with regards to the cost of resource exploitation; promoted relevant and meaningful learning; developed communication skills; teaching involved learner-centred approached to learning; teacher appealed to learner attitudes regarding SD; learners developed life and numeracy skills; teacher encouraged questioning to allow for learner knowledge production to take place; teacher encouraged the development of critical and creative thinking; teacher promoted action taking and active learning; and finally the teacher remained open-minded to learning opportunities in class. It is clear that Kay's understanding and practice of ESD extends to many more principles of teaching and learning as well as SD content than was previously displayed in her first lesson.

Kay's engaging of learners in action is a step that none of the other two teachers attempted. This shows that Kay was very concerned about attitude development towards a consciousness of sustainability. For the first time since the reconnaissance step, Kay showed cognisance of the SD content aspect of ESD. To a large extent this was influenced through Kay's

interaction with the intervention phase and specifically with René. Kay also placed a large emphasis on the need to make learners think critically about knowledge, contribute towards their own knowledge production and engage learners in activities that are meaningful to them. Kay shows consideration of all three aspects of ESD in this reflection step of the action research cycle.

6.2.2.4. The role of reflection in establishing Kay's understanding and practice of ESD.

Kay chose not to use her reflective journal as a pillar for reflection for reasons mentioned previously. In fact the only entry referring to the reflection step of the action research cycle was:

“As we proceeded... I became more critical and started thinking and using sustainable Dev Edu in everything I did. A very important point was that I started motivating my learners to start projects that would sustain our earth.”

(Reflective journal, no date)

With regards to the second lesson Kay merely commented that this was the better lesson of the two owing to the fact that it related to the topic of recycling. The fact that there was very little in Kay's reflective journal did not mean that Kay was not constantly engaging in critical reflection. This point becomes apparent when analysing the pre-lesson and post-lesson interviews.

During the reconnaissance step pre-lesson interview Kay commented that she realised her understanding of the term SD had broadened. Kay felt that this was the case because she was taking the concept to “*greater heights today*” (Pre-lesson interview, 17/06/2009). Kay

explained that due to her and her colleagues sitting down and designing an assignment that incorporated recycling into Natural Science and Mathematics, she felt that her definition of ESD had also expanded. “*So in terms of ESD I feel that my definition has expanded...*” (Pre-lesson interview, 17/06/2009) When Kay was asked when she had developed this new expanded understanding, she replied:

“Although I knew what sustainable development was, I think this entire process [referring to action research] with you has made me a bit more critical about how does sustainable development incorporate into Education and it has made me more aware. Because you say ‘sustainable development’ but I would have never thought do an assignment on it as well, so it was because of this entire process ... that it has made me more critical and aware about it.”

(Pre-lesson interview, 17/06/2009)

When further probed Kay revealed that through the interaction with Jay and René, she had learnt a lot about what could be done to enhance ESD. Kay made it clear that it was not that she didn’t have the capability to think of these ideas herself, however she needed the enthusiasm and triggers to get her thinking in that direction. This supports Lave’s (1995) emphasis on community learning through social engagement. Kay exhibits her qualities as a reflective practitioner who has chosen to use her prior experiences and understandings as a scaffold for her future experiences (Gould & Baldwin, 2004).

During the pre-lesson interview Kay reflected on her ideas about ESD generally and its implications on education. Kay felt that the present curriculum needed to make teachers more conscious of ESD. Kay also expressed that teachers needed to gain more practice in incorporating ESD as it was very possible, it just requires opportunities: “*...it just needs to be*

a bit more friendly, or we need to be a bit more manipulative, trying to outline and trying to incorporate more Education for Sustainable Development in the existing curriculum” (Pre-lesson interview, 17/06/2009). Kay felt that due to her recent success in designing an assignment that incorporated aspects of ESD, any teacher could do the same if they geared their motivations towards such activities. Kay stated that a lot of responsibility did lie with the teacher and that perhaps programme and phase organisers would be helpful in outlining specific ESD related topics that would encourage teachers to engage their learning area towards an ESD focus.

The post-lesson VSR interview which aimed to access the teachers interpretations of their practice of ESD, also offered numerous examples of reflective practice and evidence of professional development. In the first instance Kay explained why she chose to ask learners particular questions. In her explanation she explained that she tried to develop their critical thinking. This shows that Kay reflected on her action and the benefits of her particular decisions. Kay displayed this type of reflection again as she reflected back on her first lesson: “...you know the other time it was just the presentation... This was a more focused one, it was specifically related, and I was able to think about exactly what I wanted and how I wanted it to link” (VSR interview, 17/06/2009). Kay felt that she had accomplished more in her second lesson in terms of orienting her lesson towards an ESD focus because she was more aware of what she wanted to do. Kay knew she wanted to develop Mathematics skills as well as develop knowledge and attitudes around the topic of recycling. With this focus Kay felt that her second lesson was a lot more successful. Kay revealed that it was through constant self-posed questioning that she developed her ability to incorporate ESD.

Kay showed evidence of reflecting on her action as she commented on one learners’ request that the assignment include more Mathematics next time. Kay agreed that more mathematics

could be included for learners who were more proficient in Mathematics. Reflective practice for professional development must ensure not only that teachers reflect on their experiences but that they also rework and redesign certain aspects that had been shown not to work so well. So reflective practice on its own does not ensure change, but rather as Kay has shown, it requires open-mindedness and willingness to change for improvement, also taking into consideration their character and the context in which the teachers are working.

Finally Kay reflected on the overall impact that her one assignment had on her learners. Kay stated that she realised that one assignment was not enough to change learners' mindsets regarding their environment and that what she would need to do is rework another assignment that required an incorporation of ESD into the curriculum:

“I think in terms of one assignment is not going to change their mindset, it needs to be a follow up now... it has to be consistent, like the next assignment with the next topic. Our next topic is on ‘Financial Maths’ next term, so I think to critically think how can I incorporate that now into an assignment that is holistic as well, because I wouldn't want to leave a thread hanging.”

(VSR interview, 17/06/2009)

Kay added that this would not be an easy task but that she would have to ponder how she could incorporate SD. Kay felt that this would be a necessary exercise if she were to change the attitudes and behaviours of the learners eventually. Kay saw this as a worthwhile activity especially since the positive feedback received by the learners in referral to the last assignment that they engaged in. Kay showed a lot of evidence of using reflection ‘on’ and ‘for’ action (Schön, 1983; Farrell, 1993) to develop her practice of incorporating ESD effectively into the taught curriculum. Kay also showed a higher order of reflection as she

critically reflected on the value of the assignment and how she could improve on it (Boody, 2008).

6.2.3. René's understanding and practice of ESD

René's understanding of ESD is revealed via a pre-lesson interview and her practice of ESD via an analysis of her lesson planning documents, actual lesson, and post-lesson VSR interview should also be undertaken.

6.2.3.1. René's understanding of ESD

Regarding René's understanding of SD, René revealed that her understanding of SD was more ecologically and socially focussed than economically and politically focused. René described the term as the "*Utilization of natural resources in a responsible manner, ensuring for sustenance for future generations, it does not necessarily include only global warming and the reduction thereof, but all other aspects as well...*" (Pre-lesson interview, 10/06/2009) When René was probed further regarding what she meant by "*all other aspects*" she referred to the use of water, fossil fuels and electricity, and how these impact on global warming. So it became clear at this point that René understood SD as that which enabled the utilisation of resources in a way that minimised our contribution to global warming and allowed future generations to survive. For René the words global warming and Sustainable Development are strongly connected.

René revealed that this understanding of SD existed in her mind since she could remember having an understanding of SD and was one that had persisted throughout the research.

However, René admitted that the research process revealed that her understanding was only limited to the resources and materials that she had been exposed to: “... *but it has drastically increased in terms of its content and understanding*” (Pre-lesson interview, 10/06/2009).

In asking René whether she felt she incorporated SD into her teaching, it became quite clear once again that she had a passion for the topic and this motivated her to incorporate aspects of SD into the curriculum. René commented that although she taught Mathematics and Science, she could only vouch for the incorporation of SD into her Science lessons as René saw that SD was more suitably incorporated into the sciences. René provided examples of the Grade 9 syllabus incorporating SD by covering the topic of electricity and the world’s reliance on coal and energy conservation. René also referred to the Grade 8 syllabus that included elements and compounds. “*We talk about compounds like water for example, all aspects of water, also we would touch on the need for, it’s not part of the syllabus but I feel that it would be my responsibility...*” (Pre-lesson interview, 10/06/2009). René also revealed that she often liked to cut out newspaper articles relevant to certain SD issues like ‘electricity wastage’ and would incorporate these into her lessons. René often forwarded these articles to other Grade 9 teachers and had recently spoken to the English department to encourage them to use the topic of SD in class debates and literature. Such actions revealed René’s value on SD and its incorporation into the school curriculum across disciplines. It thus seems that although René want SD incorporated into Science oriented fields, she does acknowledge that it may still be explored across the other disciplines:

“... um I still feel there are only certain subjects in which it can be encompassed, that would be Science, Geography, Life Orientation, and in terms of English, considering that every learner is being taught English as a first language, and they engage in orals

in terms of speeches and debates and projects and that kind of thing, I believe that we can target each and every learner in terms of educating in that way.”

(Pre-lesson interview, 10/06/2009)

René commented that she felt that SD was not a “*core focus*” in her school and as a result felt that someone needed to take on the responsibility to ensure that it became more of a focus from a cross-curricular perspective.

When René was asked what she understood by the term ‘Education for Sustainable Development’ she commented that her definition had not changed from her answer in the reconnaissance step. However René replied further that it involved: “*Educating our learners to take care of our natural resources. Educating our learners on the negative effects of not doing so, and educating our learners on the need and desire, to want to create a positive impact*” (Pre-lesson interview, 10/06/2009)

René felt that she always understood the foundation of what ESD involved, however as time transpired she realised that it involved more than what she had originally thought. René expressed the importance of making learners realise that there is a need to live sustainably and that the method of getting learners to take on favourable attitudes and behaviour is through action. René felt that education would only get learners so far; rather what they required was firsthand experience of the consequences of people’s actions. Here René displays a deep understanding of engaging learners in SD actions (one of the ESD principles mentioned).

“Their education has to consequence in the action, and that is what I think I have learned through this whole process with you. That education and sustainable development is just a term, it means nothing if it doesn’t consequence in actions that

are directed towards reducing all the negative impact in terms of our global situation.”

