PROFESSIONAL DEVELOPMENT IN ENVIRONMENTAL EDUCATION: CASE STUDIES IN PRIMARY SCHOOLS

Thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF EDUCATION at the University of Stellenbosch.

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DECLARATION

I, THE UNDERSIGNED, HEREBY DECLARE THAT THE WORK CONTAINED IN THIS THESIS IS MY OWN ORIGINAL WORK AND THAT I HAVE NOT PREVIOUSLY IN ITS ENTIRETY OR IN PART SUBMITTED IT AT ANY UNIVERSITY FOR A DEGREE.

ABSTRACT

This study was contextualised in the broad process of change and transformation in education in South Africa In this study I investigate how SWAP (Schools Water Project) as a resource could possibly enable teachers to use the local environment as a means of promoting environmental learning in their classes: a professional development process for teachers. The purpose of this study is to understand and give meaning to the processes of professional development that might be made possible through using SWAP as suggestion materials for teaching about water quality issues in a local water source close to schools. This process was framed in my research question, "could an in-service process using SWAP as learning support material enable professional development in teachers working at rivers in a local environment?" It is organised as a number of delimited or bounded case studies within an interpretive paradigm. In this study the bounded systems are primary schools represented by a selection of teachers from the participating schools. The research process involved a short period of training for teachers to familiarise themselves with the resource, a supported field trip to provide an opportunity for hands on application and follow-up support visits to assist teachers with field trips and implementation of SWAP activities in their classroom practice.

Data was generated at various stages and suggests that materials are an important facet of professional development and the SWAP materials proved to be a useful tool

in this regard as evidenced through the development of new skills, acquisition of new knowledge and new ways of teaching. Issues that emerged were that in-service processes need to be organised over long periods of time and support is needed at school level to ensure meaningful implementation of curriculum innovations. An important insight developed is that professional development processes in schools occur in complex systems and are thus influenced by many factors that either support or hinder the process. These factors need to be recognised as impacting factors and taken into account during such processes so that they can benefit the process maximally and not hinder initiatives.

ABSTRAK

Hierdie studie is globaal geraam binne die transformasie proses in onderwys in Suid Afrika, met die fokus op die nuutgevonde belangrikheid van omgewingsopvoeding in die hersiene Kurriulum 2005. Die studie fokus op hoe 'n waterkwaliteitmoniteringstoetsstel (SWAP) moontlik kan bydra tot leerkragte se gebruik van die onmiddelike omgewing om omgewingsopvoeding in die klaskamer te bevorder; 'n professionele ontwikkelingsproses vir leerkragte. Die doel van die studie is om die prosesse betrokke by die professionele ontwikkeling van leerkragte te verstaan, verklaar en daaraan betekenis te verleen. In die geval is die prosesse gekataliseer en ondersteun deur SWAP materiaal te gebruik om onderrig te gee oor waterkwaliteitknelpunte wat dalk bestaan rondom 'n varswaterbron naby die skool. Hierdie proses word gestel in die navorsingsvraag: kan 'n indiensopleidingsprogram wat SWAP as leerondersteuningsmateriaal aanwend bydra tot die professionele ontwikkeling van leerkragte om hulle onmiddelike omgewing as 'n onderrigmiddel te gebruik? Verder, hoe verloop hierdie proses en wat verhinder of ondersteun die proses? Wat is die invloede op die leerkragte wat professionele ontwikkeling ondersteun of verhinder?

Die navorsing is georganiseer in die vorm van 5 gevallestudies binne 'n interpretivistiese navorsingsraamwerk. Die navorsingsproses het 'n kort werkswinkel vir leerkragte, 'n uitstappie na hul naaste rivier waar hulle die toetse gedoen het en 'n kritiese refleksie daarna, ingesluit. Die leerkragte is verder bygestaan deur

opvolgbesoeke waar die fasiliteerder hul bygestaan het op uitstappies na die rivier en klasbesprekings.

Data is gegenereer tydens verskeie stadiums van die proses en wys dat SWAP materiaal 'n baie goeie ondersteuning was vir die ontwikkeling van nuwe vaardighede, die verkryging van nuwe kennis en die gebruik en ontwikkeling van nuwe strategiee in die klaskamer.

Om sinvolle implementering van kurrikulum innovasies te verseker het ek gevind dat sulke professionele ontwikkelings projekte oor langer periodes geimplementeer moet word en dat gekonsentreerde ondersteuning by die skool nodig is om te verseker dat die indiensopleiding optimaal ondersteun word.

'n Baie belangrike bevinding was dat die professionele ontwikkelingsproses plaas vind midde in die komplekse sisteem van 'n skool wat deur 'n groot aantal faktore beinvloed word, beide ondersteunend of afbrekend. Hierdie faktore/invloede moet erken en in ag geneem word as beinvloedende faktore sodat die proses in leerkragte maksimaal kan gefasiliteer word.

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Now, on a more personal level, I would like to dedicate this thesis to my mother and father who has stood by me trough thick and thin. Chris, my promoter, I thank you sincerely that you never gave up on me. Thank you for correcting the English and listening when I think. I hope you drive a mini Cooper one day soon!

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INTRODUCTION

BACKGROUND TO THE RESEARCH

The introduction of Environmental Education into the formal curriculum of schools in South Africa has provided many challenges for teachers related to implementation processes in schools (Lotz-Sisitka 2000). Environment became part of the formal education policy as part of Curriculum 2005 and is also included in the most recent curriculum documents. Lotz and Robottom (1998) indicate that many teachers appeared to lack capacity regarding implementation of Environmental Education, also that there seems to be a lack of resource materials and that teachers did not have the knowledge or time to develop new materials.

When staff members of the Environmental Education Programme, University of Stellenbosch (EEPUS), were approached by the Cape Metropolitan Council (CMC) we recognised this as an opportunity to investigate a way of possibly addressing these problems. During informal communications with teachers at surrounding schools, many teachers expressed a need for background knowledge of, techniques and resources, to make use of the local environment to facilitate environmental learning.

The Cape Metropolitan Council was looking for a project that would raise awareness about the precious resource, clean fresh water, and we saw the opportunity to do two things at the same time: 1) present a well researched and tested resource regarding

Environmental Education in schools, and 2) while implementing this programme, raise awareness about the fresh water issues in the Western Cape.

Lotz-Sisitka (2002) describes this lack of resource issue as linked to curriculum development:

> [...]a 'disabling' of participation in school-based curriculum development work appears to be the failure of the system to resource curriculum activities in schools with appropriate learning support materials for teachers to draw on in designing relevant learning programmes. Added to this has (sic) been professional development processes that were often disembedded from the context of schooling and the real challenges teachers face in classrooms.

The Learning for Sustainability project (1997-2000), discussed in paragraph 1.3.4.3 highlighted this lack of background knowledge and skills regarding the local environment as well. This project aimed to clarify the government's environmental policies in relation to education. They focussed on the concept "sustainability" and clarifying this in terms of curriculum work. As a departure point the project aimed to link ecosystem conservation with socio-economic development. Lotz-Sisitka (2002) stated that they encountered difficulties in terms of teachers' limited knowledge of local issues, and the fact that teachers work and live in contexts where the much stronger discourse of economic development does not clearly support or link with environmental objectives. She further explains "teachers found it difficult to see actual options for sustainable development in a local context".