(Pre-lesson interview, 10/06/2009)

When asked whether she thought that ESD was an important aspect to be included into the curriculum, René responded with an emphatic “*Yes definitely*”. At first René felt that ESD would need to form a section in the Science syllabus, however since her liaison with Jay and Kay she had realised that every learner needed to be exposed to ESD in some form. René commented that her opinion had changed since then to say that perhaps ESD could be incorporated into all disciplines ensuring that all learners be exposed to ESD, however in her last comment René said she had changed her opinion again. René felt that ESD was not easily incorporated into every discipline and for this reason perhaps it would be a better option to include a separate compulsory subject that focussed on ESD. “*...it will have to be taught as a separate subject, being done across the board from Grade 8 till 12. Actually it should be done from primary school level so, from Grade 0 till 12*” (Pre-lesson interview, 10/06/2009). René felt that ESD could only easily be incorporated into sciences, such as Physical Science, Natural Science and Life Science; Geography and Life Orientation.

6.2.3.2. René's practice of ESD

The following analysis of the lesson planning documents, lesson observation and post-lesson VSR interview reveal René's practice of ESD. René's lesson displays various ESD principles in her teaching. The data has been organised into three groups of principles: the ESD teacher activities; the ESD learner activities; and ESD content relating to the societal, economic, political and biophysical aspects of the environment.

René's reflective journal during the reflection step served to document short descriptions of television shows and newspaper articles that she felt contributed something towards the theme SD. René's reflective journal did not serve as an instrument for reflective thought regarding the planning of her lessons, except in one case: "*Discovered that Sunday Tribune is carrying a whole page contribution @ back of sport section on saving energy – in unity with DSW eThekweni Municipality*²¹ – interesting! Used in my lessons" (Reflective journal, no date).

In other instances René reflected on the Collect-a-can project that she was starting and personal sustainable actions like gardening and recycling that she wanted to involve herself in. Evidence of planning was mostly revealed through the documents that were designed for the lesson itself. The two articles were extracted from newspapers that René had scanned.

René commented during the VSR interview that her main reason for drawing on articles from the newspaper was that it showed learners the level of importance that issues of SD were being given by the media, major organisations like Transnet and eThekweni Municipality as well as by the Government at large. This is endorsed in her claim that: "... *in my mind, it is able to bring across to the kids that this is truly an issue of great concern, in terms of its magnitude and that was the whole rationale behind that*" (VSR interview, 10/06/2009).

The entire lesson revolved around the world's reliance on coal and energy conservation. As a result René used these two articles to guide her lesson. René allowed the learners to lead her onto other related topics like fossil fuels, alternate sources of energy and possible ways of conserving energy at home. However, the two articles always served to bring her back to a focus on the effects of human actions on the environment. René had said once before, during the reconnaissance step that she had an idea in her head of the topics that she would like to

²¹ eThekweni Municipality – also referred to as eThekweni, is the metropolitan authority that includes Durban. It provides basic services like water, sanitation and electricity to civilians.

cover and then there were related topics that the learners brought up which she allowed for, yet she never had a structured plan. Thus these two articles serve as an important piece of planning documentation and led me to understand what it was that René wanted to focus upon.

According to the content of these two articles René emphasised the human impact on the environment and thus the need to realise one's responsibility in curbing one's negative impact. René saw the topic 'climate change' as an SD issue that humans had caused and could curb. In the second article, René saw human action to prevent global warming and climate change as an important aspect that should be recognised by her learners. Both articles alluded to the action-taking responsibility of humans which was further emphasised by René later during this reflection step.

René was enthusiastic about this particular lesson as she felt that it strongly exhibited many principles of ESD. This lesson involved René's Grade 9 Natural Science class as they went over the topic of 'Energy Conservation', a specified section in the Grade 9 syllabus. The ESD principles identified in René's practice and the examples that support these have been organised below according to the three aspects of ESD.

(i) ESD teacher activities

During the lesson observation I noticed how René drew on relevant examples to '*make learning meaningful*'. In the first instance René attempted to explain to learners how a geyser blanket serves to save energy by reducing the rate at which heat is lost via the metal covering of the geyser, thus reducing heating time. "*Now when you heat water in your kettle, do you agree that the water in your kettle gets hot as well as the kettle ... Do you agree that some heat is being lost from the kettle by the atmosphere?*" (Lesson observation, 10/06/2009).

René further probed learners' reasoning skills in this example as she explained how by placing a blanket over the geyser, less heat is being lost as the geyser is insulated, which means that the geyser does not need to switch on as frequently as the thermostat takes longer to detect change. René logically showed how geyser blankets serve to reduce energy wastage.

René used a locally relevant disaster to motivate the claim that climate change is a real occurrence even on a small scale. The disaster that René drew on was that of the 2007 tidal waves along South Africa's East coast. Another way in which René attempted to make learning meaningful and relevant was by drawing on a local energy saving project in Durban that was funded by Transnet, our national railway company. By using this local example of where money is being used to research ways in which energy may be saved, learners may soon realise that the issue of energy conservation is a relevant and serious one.

During the VSR interview René confirmed her attempts to '*make learning relevant and meaningful*'. René called upon local media as a point of reference regarding content on SD. René felt that learners would begin to understand the urgency of SD issues if they saw reports in local media. "*Transnet is a major concern, a powerful conglomerate ... in my mind, it is able to bring across to the kids that this is truly an issue of great concern...*" (VSR interview, 10/06/2009).

During the VSR interview René stopped the video where she drew learners recall to the tidal waves of 2007. René commented that she felt that it was important to connect the learners to the experience of climate change in order to get them to realise the reality of the issue.

"Living proof of climate change is when the children have gone through it themselves. You can talk about things that have happened in previous decades when

they were never part of this population, but they can identify with something that they have lived through, it has more meaning.”

(VSR interview, 10/06/2009)

René in her attempt to make learning more meaningful was also aiming to appeal to learners attitudes. René specifically tried to get learners to consider their responsibility towards issues of SD. She stopped the video at the point where she asked learners whether they felt they could influence climate change in any way. René acknowledged that learners may have felt as though climate change was something too large for learners to have any impact on. René expressed that it was important to make learners realise that their small actions collectively had a huge impact.

“It seems like an impossible scenario that they could possibly have anything to do with ... but they could see that any way that they could help to reduce global warming will ultimately have, even if it is small, on a small, minute, miniscule scale, they actually have some power in this whole scenario.”

(VSR interview, 10/06/2009)

(ii) ESD learner activities

In many instances René ‘*encouraged learners to involve themselves in their own knowledge production*’ and did this through guided questioning. The first question that René asked called upon learners’ prior knowledge and encouraged them to think creatively of possible solutions that could be used. The question posed was: “*What are the ways that you can save electricity?*” (Lesson observation, 10/06/2009). Learners suggested using technologies that they had heard about before and also suggested carrying out certain actions. René questioned

learners further on their suggestions to get them to think critically about what they were suggesting

Although during the VSR interview René did not make any direct reference to knowledge production, she did refer to aspects of a similar nature. With the development of knowledge around SD, René acknowledged the importance of '*considering her learners' prior knowledge*'. Although the consideration of learners' prior knowledge may not seem to link to knowledge production, it does link to the foundation for knowledge production. At the point where learners reflected on the fact that coal is a fossil fuel which is used to generate electricity, René commented: "*They picked up on the fact that, they had drawn a relation between electricity and it being stemmed from a natural resource ... and that is indicative of the fact that they do have some knowledge of Sustainable Development*" (VSR interview, 10/06/2009). Acknowledging learners' prior knowledge is not an official ESD principle; however I would argue that it should be considered as important for learners' knowledge production.

René stopped the video at the point where she asked learners to name the constituents of the atmosphere. Once again René acknowledged the importance of considering learners' prior knowledge as a scaffold for further knowledge development, thus not removing her learners from the learning process. "*... in order for them to understand the concept of global warming, you need to have a basic foundation, for me in any discipline, especially in Maths and Science. If you don't understand basics you cannot understand a complex problem*" (VSR interview, 10/06/2009). René further stated that she felt the issue of 'global warming' was a key focus of ESD.

Also linked to knowledge production is the feeling free to contribute towards knowledge production. René made reference to the learners all responding at once and shouting out their

responses to the class. René felt that although this may seem like a disorganised way of conducting one's lessons, she explained that this gave each learner an opportunity to say what they felt in a participatory atmosphere. *"I feel they are more free to give vent to their thoughts and opinions"* (VSR interview, 10/06/2009). In this way René encouraged learner knowledge production and showed *'sensitivity towards a participatory democracy'*, both of which are ESD principles. *"And each of them made a valid point ... You can actually see that these children have, maybe not wholly or completely, but they have grasped the basics..."* (VSR interview, 10/06/2009).

(iii) ESD content relating to the societal, economic, political and biophysical aspects of the environment.

Throughout the lesson and the VSR interview René made reference to the links between society, economy, policy and the environment. It may be concluded that René's awareness of the SD content aspect of ESD is very strong at this point. There are many more examples than these represented below. I noticed in the lesson that I observed that René invited learners to explore *'content on investment into appropriate technologies and assists learners in allocating the costs and benefits of society using particular energy resources'*. This aspect of ESD was well explored as René took learners on a journey into the cost effectiveness of solar panels. A learner read:

"Solar water heating... has been promoted by many of the power utilities worldwide, including Eskom, as a very effective method of reducing energy bills, with saving up to 40% for average households. Eskom offers a subsidy of approximately 20% to encourage the purpose of solar water heating."

(Lesson observation, 10/06/2009)

The use of technology to improve the global crisis was introduced as the class explored the impact that the use of solar panels could have on our traditional way of accessing electrical power. René not only suggested that solar panels could be used as an alternative source of energy to coal burning, she also suggested that this would be a good long term investment as it offered money saving solutions. Through a mathematical calculation René showed the learners how money saving every month would result in the solar heating panel being paid up after only two to three years. René showed learners how to reason out the issue to come to the final informed conclusion that solar heating was a worthy investment. Here René showed learners how technology could be used to solve societal and environmental as well as economic problems. By integrating these disciplines of understanding René promoted ESD to a large extent.

In the VSR interview René stopped the video six times to display where she had tried to develop the content around SD. It is important to note that René placed a lot of her focus on two areas: firstly the content and secondly learners' attitudes. René stopped the video at the point where she had just finished talking about how the use of geyser blankets and the switching off of non-essential appliances serves to reduce electricity consumption. René felt that this point would qualify as ESD as learners were led to an understanding of why it was important to install certain measures of energy conservation. René commented that merely informing learners of measures that could be taken to save electricity would be one thing however a lesson incorporating ESD would include the reasons as to why these measures needed to be taken. *“But the reasons for it being a necessity would have been my lesson on sustainable development.”* (VSR interview, 10/06/2009)

Further along in the lesson when René began to show learners how a solar panel worth R13 000 could be a worthy investment, René stopped the video once again. René appealed to the

economic, social and environmental aspects of SD as she calculated the economic and environmental benefits that solar panels offered us.

“This always amazes me that we don’t look at the whole picture as well. Five hundred times twelve is like six thousand, over two years that geysers will be paid off. If you look at the saving that you are creating in using solar powered geysers, it is a small price to pay, in terms not only of the money you are saving, in terms of how you are helping to reduce electricity wastage.”

(VSR interview, 10/06/2009)

Generally the content that was covered in this lesson exhibited aspects of ESD as René considered SD in terms of the economic, societal, political, environmental and technological implications and tenets. René promoted reasoning skills synonymously as she explained the broader picture of how human activity impacts on the environment. René allowed learners the opportunity to think of solutions and actions that may be taken to reduce climate change, thus engaging learners in their own knowledge production. René also used various teaching strategies to develop learners using ESD.

As this lesson involved a topic of ‘Energy Conservation’ which is very relevant to SD on a local and global level, there are many examples of where content refers to the societal, economic, environmental and political aspects of sustainability. René also in many cases encouraged learners to think critically and creatively through a questioning approach to teaching. She often drew on relevant examples and learners’ prior knowledge. Although she did not design any activities that led learners to engage in SD actions, René clearly sought to change learners’ attitudes towards one of sustainability consciousness.

6.2.3.3. René's understanding and practice of ESD

During the pre-lesson interview René verbalised her understanding of ESD. René retained her understanding of SD in terms of the utilisation of natural resources in a manner that ensures that future generations have access to the same resources without damaging the environment. As a result of this understanding of SD René understood ESD as an education that informed learners about the importance of taking care of our natural resources, the actions that may lead to the taking care of our natural resources, as well as the negative effects of not taking care of our natural resources. René commented that previously her understanding was limited to the materials that she had been exposed to in the Grade 8 and 9 teaching and learning materials: however since her engagement with the research study her understanding had drastically increased in terms of content. René added that she recently realised the importance of changing learners' attitudes towards that of sustainable living. She added that this could not be realised merely by telling them but rather through action taking regarding sustainability issues. In this way René felt that favourable attitudes may be developed. René felt that SD needs to be incorporated into the curriculum however she stated that being a Mathematics and Science teacher, she would only know how to incorporate it into Science. René was now of the opinion that the incorporation of ESD into science only would not ensure that every learner has access to it. For this reason, René supported the idea that every learner be exposed to a separate compulsory subject that focussed on ESD and not into all disciplines as she could not see how ESD could be implemented into subjects such as Mathematics and Economics etc. René added that an ESD teacher would need to lead by example and be exemplary in their actions of SD.

When observing René's lesson I observed the following ESD principles being revealed in her practice: the teacher participated as a facilitator of meaningful learning (by cutting out

relevant media related to topics of sustainability); the teacher covered content that revealed the potentials and limits of our biophysical systems; the teacher attempted to make learning learner-centred; the teacher covered content that highlighted the impact of man on his environment; the teacher encouraged learners to take action in the environment; the teacher connected society, economy, policy and the ecological environment; motivated for logical reasoning skills and problem solving skills; engaged learners in knowledge production; encouraged learners to think creatively and critically by using questioning; and finally motivated that learners become environmentally conscious.

In René's analysis of her own lesson she identified the following principles to reflect ESD principles: teacher is committed to open-mindedness and rationality by considering learners prior knowledge; learners were made responsible for their own knowledge production; teacher made learning meaningful and relevant as local media was referred to; and finally René identified that she showed sensitivity towards a participatory democracy.

Although René suggested in the pre-lesson interview that the only way to appeal to learners attitudes regarding sustainable living would be to engage learners in action taking regarding these sustainability issues, she did not incorporate this idea into her lesson. René's understanding and practice of ESD is very content focused. René does incorporate other principles of teaching and learning as a tool to bring across the major focus of SD issues. It appears that René's content knowledge regarding SD has improved over the course of the action research cycle.

6.2.3.4. *The role of reflection in establishing René's understanding and practice of ESD*

According to Sarsar (2008) by simply adopting a reflective practitioner approach, self-directed professional development becomes a natural consequence. However it has been revealed that René and the other two teachers did not frequently use their reflective journals and when they did, they used it to document events and rarely as a source of planning or of thought exploration. According to Gould and Baldwin (2004) this does not mean that the teachers are not reflective practitioners as they describe 'reflective practitioners' as those who build on their experiences and in the process develop teaching and learning theories that have a context application.

Both the pre-lesson and post-lesson interviews have thus been used to show evidence of reflective practice displayed by René. It is important to note at this point that this section serves to show how René has developed professionally via her reflective practice. It does not attempt to summarise René's professional development, rather this has been done in Chapter 7. During the pre-lesson interview René reflected that the definition that she had just given regarding SD was one that she always had. However René then went on to say that her knowledge of SD prior to "*... going through this whole research with you, my knowledge was limited...*" (Pre-lesson interview, 10/06/2009). René further explained that this was due to the fact that she only understood SD as much as the resources she had been exposed to had revealed. The resources refer to Grade 8 and 9 Natural Science course notes. René stated that since her engagement in the intervention phase, her understanding had increased.

In another instance where René was asked during the pre-lesson interview whether she incorporated aspects of SD into her practice, René revealed that through reflection on the Grade 8 content she had found ways to incorporate SD when it was not even being addressed in the syllabus at the time. "*...it's not part of the syllabus but I feel that it would be part of my*

responsibility to focus on the need to conserve water, as a natural resource” (Pre-lesson interview, 10/06/2009). René further commented that she had cut out articles from the newspaper and designed worksheets based on them and had given them to other teachers to incorporate into their subjects.

“... we’ve focused on reduction of electricity wastage, we’ve tried our utmost best. This worksheet that you see today, an extract from Daily newspaper, will be forwarded to all our grade 9 learners. I’ve actually given it to a grade 12 educator...”

(Pre-lesson interview, 10/06/2009)

René has reflected on her passion for the incorporation of ESD into the school curriculum. This has been displayed in her actions and her words.

“I have become pretty passionate about it. Um, at this moment in time I don’t think that is the core focus in our school. So I feel that it is my duty as an educator and a Science educator to do what I can.”

(Pre-lesson interview, 10/06/2009)

René is aware of her passion more now that she has been probed by the research and the other teachers. René expresses this during the group interview, which will be analysed further on in this chapter. It appears that through constant internal reflection, René has developed a desire to incorporate her materials into more of her lessons and subjects. However René has made it clear that it needs to be Science/Geography/Life Orientation focused for her own incorporation, although she acknowledged the possibility that language teachers adopt SD as a topic for literature or debate. René also added that she had promised to give the other teachers the resources that had been provided to her during the intervention phase of this cycle and that they would all take it from there. It seems that René now has the confidence and

desire to get something like this going in her school. René clearly feels empowered, which is one of the purposes of action research.

The final evidences of reflective practice refer to René's teaching style and her teaching and learning philosophy. René displayed her constructivist approach to teaching and learning as she stressed the need to build on learners' prior knowledge. *"... in order for them to understand the concept of global warming, you need to have a basic foundation ... If you don't understand the basics you cannot understand a complex problem"* (VSR interview, 10/06/2009). René was reflecting on the teaching approach that would best assist learners to understand the concept of global warming. René supported this as she drew on the importance of using examples that would make learning meaningful and relevant to the learners.

Finally, through reflection René revealed one area that she would like to improve. René felt that she did not set enough of an example to her learners, for them to feel led to act in a sustainable manner. *"I am also guilty of not practicing what I am preaching right now, because I am telling these kids to go and influence their community members, their family members and my parents are totally ignorant about global warming,..."* (VSR interview, 10/06/2009). René reflected on her need to be a role model and an exemplary example to learners. René displays a deeply felt responsibility here that goes beyond her call of duty.

6.3. A cross-analysis of the reflection step of this cycle

As was noticed in the reconnaissance step, and is still evident in the reflection step, all three teachers spoke about SD and ESD as the self-same concept. It became apparent that the teachers could only conceptualise ESD due to their prior exposure to SD and attempted to transfer their understanding of SD to education and the school curriculum, which was seen as appropriate in this study.

6.3.1. The three teachers' understandings of ESD

Jay's understanding of SD did not change much from her original explanation as she still felt that it had to do with imparting knowledge to learners that was relevant and meaningful and would assist learners in their future. Although Jay acknowledged that she always had this understanding she could add more to it as she was now more aware of examples of SD since the research and engagement with the other teachers.

Jay revealed relevant examples of how she incorporated SD into her lessons. Kay felt that her understanding of SD had become broader than it was in the reconnaissance step and felt that SD involved an incorporation of skills from other subjects to make learning experiences more SD oriented. Kay referred to the assignment that her and her colleagues had designed to elaborate on this point. Kay said that she had always understood what SD was but since her engagement with the other teachers and the research it became more apparent how she could incorporate it into her teaching. Kay reported on her second lesson as an example of

how she incorporated SD into her teaching but went further to state that articles based on SD could be used in Language studies.

René revealed that she understood SD as that which enabled the utilisation of resources in a way that minimised our contribution to global warming and allowed future generations to survive. For René the words global warming and SD are strongly connected. René originally stated that she had always understood SD in this manner, yet later admitted that the research in action process revealed that her understanding was only limited to the resources and materials that she had been exposed to. *"...but it has drastically increased in terms of its content and understanding"* (Pre-lesson interview, 10//06/2009). When René was asked whether she incorporated SD into the curriculum she gave examples of where she did not need to do too much as the Grade 9 syllabus already covered related issues, but also gave examples of efforts she had made to incorporate SD into Grade 8 Science. In addition she had encouraged other teachers to use SD issues as a resource in their teaching.

When Jay was asked about her definition of ESD, she drew on the need to connect learners emotionally, consciously and actively to their environment. Jay revealed that although Geography, Life Sciences and Natural Sciences would be the subjects that could incorporate ESD more easily, she felt that any subject could incorporate ESD.

Kay explained that ESD involved all discipline teachers in attempting to incorporate issues of sustainability into their taught curricula. Kay expressed the view that teachers needed a lot more assistance via programme organisers to get to the point of successful implementation of ESD. Kay felt that it was not about the subject being taught but more about how the subject was used to prepare learners to be functioning citizens in society. However when Kay was asked which learning area she would choose to incorporate ESD into, Kay acknowledged that although previously she had motivated for cross-curricula incorporation of ESD, she felt that

it was far easier to incorporate ESD into Science. This revealed Kay's content focus on the principles of ESD, as opposed to the teaching and learning principles within ESD. Kay placed content regarding issues of SD above skills, attitudes and values which could be taught in any learning area. This reveals that although Kay is aware that ESD incorporates principles of teaching and learning such as critical and creative thinking, numeracy, problem solving etc., she is also aware that it incorporates issues of sustainability such as resource use and biome destruction.