With this in mind we aimed to investigate how SWAP (Schools Water Project) as a resource could allow or enable teachers to use the local environment as a means of promoting environmental learning in their classes: a professional development process for teachers.

We felt that, in areas where resources for teaching are quite scarce, an often overlooked fact was that many schools have a water body close to them. The strong motivational factor therefore was that the local environment is a resource that is available to many schools. This resource is often under utilised because of a lack of knowledge and skills to "unlock" this resource. In this study the Schools Water Project kit (SWAP-kit) would be used as an environmental learning support programme to facilitate and enable the use of the local environment as a vehicle to foster the professional development of teachers in the area of Environmental Education

In short: the purpose of this study is to understand and give meaning to the processes of professional development that might be made possible by using SWAP as a tool to enable the use of the local environment. My research question is: can an in-service training process using SWAP as learning support material enable professional development in teachers working at rivers in a local environment?

The research process involved a short period of training for teachers to familiarise themselves with the resource, a field trip to provide an opportunity for hands on

application and follow-up support visits to assist teachers with field trips and implementation of SWAP activities in their classroom practice. Data was generated at various stages of the process as described in Chapter 3.

CHAPTER OUTLINE

In Chapter 1 I present an overview of Environmental Education globally and trace development of Environmental Education processes in South Africa. I discuss why the SWAP materials could be used as a resource tool to address the above stated problem (lack of resource materials for EE processes). In Chapter 2 I review literature related to the theory and approaches behind professional development and in-service training. Chapter 3 is devoted to the research design and methodology I used and in Chapter 4 I present the data I generated in the research process in the 5 different case studies of schools involved in the programme. In Chapter 5 the discussion and analysis of each of the case studies is done and lastly, in Chapter 6 I make some suggestions for further research.

CHAPTER 1

ENVIRONMENTAL EDUCATION IN THE FORMAL CURRICULUM IN SOUTH AFRICA

1.1 INTRODUCTION

This chapter presents a broad overview of Environmental Education and its development in the global and national arenas over the past number of decades in order to position the research problem in the field.

1.1.1 TO DEFINE OR NOT DEFINE

To ensure open processes of engagement, it may be useful at this stage not to start this chapter with the narrow definitions of concepts such as the *environment*, *local environment*, and *Environmental Education*. I choose not to define *Environmental Education* nor find the need to define it, as "defining in our usual, modernistic sense of definition may be problematic, as definition tend to limit and close rather that generate and open" (Doll 1993:280). We will rather explore how Environmental Education has been defined and used over the past decades and how the interpretation of this term has evolved and is still evolving. The following chronological record of international and prominent South African milestones, including the different views on Environmental Education that accompanied each phase, represents this evolution.

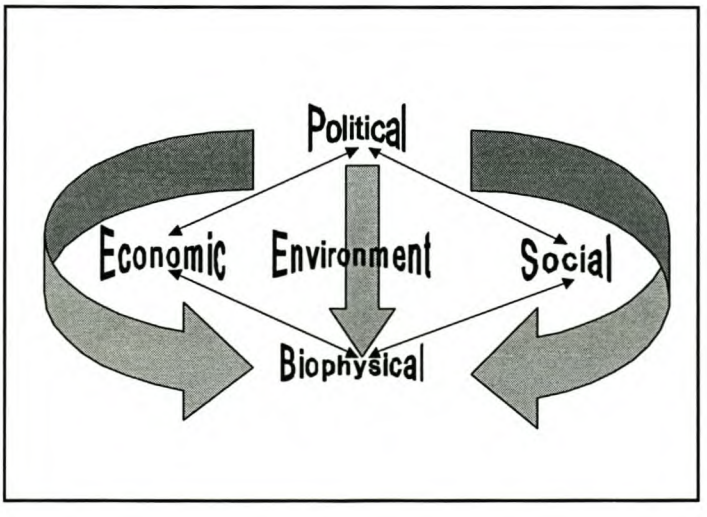
1.1.2 THE CONCEPT *ENVIRONMENT*

Although we are not defining concepts as such, clarification of the concept *environment* is essential before continuing with the milestones in Environmental Education. O'Donoghue, in the Share-Net booklet *Environment and methods* (1995), set out the four different dimensions of the environment. Fig. 1.1 is an adapted version of the diagram set out by O'Donoghue. This diagram explains that for the purposes of this thesis the concept *environment* will include four dimensions:

- Economic - Involves people, jobs and money
- Political - Deals with issues of power, policy and decisions
- Social - Created by people and their interaction with each other
- Biophysical - Life-giving source of our existence without which we will all die.

Formerly, people perceived the concept *environment* to only refer to the biophysical. In recent years, the perception has changed to become commonly accepted that these four dimensions exist in intricate closeness and interdependence, as the arrows in figure 1.1 indicate.

FIG. 1.1 THE FOUR DIMENSIONS OF THE ENVIRONMENT (SHARE-NET 1995)



1.2 ENVIRONMENTAL EDUCATION: INTERNATIONAL MILESTONES

The global response to the environment in crisis found its expression in a number of landmark conferences that started in the 1970's and eventually developed into an educational focus. I discuss some brief details below.

1.2.1 INTERNATIONAL CONFERENCES

Numerous conferences, spanning several decades, have led to the status quo in Environmental Education. In 1972, Stockholm hosted the United Nations Conference on the Human Environment. This was the first world environmental conference and led to the establishment of the United Nations Environment Programme (UNEP). The first international workshop on Environmental Education was held in Belgrade in 1975 and in 1977, the first Intergovernmental Conference on Environmental Education was hosted in Tblisi.

These three conferences were part of the UNESCO/UNEP International Environmental Education Programme of that decade. The last two produced notable statements of aims and guiding principles for Environmental Education notably the *Tblisi Principles of Environmental Education* and *The Belgrade Charter* that became an influential policy statement, (Naidoo, Kruger and Brookes 1990:13).

A number of "landmark" conferences also occurred in the 1980's. The 1980 World Conservation strategy (IUCN/UNEP/WWF, 1980) called for the conservation and sustainable use of life support systems, bio-diversity, and renewable resources. Tilbury (1995:197) states that this conference gave *sustainability* currency and redirected the goals of Environmental Education to what is referred to as *education for*

sustainability. The 1983 World Commission on Environment and Development and the 1987 Brundtland Commission followed that. According to Schreuder, Le Grange and Reddy (1999:127) the Brundtland commission coined the term *sustainable development* to meet the needs of both conservation and development. Also in 1983, the International Conference on Environmental Education was held in Moscow. At that conference the Tblisi principles were revisited and affirmed as sound guidelines for the development of national Environmental Education programmes (Irwin 1990a: 14).

The most important Environmental Education event in the 1990's was the first Earth Summit, held in Rio de Janeiro in 1992. The document *Caring for the Earth: A strategy for sustainable living* (drawn up in 1991) was firmly embraced. Tilbury (1995:198) notes that education for sustainability was established as the central goal of Environmental Education in the 1990's.