René once again stated that her understanding of ESD had not changed, yet when she gave her definition she realised that her understanding had deepened. René had stated that ESD involved: "*Educating our learners to take care of our natural resources. Educating our learners on the negative effects of not doing so, and educating our learners on the need and desire, to want to create a positive impact*" (Pre-lesson interview, 10/06/2009). René also demonstrated her displayed an understanding of the need to engage learners in experiential learning when trying to develop the correct attitudes and behaviours around SD. René stated that if we wanted learners to conduct themselves in a sustainable manner we would have to engage them in sustainable actions. Action taking was never a consideration in René's previous understanding of ESD.

The above discussion regarding the three teachers' understandings and how they feel their understandings developed, reveals that teachers were happy with their original verbal definition however they felt that refining of their definition took place when engaging collaboratively on the topic of ESD implementation. It may be noted then that teachers shape their understanding and thus practice of ESD the more they engage in examples of implementation and discussion of implementation.

The teachers in various cases throughout the reflection step commented on the effect that the collaboration with the other teachers had on their own understanding and practice of ESD. It is clear that René, through her interaction with Kay and Jay, began to see how ESD could be implemented in a cross-curricular manner, although she insisted throughout that it would be difficult to incorporate ESD into non-science based disciplines. Kay spoke about how René had influenced her to think towards SD issues such as recycling. Kay had broadened her understanding of ESD with regards to content and a cross-curricular approach. Kay expressed doubts about incorporating ESD into Mathematics, however in her second lesson she precisely showed how she attempted to incorporate ESD into Mathematics. Jay moved the least with regards to her understanding and practice of ESD, however she used the collaborative meetings as a source of inspiration, spurring her in the practice that she was already implementing. Jay commented that her practice always geared towards ESD practice but now she was more aware of it. This conscious awareness offered Jay greater avenues for ESD implementation in her teaching. All three teachers expressed great emphasis on the need to engage learners in active learning situations whereby learners interact with the environment around them and address community problems. All three teachers expressed feelings of excitement and energy towards the purpose of ESD implementation.

6.3.2. The ESD principles displayed

The ESD principles that Jay displayed included: commitment to the wellbeing of human beings, those being her learners; development of learners' personal skills; commitment to open mindedness; encourages learners to engage in questioning; encouraged a participatory democracy; encouraged the learners to think critically and develop reasoning and study skills; Learning with understanding as opposed to rote learning was encouraged (this was not

outlined within the ESD conceptual framework); relevant and meaningful learning. Jay was aware that she was fulfilling all of these principles, however added the principle of 'scientific literacy skills' as an aspect of ESD. Jay's main emphasis was to develop critical thinking, reasoning, and relevant and meaningful learning. According to Jay if a lesson contained these, it followed an ESD focus. The ESD principles that Kay displayed included: analysing the curriculum for opportunities of SD inclusion; developing numeracy skills; engaging learners in guided discovery and sustainability actions; commitment to tolerance and rationality; encouraging questioning and critical thinking; development of communication skills; solving of community problems; encouraging knowledge production; developing SD content knowledge by drawing learners' attention to the allocation of cost and benefits to the social use of biophysical systems; ensuring meaningful learning; development of reasoning skills and engaging learners in active learning. Kay added that her lesson geared learners towards an attitudinal attachment to SD, which she felt was important to ensure future SD actions. The ESD principles that René displayed included: content that referred to the societal, economic, environmental and political aspects of sustainability; encouraging learners to think critically and creatively through a questioning approach to teaching; drawing on relevant examples and learners' prior knowledge; appealing to learners attitudes towards a sustainability consciousness (not included in the conceptual framework); encouraged knowledge production amongst learners; promotion of reasoning skills; promoted relevant and meaningful learning. René placed a lot of her emphasis around the SD related content and the learners' attitudinal development towards SD.

This significantly shows that teachers select aspects of ESD that are most important to them. So when looking at how ESD is understood and practiced in context, one's personal values

are seen as part of the context. Teachers interpret ESD in a way that is most relevant and meaningful to them.

6.3.3. Teachers' engagement in reflection

Jay showed evidence of deep reflection and use of her reflective journal to reflect on her style of teaching and ideas of effective learning. Jay displayed evidence of reflection 'in', 'on' and 'for' action. Jay displayed a strong sense of responsibility towards developing ESD and acting in a sustainable manner herself. Kay made one reflective journal entry regarding the reconnaissance step of the action research cycle and it is therefore quite clear that Kay chose to reflect internally as she went along. Kay showed evidence of reflecting 'on' and 'for' action in many instances. Kay also showed a higher order of reflection as she critically reflected on the value of the assignment and how she could improve on it. Kay did a lot in terms of comparing her first lesson to her second lesson. Kay felt that her second lesson was more ESD focused yet showed discontent as she felt that it should have impacted on learners more. Kay already began to reflect on how she could ensure more impact, thus reflecting 'for' action. René did not use her reflective journal to document her thoughts about ESD, rather she used it to document event or television programmes and articles that she felt related to ESD. For René this was an activity of becoming more conscious about where one could find SD and how this could be used in one's lessons. René showed evidence of introspection during the interviews as she motivated for various choices and even compared her ideas over time, of how ESD should be incorporated into the curriculum. René also motivated why her lesson could be seen as one that incorporated ESD. A major reflection that René made, was that what was lacking was 'action taking' as she noted that you could teach learners so much before they needed to be actively involved in it. René also used

reflection to motivate for her teaching style and how it benefitted her learners. René thus did a lot in the way of reflection ‘on’ and ‘for’ action.

6.4. A post cycle group interview

At the end of the cycle all three teachers were invited to the Botanical Gardens for another picnic. The meeting served to talk about the key incidents that the teachers experienced; why the three teachers had chosen to develop themselves in the manners in which they did; how they experienced the research cycles; what challenges they and other teachers alike would face, and finally the meeting also served the researcher the opportunity to hand the transcribed data to the teachers for proofing and to take in their reflective journals. My role during this group interview was that of co-researcher, both sharing experience and probing of issues. After each question, each of the teachers responded in turn. In some cases a discussion broke out and this provided useful data. The data that was captured regarding why the teachers had chosen to develop themselves in the ways that they did, was revealed in chapter 5 and will not feature again here. This section within chapter 6 sets out the feelings that the three teachers shared on our final encounter.

The group interview began as I asked the three teachers to go through their reflective journals and pinpoint four to five most crucial experiences that they would like to share with the group. Due to the fact that entries in the reflective journals were irregular and few the teachers had to speak from memory. The advantage was that this focused on those points that stood out in the teachers’ memory. Jay started by reading her reflective journal, including this: *“I can’t wait to see the end of the four weeks so no more reflections, let’s hope I can*

really keep it up this is the first page” (Group interview, 10/07/2009). None of the three teachers valued the reflective journal as they felt that it was merely a time-consuming activity. Educational bureaucracy with regards to demands on teachers for written assessments and reports may be a contributing factor to such lack of enthusiasm for writing. In this way the three teachers mostly did not see the professional value of reflective diaries. However Jay was an exception in that she showed a particular depth of reflection in her reflective journal as well as a lot more entries than the other two. Jay commented: *“I said here reflections are really becoming interesting now as I can see how I am incorporating these experiences”* (Group interview, 10/07/2009). Rather the three teachers valued conversation and community as they did most of their reflecting in these ways.

For Jay one of the most remarkable aspects of her journey was tying her everyday experiences to ESD as she became more aware of the many examples that she was in contact with. Jay felt that the research had opened her eyes to these examples and avenues. Jay also remarked on the readings that were given during the planning and action steps (intervention phase) which she found interesting. Finally Jay chose the entry in her reflective journal where she reconsiders her drawing of an ESD teacher. *“Then that was when I said I think I need to change my picture, I need arrows from me to the source as the first steps and then me absorbing and internalising information”* (Group interview, 10/07/2009). Jay revealed intense reflection on her mental model of an ESD teacher.

Kay generally spoke about the highlight of the research for her. For Kay the first lesson was learner centred and in that way had incorporated ESD, however she felt that although that was also the case for the second lesson, the second lesson was a lot more ESD focused and therefore more enjoyable for her. Kay explained to Jay and René what she had done in the second lesson, and thanked René for her motivation regarding waste management as this had

encouraged her to design the assignment that she had. Kay also explained that the learners were a lot more motivated after the lesson and actually wanted to start a Collect-a-can initiative. Kay showed evidence of feeling empowered about doing other activities that were also ESD focused. *“I have really grown and there’s a lot more that I would want to do because of how I have grown and the processes that we went through”* (Group interview, 10/07/2009).

René also preferred to speak generally about her experience as she had also not kept a detailed account of events in her reflective journal.

“I can’t say that I came here with ignorance but, on a certain level I was ignorant about the degree of intensity that sustainable development actually envelopes and um, it has been a real learning, a rich learning experience for me.”

(Group interview, 10/07/2009)

What stood out for René was her uncertainty on where ESD should be incorporated. René commented that she had reflected intensely on this issue and was aware that originally she had felt that ESD needed to be incorporated into a Science discipline as this was most relevant, however she acknowledged that since meeting with Kay and Jay she had realised that it could be incorporated into any discipline even though its roots, she felt were embedded in Science. Ideally however, René expressed her view that she felt, after having engaged in the materials that I had given them in their request, ESD should be incorporated into a separate subject as it was far too intense. *“I believe we can adapt anything to any subject, I mean when it comes to doing Maths, yes you can use any topic for that matter including ESD...”* (Group interview, 10/07/2009). René added that originally she had thought of ESD as being limited to covering the topic of fossil fuels and non-renewable resources, however

she had recently realised that it involved all resources, not particularly only those that contributed to global warming. René made a very interesting comment, which revealed her willingness to reflect in a manner that would promote her own professional development:

“...something that Jay reflected on in her journal was she says the information doesn’t come to us we must go and get it, I think that is really important and a really valid point, um we usually tend to base our opinions and the way that we teach and our teachings, based on interpretations that we have on a particular subject. I believe there is so much more to learn out there that we are totally unaware of, that can increase our knowledge and increase our ability to empower others to realise the true potentials we have in saving our planet”

(Group interview, 10/07/2009)

René revealed that she had always relied upon her own interpretations of content and since the engagement with the group had realised that there was a lot more to be gained from accessing other interpretations of the same content. René also reflected on her experience of the action research process itself:

“...action research has opened my eyes to, not to things that I would be blinded to before, but it has opened my eyes in a more enriching way in that I have more eagerness, more motivation and more encouragement to go out and learn more and I feel that it has increased my environmental responsibility with regard to myself and with regard to my power to empower all the learners that I come into contact with.”

(Group interview, 10/07/2009)

René also commented that she wanted to share her resources with more teachers than she had before as now she saw it as her environmental responsibility. Finally I asked the three

teachers what obstacles they foresaw for teachers who attempt to develop themselves in the manner in which they had chosen.

René commented that for teachers onto whom this had been imposed and whom had no prior association with SD, this task would be daunting and too much effort. René felt that it would be due to teachers' lack of interest and ignorance of SD that this journey of incorporating ESD would not be embarked upon willingly. René and Kay commented that thus the challenge would be to educate the staff as to what SD actually means before they could see it as important to include into the curriculum. With such a response I could see that the teachers were referring to those teachers who had no experience in the field of SD or ESD, thus the question posed to them next was: "*What about teachers who are interested like yourselves? ... What were your challenges?*" (Group interview, 10/07/2009).

René commented that teachers within the field of Science would not face any challenges as ESD would always be relevant. This comment reveals her understanding of ESD as being largely content based. Kay commented that she felt her biggest challenge was time. This was evident as Kay in both lessons had to incorporate ESD into a subject that she felt was seemingly unrelated to SD. Kay particularly referred to her last lesson where she had to sit down with teachers to design an assignment that incorporated ESD into Mathematics.

"... because as teachers we know we just don't come and teach... it's this, it's that, it's your extra-curriculum so with me I think I have to designate a day in the week, a particular time-slot where I have to either motivate or take on this project and reflect on it."

(Group interview, 10/07/2009)

René added that she felt that if something really means something to you then you will make time for it, stressing that the major challenge would be to make ESD something that is valued by teachers, enough so that they sacrifice their time to ensure its incorporation. All three teachers commented that they felt that they could use the same approach (action research cycle) that they had engaged in during the research, in their professional capacity with anything that they wished to develop. Jay actually commented on using the approach with her teachers at the ‘Dinaledi’ schools. René stated that although originally she had shown much trepidation in engaging in research that documented her development, she felt empowered in her own practice as she was now more conscious of her practice.

6.7. Conclusion

This chapter served to reveal data collected during the reflection step of this action research cycle as well as data from a post-cycle group interview. The findings contribute towards the answering of the first research questions which states: “What are Grade 9 teachers understanding and practice of education for sustainable development?” Data from the group interview contributed towards the answering of the third research question which asks: “Why do Grade 9 teachers develop their understanding and practice of education for sustainable development in the way(s) they do?” Data from both chapter 4, which represents the reconnaissance step, as well as from this chapter which represents the reflection step will be brought together in chapter 7 to answer the first research question completely. Chapter 7 which follows highlights the main synthesis of the findings of my research in relation to the three research questions posed. Chapter 7 will draw on the main findings in chapter 5 to

answer the remaining two research questions: “How do Grade 9 teachers develop their understanding and practice of education for sustainable development?” and “Why do Grade 9 teachers develop their understanding and practice of education for sustainable development in the way(s) they do?” Finally chapter 7 alludes to the limitations of my research study as well as recommendations for future research in the field. Chapter 7 also aims to show how my study extended the boundaries of research in ESD through the consideration of the importance of teacher empowerment and professional development when attempting to implement ESD into one’s teaching.

Chapter 7

‘Looking back to travel forward’

7.1. Introduction

This chapter serves to bring together the main findings of the research. These findings contribute towards the answering of the three research questions. In answering the three research questions the following is referred to: the role that action research plays in teacher empowerment; and the role that reflective practice plays in teacher professional development. The chapter also suggests a model for ESD implementation and highlights the possible barriers and challenges facing teachers attempting to implement ESD. The chapter identifies some major findings that emerge from the data. One such idea is that these three teachers prefer programme and phase organisers to assist them in the implementation of the innovation across the curriculum. According to the teachers phase organisers would provide teachers with an idea as to how ESD could be implemented across the curriculum, thus removing a lot of the difficulty they had experienced during the reconnaissance step. Another idea revealed that teachers hold their own principles that they view as being relevant to ESD yet that are not outlined as ESD principles in the literature and Appendix II. This chapter also claims that teachers should be placed at the centre of change to ensure teacher professional development in a manner that is empowering, not neglecting facilitation. The chapter concludes by listing the limitations of the research and recommendations for further research.

7.2. Addressing the Research Questions

The main findings that serve to answer each of the three research questions were sourced from the data analysis in chapters 4, 5, and 6. The existing ESD conceptual framework presented in Appendix II guided the response to the research questions. Literature regarding action research, professional development and reflective practice is drawn upon in addressing the research questions to reach a deeper understanding of the activities teachers need to engage in to become effective curriculum implementers and designers with respect to ESD. Theories of learning and educational change are also commented on to explain how each assists teachers in developing professionally in a sustainable way. Conclusions are drawn regarding the value of action research for professional development as well as the nature and type of reflection that teachers engage in. This chapter also reveals teachers' preferred methods of professional development and the value of such methods.

7.2.1. The teachers' understanding and practice of ESD

This section serves to answer the first research question: 'What are Grade 9 teachers' understanding and practice of ESD?' The answer to this question has been formulated using the main findings revealed in the pre-lesson interview, lesson planning document analysis, lesson observation and post-lesson VSR interview that occurred during both the pre-intervention and post-intervention phases of the action research cycle.

This research question refers to two time frames as data from the two phases are drawn together to understand what the teachers' understanding and practice of ESD was and now is.

The first time frame refers to the pre-intervention phase i.e., the reconnaissance step of the action research cycle. The second time frame refers to the post-intervention phase i.e., the reflection step of the action research cycle. Therefore in answering this question I will also be briefly displaying the actual development that took place in the teachers' understanding and practice of ESD. The response to the first research question is represented in this order: Jay, Kay and then René. The group ZPD at the reconnaissance step is summarised in table 4 and the group ZPD at the reflection step is summarised in table 5 below.

The reconnaissance step served to access the three teachers' understanding and practice of ESD. During the interview it was revealed that none of the three teachers had heard of the term ESD before and in fact had only ever heard of the term SD. This confirms McKeown's (2002) claim that teachers have a poor awareness of ESD because it has not been given attention in school policy. Due to their awareness of the term SD they inferred an understanding of ESD as they applied their understanding of SD to an education context. All three teachers had different ideas of what SD meant to them and as a result all three applied their understanding to their practice in different ways.

The reflection step served again to access the three teachers' understanding and practice of ESD. It seemed that the three teachers had worked towards their group ZPD which was established by combining all three teachers individual ZPDs to identify the continuum for development, Each teacher was more informed regarding their understanding and practice of the ESD principles than they had been previously. Out of the three teachers, Jay showed the least movement in her practice. This may be due to the fact that Jay preferred to focus on the teaching and learning aspects of ESD and felt that the SD content aspect of ESD was naturally addressed in her science discipline. Kay showed the greatest movement in her understanding and practice of ESD as she faced her self-identified challenge of implementing

ESD into Mathematics. According to McKeown (2002) the implementation of ESD should follow the 'Strength Model' whereby ESD is implemented in a cross-curricular manner, however the actual implementation of the Strength Model has its challenges as identified by Kay initially and René. René displayed a deeper understanding of the interrelatedness of society, policy, economy and the biophysical aspects of the environment than she had in the reconnaissance step. The challenge that all three teachers identified up until the final interview, was the implementation of ESD into disciplines that were not directly SD linked, like Science, Geography and Life Orientation. This finding is supported by Jenkins & Jenkins (2005) who state that often teachers are unable to translate their understanding into their practice. This indicates that the three teachers implemented teacher and learner activities that promoted ESD, however they placed most importance and relevance upon the SD content aspect of ESD which draws upon the interconnectedness of society, economy, policy and the biophysical aspects of the environment (O' Donoghue, 2001).

Both Jay and Kay agreed that ESD could be incorporated into any learning area, however René felt that it needed a lot more focus and should have a discipline on its' own as well as certain aspects should be incorporated into all learning areas.

Jay and René's understanding of ESD did not shift from the reconnaissance to the reflection step, however René's understanding deepened in comparison to the textbook definition that she previously held as her understanding of SD content related to society, economy, policy and the biophysical aspect of the environment improved. Jay showed evidence of displaying new principles in her teaching as well. Kay showed a shift in her initial understanding of ESD as that which prepares the learner for citizenship to more specifically preparing learners to function in sustainably considerate ways. Through the intervention Kay gained knowledge about SD issues and specifically learnt from René with regards to recycling as René was very

driven by this topic. Kay displayed a principle of ESD that neither of the other two teachers had displayed. Kay involved her learners in active engagement in recycling (an SD issue) in her attempt to change learners' attitudes towards an environmental consciousness. Kay placed emphasis on 'learning for action', which is a principle supported by Jucker (2004).

Collectively the three teachers suggested new principles that should be added to the ESD framework. Jay suggested that 'the development of scientific literacy skills' should be an ESD principle. In her second lesson Jay also added that 'improving one's self image' and 'addressing learners' misconceptions' are principles that contribute towards the sustainable development of the individual. Kay, like Jay, suggested two further principles that she felt should be ESD principles. These principles included: developing learner self-image, and career advice. René highlighted a new principle as she aimed to 'develop a sense of environmental responsibility in learners'.

In reflecting on all three teachers it is clear that during the reconnaissance step René strongly emphasised SD issues, however both Kay and Jay focussed on the teaching and learning activities that promoted ESD. By the time the three teachers arrived at the reflection step of the action research cycle Kay and René displayed a greater understanding of SD issues and displayed this in their practice. René displayed a deeper understanding of the teacher and learner activities that support the development of learners to not only function in society but are also environmentally conscious. Jay displayed a greater enthusiasm for critical thinking and meaningful learning, yet did not make an overt attempt to incorporate other aspects of ESD.

Table 5 below represents the ESD principles that the three teachers displayed and were consciously aware of in their practice during the reconnaissance step of the action research cycle.

Table 5. Individual and group understanding and practice of ESD at the reconnaissance step.

ESD Principles	Jay	Kay	René
Teacher Activities			
Teacher shows rationality and open mindedness	✓		
Encourages critical and creative thinking	✓		
Facilitator of meaningful and relevant learning	✓	✓	✓
Commitment to human rights and social justice		✓	
Learner Activities			
Learners engage in guided discovery	✓		✓
Learners become part of knowledge production	✓		✓
Learner develops communication and social skills		✓	
SD Content (society/economy/political/biophysical)			
Content covered was locally relevant (alien plants)	✓		✓
Biophysical systems, their limits and potential			✓
Technologies societies use to necessarily ‘exploit’ biophysical systems and the environments they create in the process			✓
Teacher-suggested principles			
Integration of skills across learning areas.		✓	
Develop environmental responsibility in learners			✓
Develop learner self image/esteem		✓	
Provide career advice		✓	

From this table 5 above it is clear to see that Kay and Jay show very little attention to the SD content aspect of ESD. The table also displays that Jay is most in tune with learner and teacher activities that promote ESD. René shows a strong focus on SD content, yet she also demonstrated increased use of teacher and learner activities that promote ESD.