1.2.2 BEFORE THE CONFERENCES

Causality leads us to explore a little into the time before the international conferences. Naidoo, Kruger and Brookes (1990:13) states that the pre-amble to these conferences were the writings of authors such as Leopold (1949), Carson (1962), Marshall (1968) and Ehrlich and Ehrlich (1972), who brought the threat of environmental degredation to the attention of the general public. Irwin (1990a:12-13) reveals even earlier evidence of Environmental Education: the pharaoh, Ikhnaton, sent scribes to teach farmers not to plant crops too close to the banks of the Nile as the natural vegetation prevented erosion of the banks and loss of productive farmland. The philosopher-biologist Haekel coined the term *ecology* in 1874 and Irwin (1990a: 4) reminds us that at the

same time there were other critical writers such as Spencer, Thoreau, Wordsworth, and Engels. Engels' concern for the despoiling of nature was largely on the grounds of the deprivation it would cause for future generations.

In the next section I draw largely on the work of Irwin (1990) and Lotz-Sisitka (2002), focusing on Environmental Education and its development in South Africa.

1.3 ENVIRONMENTAL EDUCATION IN SOUTH AFRICA

1.3.1 EARLY DEVELOPMENTS

Non-governmental conservation organizations (NGO's) and state conservation agencies played a pioneering role in the practice of Environmental Education in South Africa. Environmental Education, in the modern sense of the word, only reached South Africa in the 1970's.

Irwin (1990b:6) states that organizations such as the Wilderness Leadership School, the Wildlife Society of Southern Africa, and others, had by the 1960's recognized the importance of educating people about their environmental responsibilities and had begun to set up programmes to put these into effect. The Wildlife Society's Umgeni Valley Project became a model for work being done on integrating the concept of evaluation with Environmental Education.

1.3.2 ENVIRONMENTAL EDUCATION ASSOCIATION OF SOUTHERN AFRICA

In 1982, at Trevorton College, in Kwa-Zulu Natal, the first International Conference on Environmental Education in South Africa was held. Representatives from four different

continents attended. The Environmental Education Association of Southern Africa (EEASA), which has subsequently played a significant, catalytic, developmental and co-coordinating role, was formed. EEASA started the first regular publication in Environmental Education in South Africa. They have co-coordinated numerous workshops, seminars and conferences and liased with government departments, conservation agencies, non-governmental organizations and liberation movements in South Africa and neighboring countries. One of the most significant ideas that this association promoted is that we share one environment and the better we share and collectively care for it, the better future all of us are likely to have.

1.3.3 TERTIARY ENVIRONMENTAL EDUCATION

Environmental Education at tertiary level, for teachers and decision makers, was pioneered in the former Bophuthatswana in the early 1980's. The University of Buphuthatswana and all five colleges of Education offered a three-year course in Environmental Education. The Worldwide Fund for Nature (WWF) sponsored the first Chair of Environmental Education at Rhodes University, which enabled research priorities to be identified and much needed research to be initiated (Irwin 1990b:4-6). Currently, Environmental Education is offered at many universities at both pre- and post-graduate levels. The University of Stellenbosch is the only residential university offering Environmental Education at under graduate level, an it is also compulsory at Post Graduate Certificate level.

Following the growth of Environmental Education from NGO's into colleges and universities, it was only a matter of time before it started to impact the formal curriculum in schools. This leads us to our next section where we explore how Environmental Education made its way into the formal curriculum in schools in South Africa.

1.3.4 ENVIRONMENTAL EDUCATION IN THE FORMAL CURRICULUM

In South Africa, the 1989 White Paper on Environmental Education was the beginning of the process to include Environmental Education in the formal curriculum. It embraced the Tblisi Principles and the internationally accepted concept of Environmental Education at that time. Viljoen (1990:7) states that this document clarified the concept of Environmental Education regarding its definition, principles, aims and objectives and stressed the holistic nature of Environmental Education as well. Some major events that followed this document were the EEPI, EECI and NEEP, all of which are discussed in detail in the following section. Lotz-Sisitka (2002) explored the development of Environmental Education in South Africa from 1992-2002 in her chapter *Curriculum Patterning in Environmental Education: A review of developments in South Africa.* I largely draw on this work to shed light on the policy and curriculum developments in South Africa in the last decade. The development is documented through a number of initiatives and projects.

1.3.4.1 Environmental Education Policy Initiative

Lotz-Sisitka (2002:97-98) postulates that the Environmental Education Policy Initiative (EEPI) introduced a participatory policy making process to Environmental Education

curriculum work in South Africa just prior to, as well as after, the first democratic elections (1992-1995). Schreuder (1994a) explains that this initiative was the result of a mustering of a strong network of expertise, a well-developed and supportive non-formal Environmental Education community and well established community structures with the explicit goal to influence policy-making processes. This highly representative group was called together by the EEASA and the education section of the Department of Environmental Affairs. Schreuder (1994) explains that they adopted a participatory process approach to education policy development, contrary to the usual management-hierarchical approach to policy development, because unless a wide range of people were to accept ownership of this policy, implementation could be problematic.

1.3.4.2 Environmental Education Curriculum Initiative

From the EEPI evolved the Environmental Education Curriculum Initiative (EECI), 1996-2000, which Lotz-Sisitka (2002:97-98) describes as a state-civil society partnership enabling staff from provincial government education departments and Environmental Education practitioners around the country to work together to debate and define Environmental Education in the emerging new school curriculum, known then as Curriculum 2005. Environment, at this point, was included in Curriculum 2005 (policy) and hence a curriculum thrust was needed rather than a policy thrust. The EECI included higher education institutions (national) and education department officials. Environment was considered strongly by this group for inclusion into teacher education curricula to enable teachers to implement environment in Curriculum 2005.

1.3.4.3 Learning for Sustainability Project

Following the EECI was the Learning for Sustainability Project (1997-2000). This was a donor funded pilot project which focused on the professional development of teachers to enable them to enhance their skills for learning programme development in a context of rapid curriculum change in two provinces.

This led to the current state of affairs where Environmental Education, having first been part of the original Curriculum 2005 as a phase organizer[1], is now in the RNCS as one of the three principles (social goals) of the curriculum and environment is integral to the different learning areas. This gave rise to the National Environmental Education Project which addresses the new emphases and was developed to support the implementation of environment as a curriculum concern in the General Education and Training phase.

1.3.4.4 National Environmental Education Project

The National Environmental Education Project for General Education and Training (NEEP-GET) is the most recent initiative. This is a large-scale donor funded initiative aimed at providing professional development to curriculum advisors and teachers to enable the integration of environmental learning in schools. NEEP-GET highlights the importance of Environmental Education in Primary schools. These policy changes

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[1] A theme that spans multiple learning areas for a specific length of time.

created a positive climate for the use of SWAP-kits as these are a resource for teachers and teachers indicated a need for learning support material in the area of Environmental Education. (NEEP-GET pilot report)

1.4 VIEWS ON ENVIRONMENTAL EDUCATION IN SOUTH AFRICA

Before presenting the history of different types of Environmental Education approaches, I offer a broad framework in which to interpret these. Education *in*, *about,* and *for* the environment, although now already part of the dominant discourse in Environmental Education, was the result of Lucas' 1979 PhD dissertation, in which he develop this three-fold classification of Environmental Education (Greenall Gough 1993).

1.4.1 EDUCATION *IN*, *ABOUT*, AND *FOR* THE ENVIRONMENT

Lucas argues that all Environmental Education programmes could be classified as education *in, about*, and *for* the environment, or a combination of the three, according to the goals of the programme. Lucas uses the order of presenting the three types as *in, for,* and then *about* (Lucas in Greenall Gough 1993). The order of the above (in, for and about) in most subsequent writings is usually *in, about*, and then *for.* The reason for this could be that *for* seems to be the one mostly chosen today, since it has notions of socially critical education, explained later in the text.