The principles listed in the far left column, provide a list of the ESD principles that were collectively displayed across all three teachers and defines the group ZPD as described by Nyikos and Hashimoto (1997). Recall the group ZPD is the zone where all three teachers' understandings intersect. The individual columns represented by each teacher's name, represents the individual ZPDs for each teacher. Individual teachers moved from an individual ZPD to this group ZPD shown in Table 5 and in some cases, beyond. Important to note is that some of the principles mentioned in both Table 5 above and 6 that follows are not ESD principles as identified by the UN (2002).

The three teachers all felt that they understood SD and ESD, thus they did not identify what needed to be achieved in order to successfully implement ESD. However when the three teachers came together, they realised from their colleagues' practice that there were elements that they could pick up on. Nyikos and Hashimoto (1997) support the idea of meaning making during social interaction among teachers. By the time the reflection step transpired, all three teachers had acknowledged the need to engage learners in active learning and action taking. According to all three teachers this was the only way to appeal to learners' consciousness towards a sustainability focus. O'Donoghue's Active Learning Framework (SADC-REEP, 2002) also argues for engaging learners in action in order to bring about attitudinal change. It may be seen at this point that the established group ZPD above in Table 5 directly influenced individual teacher ZPD's as teachers went from displaying only a few of these principles to focusing on more of these principles.

The group understanding of ESD can be shown in a more elaborated version, as during the reflection step the three teachers' added substance to their understanding and practice. Table 6 below shows the aspects of ESD that the group collectively displayed in the reflection step

of the action research cycle after they had engaged with one another during the intervention phase.

Table 6. Individual and group understanding and practice of ESD after the reflection step.

ESD Principles	Jay	Kay	René
Teacher Activities			
Teacher shows rationality and open mindedness	✓	✓	
Encourages critical and creative thinking	✓	✓	✓
Facilitator of meaningful and relevant learning	✓	✓	✓
Commitment to human rights and social justice			
Concern for human well being	✓		
Learner Activities			
Learners engage in guided discovery	✓	✓	
Learners become part of knowledge production	✓	✓	✓
Learner develops communication and social skills	✓	✓	
Learners develop study and reasoning skills	✓		✓
Develop numeracy skills		✓	
SD Content (society/economy/political/biophysical)			
Content covered was locally relevant (alien plants)		✓	✓
Biophysical systems, their limits and potential		✓	✓
Technologies (farming) societies use to necessarily ‘exploit’ biophysical systems and the environments they create in the process			✓
Learners engage in sustainable development actions		✓	
Content covered the interrelatedness of Science, Economy and the biophysical environment (recycling)		✓	✓
Content covers interrelatedness of Society, policy and the biophysical environment			✓
Teacher-suggested principles			

Integration of skills across learning areas.		✓	
Develop environmental responsibility in learners		✓	✓
Consider learners' prior knowledge			✓
Addressing learner misconceptions	✓		
Develop Scientific Literacy skills	✓		

In observing the table 6 above it is clear that Jay still had not implemented SD content into her teaching, although she had increased her attention to the teacher and learner activities that promote ESD. Kay showed consideration for SD content whereas before she had not. Finally René showed in-depth consideration of SD content and focus on environmental responsibility although her learner activities did not support her focus as there was no learner engagement in addressing SD. Once again this highlights Jenkins and Jenkins' (2005) claim that teachers battle to transfer understanding into practice. Wolff (2005) also acknowledges this phenomenon of teachers' educating about SD in unsustainable ways as they often resort to telling learners what they should do instead of educating them in a way that brings about the desire for the action that is being implied. Evidence for claims presented in Tables 4 and 5 can be viewed in both chapter 4 and 6.

7.2.2. How the teachers developed their understanding and practice of ESD

This section serves to answer the second research question: 'How do Grade 9 teachers' develop their understanding and practice of education for sustainable development?' The answer to this question has been formulated using the main findings revealed in the observation of the three meetings that took place during the intervention phase of the action research cycle as discussed in chapter 5. The description below reveals the five main

features of the intervention: (1) Teachers required meeting venues for lengthy discussions and idea sharing; (2) Teachers used each other as springboards for idea sharing; (3) Teachers shared resources that they brought; and (4) Teachers required a facilitator in their development of ESD and finally (5) Teachers needed to be interested in ESD and willing to develop themselves towards an ESD focus. These features explain how the teachers developed their understanding and practice of ESD.

The teachers met three times, which set the time frame for development. The three teachers had these meetings over the course of one month and only decided on the next meeting if they saw a need for it. The meeting places provided a neutral meeting ground where all teachers felt comfortable to contribute. The first meeting which was held at the botanical gardens was the planning meeting and served for teachers to get acquainted and establish their initial ideas on ESD. It was at this meeting that the teachers agreed to meet again to develop their understanding further. It was not clear how this would be done and no arrangements were made regarding what would constitute development however the teachers assumed that gathering together to talk more would be the method. The teachers met for the second time and René brought newspaper article and resources to share. They proceeded to talk about how these could be used in practice and everyone shared their ideas regarding ways of implementing ESD into the curriculum, as well as ways of encouraging other teachers and learners to become conscious about SD issues. At this point the teachers revealed that their challenge was in the implementing of ESD and not so much the understanding of it as they felt they did. The teachers agreed to meet one final time at Jay's school but requested outside assistance from me. This was the first indication that teachers required facilitator assistance. I agreed to drop off readings related to ESD which they agreed to read and discuss when they met again. The final meeting served to wrap up the teachers

main ideas and express new ideas that came to them as a result of the readings. Jay felt that the readings had provided her with affirmation that she was doing the “right thing” and appreciated the fact that the readings supported the idea that there cannot be one definition of SD or ESD as it depends upon the context into which it is being implemented (Huckle, 2001). The teachers showed even more enthusiasm for ESD and SD than they originally had. Jay shared some of her resources with Jay and Kay and offered many examples of ways in which ESD could be implemented in one’s Science lesson.

During the planning step the three teachers did not sit and strategically plan a method of development. Rather they resorted to casual conversation drawing from their experiences and resources that they had. In the first meeting it was already clear to me, that the three teachers felt that their gathering together to talk about their understanding and practice of ESD was a dominant resource in developing their understanding and practice further. Jay made a direct comment regarding this technique, stating that by merely collaborating with different people from different contexts everyone brought something different to the table. This type of knowledge development is described by McKeown and Hopkins (2003) who state that each teacher in every discipline brings to the fore their own strengths of skills and perceptions. Jay and Kay both felt strongly about the power of communication and collaboration of ideas. René was also in agreement, however she felt that it was also important to access further outside information to add to the group understanding. This became very apparent during the action step of this intervention phase when René requested my input. Oettle and Law (2005) support the dynamic social process of bringing together the outsider (me) and insider (the teacher) to bring about change.

During the action step René provided the other two teachers with the opportunity to view relevant material and to reflect on how they could incorporate the resource into their learning

areas, as she always brought newspaper article based on relevant SD issues. René motivated that newspapers were the best way of accessing materials on locally relevant SD issues. Jay offered Kay and René contact details of organisations that she had visited that served to educate the public further on SD issues. Jay knew a lot about sustainability activities and workshops and thus offered great insight regarding how Kay and René could incorporate these into school visits. The meetings served to provide opportunities for knowledge sharing.

The intervention phase is seen as engaging the teachers in self-directed professional development because teachers were constantly placed in the roles of co-researcher, planner, designer and implementer. The teachers were given freedom to develop themselves in the manner in which they chose. This act of giving teachers the responsibility for their own development is consistent with Talbert's (2003) view that teacher empowerment is assisted by allowing teachers to take charge of a change process in which they are reflective. The nature of their choice however, questions the role of self-directed professional development. In chapter two I suggested that a method whereby teachers become responsible for their own development, offers a concerted effort at adopting and implementing new policy innovations. I would still agree given my findings, however I would add an important element of 'support'. The three teachers scrambled through the idea of 'developing themselves' and did not know where and how to begin developing. At the beginning they were not aware of how much they knew and how much they were still to learn. Initially they used each other as benchmarks for development until René required a higher point of reference and asked me for help. It seems that if teachers are placed together to develop themselves professionally they are quite capable of doing so, provided they are given sufficient support by a facilitator regarding the avenues that they may explore in the process. This idea of teachers engaging in such an open-ended process of collaboration does give teachers a sense of empowerment as

they drive the curriculum innovation. However scaffolding, as identified by Vygotsky, is still required to be provided by someone who has a broader knowledge of the concept. By teachers engaging in their own development they were given the best opportunity to take whatever they had learned from each other and apply it to their context. Pertinent is that the teacher themselves take on catalyst roles to work towards a point of believing in their own practice (Mushayikwa and Lubben, 2008). These three teachers by the reflection step showed great enthusiasm for their further implementation of ESD. Teachers had come a long way from their trepidation of implementation in the reconnaissance step. It seems that the strategy that these three teachers used the most was the reflective practitioner approach, which Sarsar (2008) states is a sure way to attaining self-directed professional development.

Mushayikwa and Lubben (2008) provide insight into what occurred during this study. They state that by empowering teachers to engage in their own development, one provides them with the opportunities to develop the skills that will enable them to develop themselves professionally in the future. Jay reflected on this saying that she felt that she could take what she had learnt regarding professional development and take it to her teachers at the Dinaledi schools.

7.2.3. Why the teachers chose to develop their understanding and practice of ESD in the way(s) they did.

This section serves to answer the third research question: ‘Why do Grade 9 teachers’ develop their understanding and practice of education for sustainable development in the way(s) they do?’ The answer to this question has been formulated using the main findings revealed in the post-cycle group interview.

When teachers during the group interview were asked why they had chosen the intervention they did, Jay responded that “it just developed”. There was no evidence of structured planning regarding the teachers’ choice of intervention. Kay added to the explanation given by Jay to say that they were not sure how to begin developing themselves so they decided to keep meeting and contributing to ensure that there would be more learning and inevitably more development. René added further insight, saying that they saw their main purpose to be the bringing together of their interpretations of ESD in an attempt to develop a more holistic understanding. René saw her colleagues, input as an important part of their overall development. René referred to the great influence that the ESD readings had played in her developed understanding of ESD which suggests that perhaps external influence, such as a facilitator, should play a small role in the process whereby teachers attempt to implement new innovations.

When the teachers were asked how they would have developed themselves differently, there were only two suggestions, which implied that teachers felt empowered as a result of their own intervention. Firstly René suggested that a more frequent collection of newspaper articles be collected and shared. Secondly Kay wished that she felt this enthusiastic a lot earlier in the research process. Kay shared her desire to take what she had learned and apply it in as many ways as possible. The answer to this question provides a lot of insight into how teachers may develop themselves once given the freedom to do so, however it is acknowledged that the action research process offered a vital motivation for teachers to get together to develop themselves. Simply put, it is with the guiding steps of the action research that self-directed professional development became possible.

If teachers are not aware of such a process then on what basis do they structure their development? In partial answer to this question and the research question it appeared that

teachers used reflective practice as the main tool for their professional development. This confirms Sarsar's (2008) claim that reflective practice is a sure way of self-directed professional development. It is clear that teachers used what they knew to develop themselves. Teachers felt comfortable with sharing knowledge and reflecting verbally, as well as reading literature. Teachers were not familiar with any other avenues and thus chose these avenues for professional development regarding ESD implementation. In summary, teachers used the steps of the action research cycle as a facilitator of the process, as well as their own reflective practice, in developing themselves because these were the tools that were accessible to them at the time.

7.3. Implications of the research

7.3.1. Action research – An avenue for teacher empowerment

Action research served as the driving force behind the three teachers' professional development. As indicated earlier, Greenwood and Levin (2007) mentioned the five main characteristics of action research: it attempts to provide solutions to problems that exist within a particular context; it involves a form of reflective inquiry which requires and allows for participation from parties; it values diversity of skills and experiences to make action taking more meaningful; by allowing for meaning construction it benefits its participants in making action more meaningful; and finally the success of action research is measured by its ability to develop the participants to a point where they are able to function well in problem situations.

In drawing from the findings of this study it is easy to identify all of these aspects within the study. Firstly teachers were required to develop their understanding and practice of ESD

within their teaching. Secondly teachers used reflective practice during their meetings together to try and develop their understanding and practice of ESD further. Considering the third aspect of action research, René commented in the group interview that the teachers' diverse understandings and experiences were drawn upon to gain a more holistic understanding and practice of ESD. Referring to the fourth aspect, the three teachers showed confidence in their second lessons and confidence in the VSR interviews where they reflected on their lessons. The teachers felt they were more aware of aspects of ESD in their practice and felt that they had adequately addressed ESD, whereas before they were uncertain as to whether they were doing the right thing. Finally the three teachers referred to their feelings of motivation towards the end of the research process of this study. They expressed that they felt motivated to implement their understandings further in their practice. Teachers had experienced the process of professional development using action research and according to Jay could use this method in other educational situations in their professional capacity.

It was only near the end of the intervention phase, once the three teachers felt as if they had learnt all they could from one another that the three teachers asked me to intervene from the outsider perspective. Greenwood and Levin (2007) support this idea of bringing outsider specialist knowledge and insider practical knowledge to bring about sustainable contextualised change. Had teachers not eventually seen the need and benefit for outsider knowledge, these teachers may have never moved beyond the original group ZPD. I suggest that teachers be given outsider specialist knowledge regarding areas of policy implementation, but only 'on request'. Teachers need to identify their problem or area for improvement first before being given supporting documents for their development. The reason for this is teachers identify their interest and willingness to embark on their own development and will therefore put these resources to use. This is one sure way of ensuring

that teachers develop themselves in professionally empowering ways. The problem arises when teachers are required to implement innovations and policy's that they are unwilling to implement.

According to Elliott (1991) action research by its reflective nature provides an avenue for the translation of thoughts, values and theories into meaningful actions in order to improve practice. It was precisely by the teachers' engaging in the steps of the action research process whereby they reflected on their practice in two occasions (the reconnaissance and reflection steps) and constantly throughout, that teachers were able to identify their improved understanding and practice of ESD. This is evident when the three teachers reflected on their heightened motivation regarding ESD implementation during the final group interview.

7.3.2. The role reflective practice played in teacher professional development

Schön (1987, 1989) supported the idea that the body of knowledge around teaching was formed by the action taken by exceptional teachers. Schön (1987, 1989) further stated that this body of knowledge developed as teachers reflected in and on action. Thus as the three teachers in this study reflected on and in action they inevitably contributed towards the knowledge around teachers understanding and practice of ESD and how teachers attempt to develop themselves professionally. The teachers in this case are not exemplary in their practice of ESD, as it is still being a new concept, they have however marked the first milestone towards becoming exemplary in ESD implementation.

The three teachers reflected most often in a collaborative capacity. Naidoo, Brookes and Pillay (1993) support this notion of affording teachers the opportunity of reflecting through dialogue. In fact Dreyfus (1989) explains further that teachers' levels of reflection improve

when teachers engage in a collaborative dialogue of reflection, thus improving teaching. As indicated throughout the findings chapters, Schön's (1983) reflection in and on action as well as Farrell's (1998) reflection for action were engaged on by all three teachers. Despite the idea that reflective journals offer a great tool for critical analysis of events (Culp et al., 2009) and promote active knowledge development (Lee, 2008) thus promoting professional development, none of the teachers took well to reflecting in their reflective journals. Perhaps it is important not only to consider the usefulness of the tool but also to consider the practical use of the tool. It appeared that teachers found it difficult to pull away from their everyday activities to reflect in a written nature. It may be due to the fact that teachers are already inundated with writing activities, such as assessments and reports that they seem almost unwilling to reflect in writing. There is no doubt that had teachers engaged in regular written reflections, teachers would have spent more time with their thoughts regarding planning and action, resulting in more time engaged in reflective practice. Perhaps the researcher was in large part to blame for not providing a structured framework for teachers to reflect according to. However the fact that the teachers were not reflecting in a written format did not mean that they were not engaging in deep reflective thought. In fact, they engaged in critical reflection (Boody, 2008), the highest level of reflection, whereby they critically examined their value on ESD implementation and the ways in which they attempted to implement ESD. The teachers also reflected critically on the greater good of ESD and its role in learners' development.

Reflection assisted these three teachers in hearing their own and their colleagues' conceptualisations and practices. In many instances the teachers would shift their ideas after hearing their colleagues' ideas. René provides a good example as she voiced her opinion strongly in the beginning regarding whether ESD should be implemented across the

curriculum. As time went by, the three teachers constantly referred back to René's voiced opinion which provided a clear point from which the teachers' opinions contrasted and/or changed. Through reflection, a dialogue was created where, before, teachers were unaware of their own and others' thoughts and practices. Reflection provided these three teachers with an avenue for professional development.

Jay commented that she had become a lot more reflective about SD and Education ESD since the beginning of the research and felt at an advantage above others in trying to grasp an understanding, "*I feel at an advantage because I have been thinking about it now...*" (Pre-lesson interview, 03/06/2009). It seems that the prolonged exposure during the intervention phase encouraged Jay to reflect more on ESD, giving her time to conceptualise it in her practice.

7.4. Supporting educational change towards an ESD focus

7.4.1. The role of constructivism in educational change towards an ESD focus

According to Roelofs and Terwel (1999) knowledge is something that is acquired through engagement with inquiry, active searching and experience. These three teachers acquired their knowledge and practice by searching for an understanding of ESD, trying to implement their understanding into their teaching and reflecting on what they could do differently to implement ESD more effectively the second time round. Considering the fact that the term 'sustainable development' needs to be understood within a context (Huckle, 2001), constructivism offers an explanation as to why teachers need to engage in such new concepts actively within their natural settings. The three teachers attempted to understand and practice ESD within their contexts and drew upon relevant experiences and examples in their

intervention meetings to build an understanding of SD and ESD. It is clear that Vygotsky's claim that meaning is constructed via collaborative engagement in problem-solving, is an appropriate one when considering the social interactions that brought about meaning construction in the intervention phase of this study.

The three teachers' Zone of Proximal Developments developed through the interaction that took place during the intervention phase. Evidence for this claim presents itself when comparing Table 4 and 5 above. Teachers moved from their individual ZPD's closer to their Group ZPD. This was achieved as teachers engaged in cognitive apprenticeship (Nyikos & Hashimoto, 1997) whereby teachers who were members of a group each became responsible for ensuring a mutual understanding across the group. Teachers engaged themselves in critical divergent thinking before converging towards a common understanding (Nyikos & Hashimoto, 1997). It is clear that Vygotsky's explanation of learning being a socio-constructed activity is supported by this study as teachers' ZPDs move towards the group ZPD after interaction during the intervention phase.

7.4.2. The role of situated learning in educational change towards an ESD focus

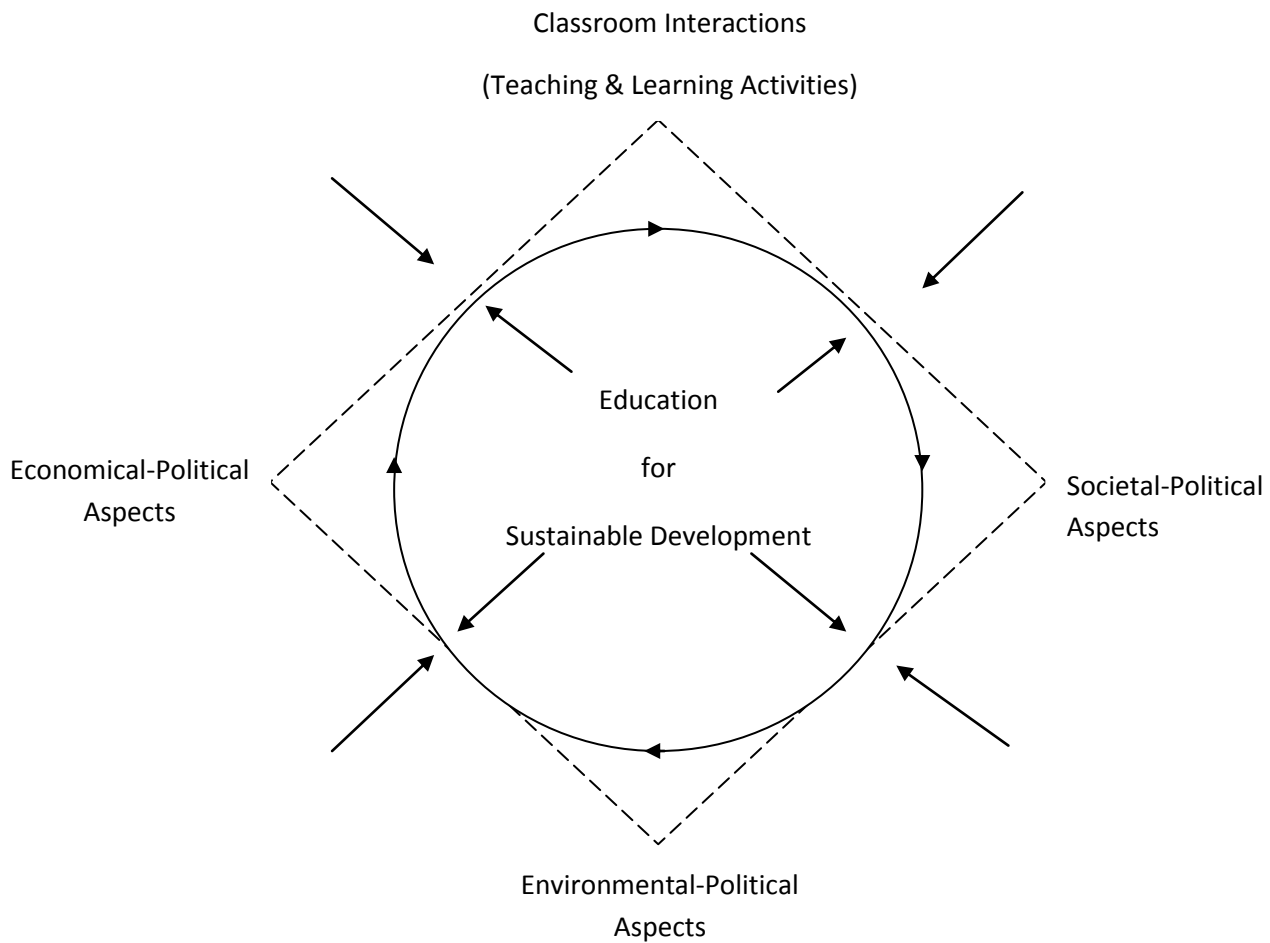
The idea of situated learning is similar to that of Huckle's (2001) argument that SD needs to be understood within a particular context and that people within different contexts would understand SD according to their local issues. Lave (1988) and Roelofs and Terwel (1999) support the need for learning to be situated in a real context whereby teachers' understandings can be applied and not only understood from a theoretical basis. It is not just the context that is crucial in situated learning it is also the social interaction that goes with it (Lave, 1995). The three teachers used a situated learning environment to develop their