1.4.1.1 Education *in* the environment

Lucas (Lucas in Greenall Gough 1993:101) distinguishes between the concepts as follows. Education *about* and *for* are classified according to their goals and objectives, but education *in* the environment is characterized by the use of a particular pedagogic technique. Any programme that took place *in* the environment, that is in this case the world outside the classroom, would fit the logical criterion for this classification. This technique speaks of a fundamental belief that the concrete representation of phenomena discussed, assists in the attainment of programme goals. Educators therefore use education *in* the environment in conjunction with either *about* or *for*.

1.4.1.2 Education *about* the environment

Environmental programmes that are designed to provide information concerning the biophysical environment embody this classification. The goals are purely cognitive, with the exclusion of value judgments (Lucas 1993:98). Programmes that can be classified as education *about* would have objectives such as knowledge about natural systems and processes. Fien (1993:15) notes that "integration of natural and social systems is often neglected in education *about* the environment". In South Africa, geography, science and biology have been situated in this category for an extended period.

1.4.1.3 Education *for* the environment

Lucas (1993:101) presents education *for* the environment as programmes that have a goal of producing particular overt behaviors, perhaps habitual responses. This speaks of fostering and constructing an ethos of values and norms that govern behaviours and

decisions, in this case pertaining to our human environment in the broadest sense of the word.

Lucas (1993:101) gives this example:

> The logical distinction between education *about* and education *for* the environment is that, for example in *about* an air pollution technician need not be taught anything about the environment with which he is concerned professionally, he need not know about the effect of air pollutants on human health, on green plant productivity or on buildings and paintings. All he need be taught are skills: the correct operation of his instruments and how to compare the results with a set of standards."

Lucas (1993:101) debated further that it is still an empirical question whether development of attitudes of concern for the environment increases the effectiveness of programmes for the development of a quality environment. Almost a decade later we are convinced that attitudes are crucial for influencing human behavior towards the bettering and conservation of the natural environment, the social-political transformation and calls for justice. Schreuder (1995a:21) sets out that education *for* the environment is inherently counter-hegemonic because it

> [...]constitutes a challenge to and critique of the way that uncritical curriculum theories and practices serve to reproduce values of the dominant social paradigms and of political agendas.

This strongly corresponds to socially critical education goals discussed in 1.4.3. Schreuder (1995:22) writes that the EECI was an opportunity to establish key elements of education *for* the environment as a matter of policy in the formal curriculum.

As Environmental Education developed in South Africa, different approaches also emerged over time. Each of the following approaches can inherently be identified as either having an explicit focus *in, about* or *for* nature, or a combination of the three.

1.4.2 ENVIRONMENTAL EDUCATION APPROACHES

There were two main approaches that need mention here: Conservation Education and Outdoor Education.

1.4.2.1 Conservation Education

Environmental Education in the modern idiom first emerged in South Africa in the 1970's. Before that, the efforts were mainly concentrated on education, with apparently limited success, about biophysical issues such as soil erosion. This was termed *Conservation Education*. Conservation Education concentrated on the responsible use of natural resources and basic ecology. It seldom concerned itself with social, political or even the built environment. Irwin (1990b:5) states that Conservation Education continued to be an integral part of Environmental Education until the 1990's.

1.4.2.2 Outdoor Education

Before the 1970's, Irwin (1990b) states that the concept of *Outdoor Education* was readily confused with Environmental Education – sometimes on purpose. Some conservative educators in South Africa were alarmed by the potential of Environmental Education to address social issues and saw a possibility of sanitizing its socio-political dimensions by conflating it with Outdoor Education, which was perceived as being free

of such notions. In the 1990's, these two viewpoints and approaches were implemented simultaneously in different arenas. Often, there was overlap between teaching *for* the environment (socio-ecological issues) and Outdoor Education focused on *about* the environment (ecological understanding). It became evident in the case studies in Chapters 4 and 5, how teachers prefer to stay away from issues of political and social power and rather focus solely on saving the *environment* – pertaining to the biophysical only. That could indicate that they themselves either do not understand that it is the economic, social and political areas that give rise to the crises in the biophysical environment or that these are the things that you have to change in order to save the biophysical environment, not something in the biophysical environment itself! During the 1990's, a stronger focus on social issues was evident in South Africa in Environmental Education.

1.4.3 SOCIALLY CRITICAL EDUCATION AND THE ENVIRONMENT

Robottom and Greenhall Gough (1993:310) explain that both Environmental Education and socially critical education seek to empower students to critically participate in a democratic transformation of society, by providing them with a map of what a better society might look like. The rise of socially critical education therefore went hand in hand with the political changes in South Africa during 1985-1994 and after that. Janse van Rensburg (1995) describes Environmental Education as a "responsive process of change", involving the development of the capacity to "collaboratively develop capabilities (tools, resources, action competencies) to deal with and encourage change in local contexts". Schreuder et al (1999:128) endorses this view by saying that

Environmental Education should be viewed as processes of change towards critically addressing environmental risks. The socially critical stance towards education is discussed in detail in Kemmis, Cole and Suggett (1983) and an example of the use of this in Environmental Education can be found in Greenall Gough and Robottom (1993) in their discussion of a water quality monitoring project.

In South Africa socially critical education and its characteristics as a steering idea in Environmental Education, was incorporated during the Learning for Sustainability project. Lotz-Sisitka (2002:116) states that this project highlighted the potential and limitations of socially critical education in Environmental Education, as discussed in Janse van Rensburg and Du Toit (2000).

1.4.4 COMPARING VIEWS ON ENVIRONMENTAL EDUCATION

In reviewing Lucas' three classifications of Environmental Education, one can draw parallels between Outdoor Education, Conservation Education and education *about* the environment, being value free and learning about nature and conserving nature as it is. These approaches do not focus on or integrate the social, political and economic aspects of the human environment as part of their teaching about the concept of environment. Refer to Fig. 1.1.

Education *for* the environment can be strongly linked, not only to socially critical education, but also to the reigning view regarding Environmental Education in general. For example:

> Environmental Education as a response to environmental crises should therefore emerge as a process of reflective engagement and transparent critique making visible the

> ideological roots of many of the myths, fallacies and paradoxes characterizing modern education in a changing era. (Lotz 1994 in Schreuder 1995a:8)

A further link between Environmental Education and socially critical education is the fact that they are both counter-hegemonic. Fien (1993), in Le Grange and Reddy (1997:12), elaborates on this point:

> Environmental Education can be seen as counter hegemonic in nature. Environmental Education challenges the role of schools as agencies of cultural and economic reproduction.

Environmental Education, which addresses social issues, values and ecological problems as an integrated process, has the potential to challenge and examine hegemonic structures and systems the often underlie environmental problems. Examples of such approaches have been emerging in current times, but more nature oriented approaches which ignore social aspects and issues related to environment still exist.

In the second part of this chapter, I explain what the content, nature and objectives of the Schools Water Programme (SWAP) are and how and where SWAP fits in this map I have drawn of Environmental Education in South Africa. I discuss details about the history of SWAP, the reason for its fresh water focus and exactly what the programme entails.

1.5 THE SCHOOLS WATER PROJECT

1.5.1 HISTORY OF SWAP

Schreuder (1995a:8) states that the Schools Water Project

> [...]is an example of an initiative based on the principles of both wide participation, critical reflection, social construction of knowledge, the development of an environmental ethic and political literacy, and innovative teaching strategies.

De Lange (1997:189) describes SWAP in her thesis as "a process of investigation into, and dialogue about environmental issues" (translated from Afrikaans).

During this project, I found that SWAP could be a catalyst that leads to investigative discussions around social, political and economical concerns. The use of SWAP therefore facilitated the opportunity to challenge paradigms and hegemonic thought structures in a manner that is simple enough for even a child to participate. On a different level, it acted as an example to teachers regarding what an Outcomes based Environmental resource could look like. Through using SWAP, they gained new skills and insights regarding learning programmes a professional development process for them.

SWAP started as one of the projects of the Environmental Education Programme of the University of Stellenbosch (EEPUS). It started early in 1992 and was linked, at that stage, on an international level with Global Rivers Environmental Network (GREEN) and on a national level with UMGENI WATER in Kwa-Zulu Natal.

Schreuder (1998) states that SWAP was never intended to be a clean-up campaign for rivers (as would be typical of Conservation Education), but that the development of the kit

> [...]was initiated in response to a need to improve school curricula by enabling teachers to develop learning programmes which focus on relevant local issues, and to empower young people to become actively involved in managing local natural resources.

From its inception in 1992, SWAP grew to a national programme in 1998 with children using the "tools of science" to monitor the quality of fresh water in many catchments. During that time Schreuder (1998) defines the Schools Water Action Project (SWAP) as it was known at that stage as non-formal, cross-curricular school programme aimed at involving children in monitoring and auditing the quality of water in streams, rivers and wetlands.

The acronym, SWAP, has also gone through some changes as the period and the scope of the SWAP programme has changed, developed and expanded. The acronym originally stood for "Stellenbosch Water Analysis Project". The programme expanded and grew to include schools outside Stellenbosch, hence the name changed to "Schools Water Analysis Project". Later it evolved again to "Schools Water Action Project" and during the partnership with the CMC it is being used as "Schools WAter Project".

1.5.2 KIT DEVELOPMENT

When the project started, the SWAP kit was not in the form in which I used it now. De Lange describes this process in her thesis.

FIG 1.2 LEARNERS READING THEIR LAB TO INTERPRET TEST RESULTS

Presently, the resource for Primary schools consists of a small jam-tin including various tests, a teacher's guide with worksheets and A1 posters (Laboratories) on which results are reported and interpreted. (Appendix A) The tests investigate chemical, biological, and physical aspects of water quality, and the results provide indicators of water quality in fresh water bodies.

1.5.3 THE SPECIAL NATURE OF SWAP

Firstly, SWAP does not only consist of tasks of an active enquiring nature (in other words, it does not merely take you outdoors on an educational outing *in* the environment), but it also provides information to the teachers and learners that assists them to assess and interpret the information that they assemble and bring into being through the tests and investigations. Let us take the pH test as an example.

Instead of the pH worksheet merely stating that the pH of Black Rivers should be 5.5, the laboratory (A1-poster) would refer the learner to talk to some of the "scientists" in the Catchments and Health Risk Laboratory to find out what could influence the pH of the river. Furthermore, whether the pH is normal or not will be affirmed by the "scientists" in the Water Life Laboratory, because the type of insect larvae and invertebrates that they find would also indicate if the pH is normal or abnormal. The water life laboratory would also provide more information on the influences of an abnormal pH on the living creatures. Therefore, instead of only actively doing a test in the outdoors and finding a yes or no answer, the learners are encouraged to interpret and explore their information. This then leads to the second special feature of the SWAP resource, the actual important discussions in the classroom concerning social, political en environmental issues that have an influence on the pH of the river.

Thirdly, it is evident that the different laboratories therefore function as independent units, but simultaneously as inter-related, mutually informative units that demonstrate the interdependent nature of the river and thus the environment as a whole. This creates a flexible resource because you can either use one specific laboratory or any selection of the rest or all of them simultaneously.

The value of the resource is this: through analysis and discussion of the results of these simple tests, learners (and teachers) may come to a better understanding and awareness of local environmental issues related to water quality. The fifth contributing aspect to the success of this specific water quality monitoring tool is water.

The primary focus, however, of this particular study was to investigate the professional development teachers experienced while using a resource like SWAP.

1.6 FRESH WATER AS FOCUS IN ENVIRONMENTAL EDUCATION PROGRAMMES

Schreuder (1998) reports that during the 1980's and 1990's there was an explosion of water quality monitoring networks, programmes and resources all around the world. Different reasons can be sought for this but maybe the one that sits at the core of it all is the significance of fresh water for maintaining a high quality of life for humans, as well as non-human species.

1.6.1 TWO PERSPECTIVES: EDUCATIONAL VS SOCIO-POLITICAL

The importance of freshwater as a focus for educational programmes is discussed from two perspectives:

- The educational perspective
- The socio-political perspective

1.6.1.1 Educational Perspective

I support Schreuder (1998), in this argument that fresh water is an excellent educational focus for a number of reasons. Firstly, and sometimes the most obvious and overlooked reason, is the fact that children love playing with water. The fresh water focus, presented in the active learning fashion of the SWAP kit, naturally interests children (and adults).

Secondly, rivers are like the blood system of the community, and by analysing the chemical, physical and biological properties of the water, learners can learn about the "diseases" caused by affluence, poverty or neglect among the communities in the catchments. Thirdly, rivers can act as a link between schools in the same geographical area, monitoring different areas of the same river. Schreuder (1998) highlights that, in South Africa, this is particularly significant, as our communities have been deeply divided previously. The earliest SWAP programmes introduced schools "on different sides of the river" to each other during the project.

Lastly, and maybe most importantly, I agree with Schreuder (1998) that

> [...]focusing on rivers makes educational sense, as it gives teachers the opportunity to develop curricula that respond to local community issues and problems. There is hardly anything that happens, or which is wrong, in a catchment which is not reflected in the rivers.

Ironically, in a country where educational resources are not always readily available, it is often overlooked that *every* school has a *local environment* surrounding them. My aim is to show that SWAP can serve as a tool to source information from the local environment and use it as a resource to facilitate both environmental learning in classrooms and, indirectly, professional development for the teachers involved.

Schreuder (1998) reveals some of the societal "illnesses" that can be identified in the rivers.

> Poverty, poor socio-economic conditions, ignorance, over-consumption, pollution, poor agricultural and industrial practices and mismanagement of natural resources are some of the factors which are directly reflected in the rivers and the quality of the water.

These problems lead me to the socio-political perspective.

1.6.1.2 The socio-political perspective

The rising panic about the availability of fresh water for a growing population is an issue of great concern. In fact, it is exactly because of this concern that the CMC contracted EEPUS to facilitate the 2001/2002 SWAP project.

A possible focus within a SWAP programme could be the mismanagement, as well as the equitable distribution, of this resource. Issues of previous political history include how rivers were used as a separating device rather than of a means of uniting communities. Issues of social equity, industrial and agricultural pollution, poverty vs. affluence, over-consumption, health risks, mismanagement, environmental degradation, species loss and the like can be identified by the learners and teachers when they understand the language of rivers. This usually leads to discussions on issues of power, economic and social concerns and how they are related. Although each of these issues could originate in different dimensions of the human environment, (Fig. 1.1) all of them impact on our biophysical surroundings and that is where the SWAP-kit tests identify the different impacts on the river.