understanding and practice of ESD. They did this as they not only implemented their understanding of ESD into the lesson they taught at their schools but they also came together during the intervention phase to develop their understanding of ESD further through collaborative social interaction. According to Billet (1996) situated learning ensures that the knowledge learnt can ultimately be applied to the real situation in which it needs to be applied. As teachers used their real contexts in order to develop their knowledge, situated learning was naturally engaged in. Situated learning was crucial in ensuring that the teachers in this study developed professionally in a manner that was meaningful and sustainable (Billet, 1996).

7.4.3. A model for educational change towards an ESD focus

In exploring the factors that influence ESD implementation it is also important to consider a more specific model that relates uniquely to ESD as an innovation in its' own right. The three teachers constructed their understanding and practice of ESD within their various contexts through social interaction between colleagues. Through this journey with them, I established the following model (Figure 10) which explains the dynamic that exists between the aspects of ESD as well as between the interpretation of ESD and the context in which it is being implemented. Figure 10 is explained below.

Figure 10. Bentham’s model of the ESD dynamic



According to my model ESD occurs within the frame structure represented by the square. The square may involve any classroom context/subject/location. The square simply represents the learning space. Each corner of the learning space incorporates a vital element of ESD that must be engaged in before an educational setting may be seen to possess the dynamics of the ESD circle. This circle implies that there is no beginning or ending to the ESD redefinition process. ESD (circle) is defined by the educational setting (square) around it which must change if ESD (the circle) within it is to change. The square limits the circle and therefore the nature of ESD is dependent on the educational setting in which it is placed. The square’s parameters feature as dotted lines, indicating that the educational setting can be broadened thus increasing the scope of ESD. The educational setting is defined by the

activities that take place at its four corners. To apply this model to my study, take Kay for example. Kay in her first lesson did not have sufficient insight regarding the ESD principles to address ESD holistically in her lesson. Kay focused on classroom interactions building only one strong corner for her conceptualisation of ESD. As a result Kay's educational setting which she had created, did not support the circle inside. As Kay moved along through the intervention into the second lesson she showed consideration for the interaction that exists between the biophysical environment and society. Here Kay had developed two more corners and was starting to hold the ESD circle more convincingly in her practice (square).

7.5. The challenges and barriers facing ESD implementation

As Ellsworth displayed in his model of educational change in chapter 2, every change process involves resistances/barriers to change. These resistant forces come in the form of intrinsic and extrinsic barriers and/or challenges. The teachers in many instances referred to the challenges that faced them and certain dynamics that served as barriers in their attempt to address ESD.

One of the major challenges that all three teachers faced was attempting to implement a new concept into their practice, and more specifically into a learning area that seemingly had very few links with issues of SD, such as mathematics, language and economics etc. ESD requires a cross-curricular approach to ensure that learning is meaningful (McKeown, 2002). Kay favoured the idea of ESD as she felt that it involved all discipline teachers attempting to incorporate issues of sustainability into their taught curricula. Kay felt that more support

needed to be given regarding how teachers could manipulate the existing curriculum to incorporate these issues, further suggesting ‘programme and phase organisers’ be developed for this purpose. Kay stated that a lot of responsibility did lie with the teacher and that perhaps what would be helpful is, if programme and phase organisers outlined specific ESD related topics that would encourage teachers to engage their learning area towards an ESD focus. Ironically these phase organisers that Kay refers to were removed with the revision of C2005. However one may argue that it was only through the engagement in the action research cycle that these three teachers undertook, that a true need for these phase organisers arose and this indicates that perhaps given the right conditions phase organisers can serve their purpose.

Perhaps a further challenge would be to convince all teachers that ESD is something that needs to be addressed through a cross-curricular approach. René for one felt that ESD was not easily incorporated into every discipline and for this reason perhaps it would be a better option to include a separate compulsory subject that focussed on ESD. This precise thinking potentially cripples the implementation and success of ESD, which relies on a cross-curricular approach to ensure meaningful learning. As Kay stated, drawing on skills from different disciplines towards an activity of problem solving, allows for the application of knowledge and skills and thus meaningful learning opportunities.

This study focused on Grade 9 teachers specifically owing to the flexibility that the curriculum of this grade offered. This decision begs the question: ‘Does ESD implementation rely upon a flexible curriculum?’ It would seem that teachers are given more freedom and time to explore SD content issues related to ESD using a Grade 8 and 9 flexible curriculum structure. However aspects of ESD classroom interactions should not be dependent upon the type of curriculum. The reality however is that often teachers are pushed for time to complete

the content packed syllabus leaving very little room for creativity and consideration for ESD teacher and learner activities that promote SD. The very nature of ESD implementation is flexible and thus both the curriculum and the teacher need to accommodate and embrace this.

Finally teachers found it challenging to direct their own professional development. They indicated uncertainty regarding how to get started and what avenues to use. However teachers ultimately used what they had around them to develop themselves further: each other, newspaper articles, teaching resources and even myself. The challenge that faces any group of teachers wishing to develop themselves in any way, lies in what each brings to the group as well as the nature of the external resources. Teachers need to be enthusiastic about their own development, willing to reflect on their practice as they go along in the implementation process, wanting to share their thoughts and experiences, and finally willing to search for and access outside help if required.

7.6. The limitations of the research

This research study is clearly limited in terms of its time frame. The teachers expressed that it was only with the completion of the reflection step of the action research cycle that they felt that they were beginning to know where they were going and what needed to be done. Kay commented that she wished she had felt this motivation a lot earlier in the research study as now she felt that there were many initiatives that she would like to try in her teaching. A longer analysis of this process of development regarding the three teachers' understanding and practice of ESD would offer greater insight into the other avenues that teachers may take

in their development over time as well as provide a true reflection regarding the self-sustainable nature of these three teachers' interactions.

The action research process aims to provide power to the teacher in terms of identifying the teachers as designers and implementers of change. This was true and did take place however the limit regarding this interaction, is that teachers should also be the identifiers of their own areas needing change. In order for such a change process to be sustainable, the need for change needs to be motivated by the teacher. Of course this was not possible in this study due to the nature of ESD as something not known by them. However the study as it is does provide some new insight into how teachers may attempt to develop themselves professionally given the chance.

7.7. Recommendations for further research

Based on the limitations of this research study I would suggest that further research consider a two cycle approach to a similar exploration. These two cycles would consist of two turns of the reconnaissance-plan-act-reflect cycle. These two cycles may add a greater perspective to the various avenues that teachers embark upon and the sustainable practices that they implement when attempting to address ESD in their teaching. I would also recommend that teachers also be invited to engage in the design of the problem and the address of the problem as it would offer great insight into self-directed professional development. This study did not invite the teachers to design the problem due to the focus of the research during the proposal stages of this research study. Research of this nature would provide knowledge as to the successes and challenges facing teachers who aim to develop themselves professionally.

To add to the knowledge base around ESD, I would add that research such as this study, which focuses on teacher understanding and practice of ESD, needs to be complemented by research on the broader school community. By this I mean that research should consider teachers, resources, school management, context and outside influences as factors that affect the teachers' ability to implement ESD. All of these were not examined in my study. Findings of such research would contribute greatly to an informed understanding of what is required to ensure the successful address of ESD in the education system in South Africa.

One of the prerequisites for self-directed professional development is teachers need to be interested in the nature of their own development. My study considered teachers who were interested in SD and wanted to engage in the proposed project. This is not necessarily a condition that prevails naturally. Further research could therefore look at how teachers who are not interested in developing themselves professionally towards a particular innovation actually engage in professional development activities. This will shed light on what is needed to motivate professional development for the implementation of many policies that teachers are expected to implement unwillingly.

One of the findings in my study was that teachers needed a degree of facilitation when attempting to understand and implement ESD. Further research would serve well to explore how subject advisors go about attempting to develop teachers towards ESD implementation.

7.8. Conclusion

This chapter served to present the main findings of this study in response to the three research questions as well as identify the factors that assisted teachers in their development. One of the main findings revealed that all three teachers had moved in their understanding and practice of ESD as displayed by their initial and final ZPDs displayed in Table 5 and 6. Teachers added new principles that had not been considered before in the existing conceptual framework. Another finding revealed that teachers used reflective practice in the form of group verbal discussions to share ideas and resources that would develop their understanding and practice of ESD. Teachers further revealed their need for a facilitator and a context in which collaborative meetings could be encouraged. Teachers showed the tendency to use the resources they had immediately around them to develop their understanding and practice of ESD further. Although teachers did indicate that they would appreciate phase and programme organisers to assist them in their implementation. Teachers by the end of the study showed great motivation for the further implementation of ESD indicating that the action research process was an empowering one towards their professional development. Teachers expressed the benefit of the social interaction with their colleagues. ESD is a new term to most teachers. Action research and reflective practice offer an empowering opportunity for teachers to become familiar with the term in their practice. Teachers' capabilities and therefore needs must be considered in attempting any change process that is to eventually be deemed sustainable. Teachers offer great support to one another, by mere biographical and professional diversity and should therefore not be underestimated.

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