I have experienced, and it is supported by De Lange's dissertation on SWAP (1994), that SWAP can support teachers to mediate true critical investigations challenging the hegemonic social structures and thinking styles. The socio-political and educational perspectives are therefore addressed simultaneously.

Schreuder (1998) emphasises the importance of this process:

> The crucial importance of empowering people through the development of political literacy can not be over-emphasized; people need to be made aware of the powers controlling and managing natural resources through a socially critical approach to education.

From this quotation it is evident that the socio-political and educational perspective are almost inseparable, and that maybe it is more beneficial to not even try to separate the two in the classroom.

1.7 ADAPTABILITY OF SWAP

The new curriculum expects teachers to develop their own learning resources. Wade (1996:12) accuses the dominant approach to staff development of merely spoon feeding pre-packaged activities to teachers and therefore treating them as curriculum consumers. Consequently, she objects to these products that treat all teachers, students, classrooms and communities alike. SWAP, on the other hand, leaves room for each specific context (school) to interpret each activity within the constraints and specific parameters of their local environment. Again we notice the wealth of working

with information and findings that come from your specific context – i.e. your local environment.

Wade (1996:12) states that:

> …an alternative to text-based, centrally produced curricula is 'critical pedagogy', involving (a) critical analysis of values and socio-political structures (b) action in and reflection on local environmental issues, and (c) intimate involvement between learners and local communities.

I investigated whether using the SWAP kits could lead to teachers functioning as "critical pedagogy" practitioners in each of the above three areas. The "critical pedagogy" calls for the consideration of the process of teachers' decision making and their role in facilitating true ecologically literate decision making in their classrooms. Remillard (2000:346) states that good curriculum material leaves room for "multiple possible routes". "The paths that teachers and students take[…]are not predetermined but are the results of day-to-day and moment-to-moment decisions".

Furthermore, the decision paths students and teachers choose could be as a result of day-to-day and moment-to-moment interaction with their local environment and its *specific issues,* which in turn would call for specific, context-bound interpretation, discussion and action! Therefore, the decision and action is more a result of the *interaction with the local environment within a specific context*, as opposed to the learning and teaching of certain specific facts and tasks.

In light of this, the SWAP kit can be described as a vehicle, a tool, to move from the classroom, closer into the local environment, using the tool to investigate and clarify the specific reality of that context, and through that process construct the truly relevant and important knowledge within that habitat. This knowledge can then be brought back into the "classroom" to change, inform and challenge previous knowledge, decision-making strategies and the like. This fresh and relevant knowledge can then be used in different ways that will be discussed in the interpretation of the different case studies. This whole process facilitates the professional development process in teachers regarding curriculum development and Environmental Education.

To return to the original question: did teacher's involvement with SWAP help them to become more active in curriculum development processes or was it merely an exploration of socio-political issues? Is this an educational or a socio-political question? It is evident from the above comparison that these two perspectives move and exist together and inform one another.

1.8 USING LOCAL ENVIRONMENT AS A RESOURCE

Schreuder (1997:462) clarifies that SWAP should not be regarded as a general panacea for a number of environmental ills, but as a tool to help students access the profoundly rich source of information offered by rivers and streams. Educational water quality monitoring (EWQM) helps teachers to focus on real local community and ecological problems and stimulates critical dialogue, the development of values and constructive action. Schreuder (1997:462) further states that low-cost EWQM projects

"make the tools of science accessible", so that students can interpret the environment and identify real problem areas. Such projects subscribe to the idea of making school subjects immediately useful to students.

Furthermore, SWAP "helps to stimulate the development of political literacy" by assisting students to participate in and influence decision-making processes. It assists students to understand and critically analyse the processes of management of the local environment, and the value systems that underlie these processes (Schreuder 1997:462).

SWAP, as shown in the previous section, allows for a variety of interpretations and understandings of the local environment. In some SWAP projects the environment is seen, as Sauvè (2002) explains, as nature to be appreciated, in others as a place to live, or as a community project in which to get involved. In this particular project SWAP was used as a catalyst to start and support professional development processes in teachers.

Lotz (1998) in Schreuder (1997:465) states that activities such as SWAP can play an important role in familiarising teachers with the processes which

> ...enable students, through dialogue, investigative action and reflection to acquire and construct knowledge of the local environment, whilst skills or competencies which enable learners to interact with each other and their environment in meaningful and constructive ways are developed.

Lastly, in the words of one of the participating teachers from the Table View region:

> SWAP is cheap to use, because I can take my learners on several outings without the hassle of bus fare. We simply walk down to the river, do our tests and return within half an hour. It is so easy to reach.

The fact that the local environment is on your doorstep is perhaps the biggest reason for SWAP's focus on fresh water, especially since the Western Cape is so rich in water bodies.

1.9 SUMMARY

In this chapter, I aimed to present the progression of the developing of the concept "Environmental Education". We followed the development starting at the landmark international and national conferences, the corresponding views on Environmental Education that accompanied each phase and how that process unfolded in South Africa in particular.

The second part of the chapter dealt with the specifics surrounding SWAP, what it was used for in previous project, and how this focus was changed in this specific project. The final section focussed on the importance of using your local environment as a resource in curriculum restructuring and Environmental Education. Chapter 2 deals with the specific process of professional development in the context of INSET and Environmental Education.

CHAPTER 2

PROFESSIONAL DEVELOPMENT IN ENVIRONMENTAL EDUCATION

2.1 INTRODUCTION

This chapter reviews current and recent views on professional development (PD) and the link with in-service education or in-service training, commonly abbreviated as INSET. I will clarify what SWAP's role was in this INSET programme, and I will discuss indicators to "measure" different levels or stages of PD that can/might have occurred during an INSET programme.

2.2 CONCEPT CLARIFICATION

Professional development (PD) and In-service Education and Training (INSET) are terms often used loosely and interchangeably in the educational environment. Craft (1996:6) indicates that both terms tend to cover a wide range of activities designed to contribute to the learning of teachers who have completed their initial teacher training. Veenman, Van Tulder and Voeten (1994:303) describes INSET as

> [...]a coherent set of activities to deepen and broaden knowledge, attitudes, and skills that are directly connected with the profession of teaching to improve teachers' professional competence and the effectiveness of their school.

I support Veenman et al because they expand INSET to include any teacher development effort. Holly and Maclaughlin (1990) hold the same view:

> In-service, whether formal or informal, is generally seen as the events and processes designed to facilitate new learning or development.

PD, on the contrary, in a broad sense covers all forms of learning undertaken by experienced teachers. This ranges from certified courses, private reading to job shadowing, (Craft 1996). Billings (1977:22) uses the term *professional development* to describe moving teachers forward in knowledge or skills. Craft (1996) furthermore refers to PD, in-service learning, in-service education, and in-service training as opportunities for teachers to learn. Bleckman (1989 in Holly and Maclaughlin 1990) states, "the new learning of teachers and others associated with schools is commonly referred to as professional development."

All these different, but overlapping explanations of professional development and INSET need to be clarified for this study. In short: *professional development* can include any activity a teacher undertakes to expand his/her efficiency, knowledge, and skills as a teacher. *INSET* on the other hand, is usually a formal, organised programme designed with specific outcomes of professional development in mind. For this study, I use INSET to describe a formally organised set of activities with the aim to stimulate or facilitate professional development in teachers.

While engaging with teachers in an informal manner, I noticed that they had a negative connotation to INSET. According to some of the participants at the schools,

sometimes INSET programmes are presented but no meaningful PD are experienced, rather just frustration and an even surer belief that the Department of Education is on a mission to waste their time and they expect the impossible of teachers! Strangely, those same teachers accepted the SWAP INSET programme with positive attitudes. They welcomed the project. The reason for that will be explored later.

Now that we have clarified the terms professional development and INSET we can explore different forms and purposes of professional development, remembering that INSET is a formal type of professional development

2.3 DIFFERENT APPROACHES TO PROFESSIONAL DEVELOPMENT

2.3.1 PURPOSES OF PROFESSIONAL DEVELOPMENT

Craft (1996) indicates that a variety of purposes and forms of professional development and INSET processes exist. These vary greatly and are always driven by some agenda and designed to meet the needs of either individuals and/or institutions. The formally organised nature of INSET introduces political aspects that influence the goals of such a programme. Veenman et al (1994:303) state that INSET serves three main purposes:

- stimulate professional competence and development of teachers
- improve school practice
- implement political agreed upon motivations in schools (Eg. RNCS)

Therefore the evaluation of a programme will depend on the initial objectives. Consequently, when discussing professional development during an INSET

programme, one needs to be aware of the hidden objectives a programme might have, since this will determine, for the donor/organiser, whether the programme was successful. Different goals set by different organisers or organisations for a specific INSET programme influence the approach they may take towards the planning of the programme. Similarly, the objectives will determine the "delivery format" chosen by the presenters/facilitators of the INSET programme. Craft (1996) identifies the following examples of PD courses often available to teachers

- Apprenticeship: with other teachers (more experienced and perceived to be dynamic)
- School based in groups: programmes are run at school sites in terms of school needs.
- Centre based: courses facilitated at teacher centres for districts or regions

This SWAP INSET programme could be classified as a "school based in groups" type INSET programme.

2.3.2 CHOICE OF PROFESSIONAL DEVELOPMENT PROGRAMME

2.3.2.1 Perception of the role of the teacher

Reddy (2001) indicates that professional development occurs in social and historical contexts and the nature of these also affect the process. Little (1992) writes that assumptions about teachers and teaching are made apparent in the organisation of staff development resources and in the obligations to which teachers are held and in the opportunities they are afforded.

Bleckman (1989:2) writes, "If we view the teacher as an applier of a craft, then we will focus professional development primarily upon the methods and techniques of teaching." Furthermore, if we view teachers as functioning in isolation from each other, PD focuses on activities in the classroom. Lastly, he notes that if we view teachers as functionaries in schools then managers of the school system are often the sources for the agendas of PD. Bleckman (1989:2) concludes that if we view teachers in these ways we are "apt to focus on what the teacher can *do* rather than on what the teacher *is* and can become." The other side of the coin is viewing teachers as professionals. Then the INSET programme will address broader issues related to decision making, practice, professional knowledge, human development and the purpose of schooling for example (Bleckman 1989:2). This concurs with Wade's (1996) critique against spoon feeding prepackaged activities that leaves no room for decision making on the teachers' part, as well as with Remillard (2000) All the above relates strongly to Veenman et al's (1994) three main purposes of INSET.

2.3.3 FORMAL OR INFORMAL INSET PROGRAMMES

Often, there is a distinction between two arbitrary categories of formal or informal/ad hoc INSET programmes. Dyasi and Worth (1998:104) in discussing programmes for science teachers, regard formal courses as those with *a set schedule and development of teachers' science education knowledge* as a goal. These include two to three week workshop programmes during school vacations. Few have academic structures that use two to three week programmes during school vacations, followed by weekly or monthly sessions during weekends or after school. These usually require

teachers to complete a two to three year sequence of sessions for a professional qualification. Other courses are run during evening and afternoon sessions and over holidays and weekends. The common factor is that the courses are structured and often lead to a formal qualification. Occasionally once-off workshops and short courses are run, but these serve only for dissemination purposes and tend to focus largely on the introduction of new techniques or resource materials for teachers. If one were to focus on the above three types of formal classification, the SWAP INSET programme would be classified in the third category: short courses for the dissemination purpose of new resource materials. To an extent SWAP was a reintroduction of old (matured) resource material, but that was not the purpose of the programme. Modelling a broad, critical approach to Environmental Education was one of the secondary goals. The primary goal was to investigate and support the professional development in the area of Environmental Education through using a learning support material such as SWAP.

The SWAP programme can then be described as a short intervention, with only two afternoons of training followed by support visits and modelled classes over a period of three to six months. The next section discusses the fact that within different approaches to an INSET programme, the presenters of the INSET course have different choices of what to emphasise.

2.4 FOCUSES OF PROFESSIONAL DEVELOPMENT

Little (1992) writes that enquiry into teachers' professional development reflects two quite different points of departure.

2.4.1 IMPLEMENTATION OF SPECIFIC PEDAGOGICAL/CURRICULAR INNOVATIONS

The first, most common one involves teachers' progress in mastering the complexities of classroom practice. These are dominated by a concern for the *implementation of specific pedagogical or curricular innovations*. Inquiries have also broadened to include curiosities about how teachers learn to teach, how they mature intellectually and professionally and how they sustain engagement in their work over time.

2.4.2 ORGANISATIONAL AND OCCUPATIONAL CONDITIONS

A second path that Little (1992) explains draws attention to the *organisational and occupational conditions* that affect teachers' incentives and opportunities to learn. This approach places professional development in the social organisation of teachers' work, seeking the connection between the social organisation of teaching and the professional development of teachers. They attend to the larger patterns of policies, practices and circumstances that affect teachers' professional obligations and opportunities and not the narrower issues and innovations. Broader issues that frame teaching and learning are taken into account.

2.4.3 FOCUS OF SWAP INSET PROGRAMME

This specific INSET programme was footed partially in both of these. What I was presenting to participating teachers was addressing a perceived need that the education policy had created. Furthermore, we tried, through modelling classes, to address the specific classroom needs that this new policy and curriculum created. All of the above are probably futile if you do not make progress or see the results that can be described as *successful INSET delivery* or *professional development*. Sometimes, the success of the professional development initiative is difficult to measure and could even be hampered by the experience of the facilitator and the "model of professional development" that he/she subscribes to.

2.5 MODELS OF APPROACH TO INSET AND PROFESSIONAL DEVELOPMENT

Remillard (2000:493) suggests that teacher development should/could be viewed as teachers learning, rather than as others enabling teachers to change.

While several models and typologies of INSET exist we shall examine only the growth and deficit models. This section is based on ideas from Bagwandeen and Louw (1993), Ahsley and Mehl (1985), Day (1999) and Dadds (2001).

2.5.1 THE DEFICIT MODEL

Bagwandeen and Louw (1993:69-70) indicate that the deficit model for INSET is characterised by the view of other educators that teachers need development because they lack certain skills to teach successfully. The deficit model is often the collective

view of diverse groups such as school principals, superintendents, education bureaucrats and university academics. It assumes that something is amiss with the way in which teachers operate and that this needs to be corrected, the deficits need to be repaired. At the heart of the deficit model is the contention that education is a rapidly developing field in which old ways of doing things are constantly being replaced by new and better ways.

According to Bagwandeen and Louw (1993:70), the approach is prescriptive and reduces teachers' choices. Dadds (2001) refers to this approach as the delivery model or empty vessel model, as teachers are seen as empty vessels that do not contribute to their own professional development processes, but are mere passive receivers. Permeating this view (deficit model) is the notion that someone knows more about how teachers should behave in classrooms than teachers themselves. Courses are often developed in isolation and centrally providing "one size fits all" interventions that do not take varying contexts and needs into account. Wade (1996:14) essentially describes the same approach regarding INSET in Environmental Education:

> ...the shortcoming of today's dominant approach to staff development is that teachers are spoon-fed pre-packaged activities and treated as curricular consumers rather than professional educators. Rich learning opportunities afforded by the local community and teacher involvement in curriculum research and design are pre-empted by effective marketing and dissemination of product that treat all teachers, students, classrooms, and communities alike.

In contrast to the above, SWAP is a contextualisable resource focussing exclusively on problems/issues in the immediate environment that you are investigating. This leads

to teachers adapting this resource to suit their curricular needs. SWAP is essentially a "one size fits all" programme with adaptable settings everywhere because everybody adapts the "size" to suit their particular needs and situation. In is this characteristic of the programme that greatly contributed to the success of the project in different schools. In Chapter 4 and 5 it is shown how teachers contextualise this resource.

2.5.2 THE GROWTH MODEL

Bagwandeen and Louw (1993:71) explain that the growth model's main aim is to familiarise the teacher with developments in her field, to assist her in becoming progressively more sensitive as to what is happening in her classroom and being supportive of her endeavours to improve on what she is doing. Jackson (1971:26) writes that the growth model is based on the assumption that:

> [...]teaching is a complex and multifaceted activity about which there is more to know than can ever be known by any one person. From this point of view the motive for learning more about teaching is not to repair a personal inadequacy as a teacher but to seek greater fulfillment as a practitioner[...]

In this approach to PD, wider opportunities are provided for growth. Teachers are viewed as professionals who hold professional opinions about their work and issues related to their work. INSET processes are seen as opportunities for continuous professional development rather than sessions during which skills are updated or new skills are learned. Teachers are involved as co-constructors of knowledge and could even become involved in planning and presentation. Continuous support is provided and networking is encouraged.

2.5.3 SWAP - A MIXTURE OF GROWTH AND DEFICIT MODELS

When evaluating which type of an INSET approach I used in the SWAP programme, one has to make clear the nature of the contact sessions. The NEEP-GET project emphasised teachers' needs for more knowledge and skills regarding Environmental Education. In that sense, we could say that there is a deficit of knowledge that needs to be addressed. On the other hand, the fact that SWAP leaves such a lot of room for context based interpretation opens the door to the growth model, where the teachers' growth as a person and professional practitioner takes preference rather than the physical content of the SWAP programme. In a sense then, I would describe the SWAP programme as a growth approach to professional development with a deficit-addressing aspect regarding the lack of content knowledge about Environmental Education, specifically regarding the use of the local environment as a rich source of information.

2.5.4 CONCLUSION

In conclusion to this matter, SWAP was used as an INSET programme with the goal of enhancing professional development in Environmental Education. The overarching approach would have to be a growth model to professional development, including and addressing deficits in Environmental Education as a secondary goal as mentioned by Robottom and Lotz (1998).

2.6 LEARNING SUPPORT MATERIALS IN PROFESSIONAL DEVELOPMENT

What were we emphasising in this project? Teacher development through/with using SWAP as a resource in liaison with the facilitator and ongoing support? Why? Remillard (2000:332) recalls that "[...]failure of the teacher proof curriculum materials of the 1950's[...]" suggests that teachers rather than texts, ultimately determine what is taught". She continues (2000:332): "changing instruction will require learning on the part of educators." Furthermore, she states (2000: 345) "to support teachers' learning from these resources, curriculum materials need to assist teachers in interpreting and using tasks."

2.6.1 ROLE OF THE LEARNING SUPPORT MATERIAL

We tried to move away from relying too heavily on the curriculum materials to bring about change, and chose instead to emphasize teacher development, in this case, through using a very suitable resource to support the learning. The learning materials served as an example of what an OBE-critically centred classroom's materials would look like. Remillard (2000) points out that teachers, in the midst of their pedagogical process of change, need the support of well-designed curriculum guidance. By providing learning support materials (LSM's) that are already conducive to the new knowledge that they (hope to) construct, one is supporting the development of expanded and rethought mindsets regarding the environment and how we are to function in it. They need this because they struggle with the question, "how do I do this in my class?" Besides, they are short of time to develop extensive learning

programmes around specific issues/topics because of other pressures placed on them by the Department.

The work Remillard (2000:344) did with Mathematics teachers, facilitating learning from selected tasks set out for the learners, proved that well-developed activities might contribute to changes in teachers' ideas about mathematics. I investigated whether the same could happen using SWAP as a learning support material and aimed to determine whether it would lead to changes in teachers' ideas about Environmental Education, which would be a professional development process.

2.6.2 SWAP AS LEARNING SUPPORT MATERIAL

SWAP at first glance looks like a simple complete-the-worksheet-project. However, because it utilises the local environment as context and makes explicit the interactions between different dimensions of the environment, it is a strong tool to challenge and expand thinking about the environment. All this may however be completely overlooked if the emphasis is placed on the content only, and not also on the further interpretation of the information gathered through the tests and worksheets. Therefore, in the professional development of teachers individually and as a group it is important for them to use LSM's in a manner conducive to developing sustainable thinking strategies and lifestyles among themselves as well as the learners. This fact may be the weakest and at the same time the strongest link in SWAP as an LSM. Remillard (2000:346) believes that in order to develop teachers' decision making skills, the LSM must be flexible and responsive to teacher's choices as well as incomplete

without teachers' input. Bridgham (1971) describes this flexibility as "allowing for multiple routes through the same pedagogic terrain".

This highlights probably one of the biggest responsibilities of the facilitator: to make sure that this important "hidden" information is brought to the fore so that the teacher knows their responsibilities regarding this multiple choice LSM. A teacher can at any point in time decide to pursue an interesting or important point that they found concerning their local environment. She can leave out an entire laboratory if she feels that it is not suitable, or that the issues related to it are too sensitive for the learners to discuss at that stage. Most importantly though, if the teacher does not emphasise the critical nature and if she does not highlight the environmental knowledge pertaining to the education *for* the environment, then we run the risk of learners leaving the scene of the outdoor classroom with nothing more that outdoor education/education *in* the environment *about* the environment.

To prevent this from happening, I structured the INSET programme so as to allow interaction with the LSM on a meta cognitive level. I introduced them to the Active Learning Framework (ALF). By combining the use of SWAP with the Active Learning Framework (ALF), teachers are presented with a tool to assess their environmental education teaching and balance other activities that they may develop in later learning programmes for their learners. During the workshops, the activities in the SWAP programme are identified and plotted within the ALF. In this way, teachers can identify the purpose of each activity and therefore also develop suitable assessment activities

in their classroom. Most importantly though, they experienced the complexity of the issues investigated first hand, and could therefore highlight them in their classroom discussion.

2.7 ACTIVE LEARNING FRAMEWORK

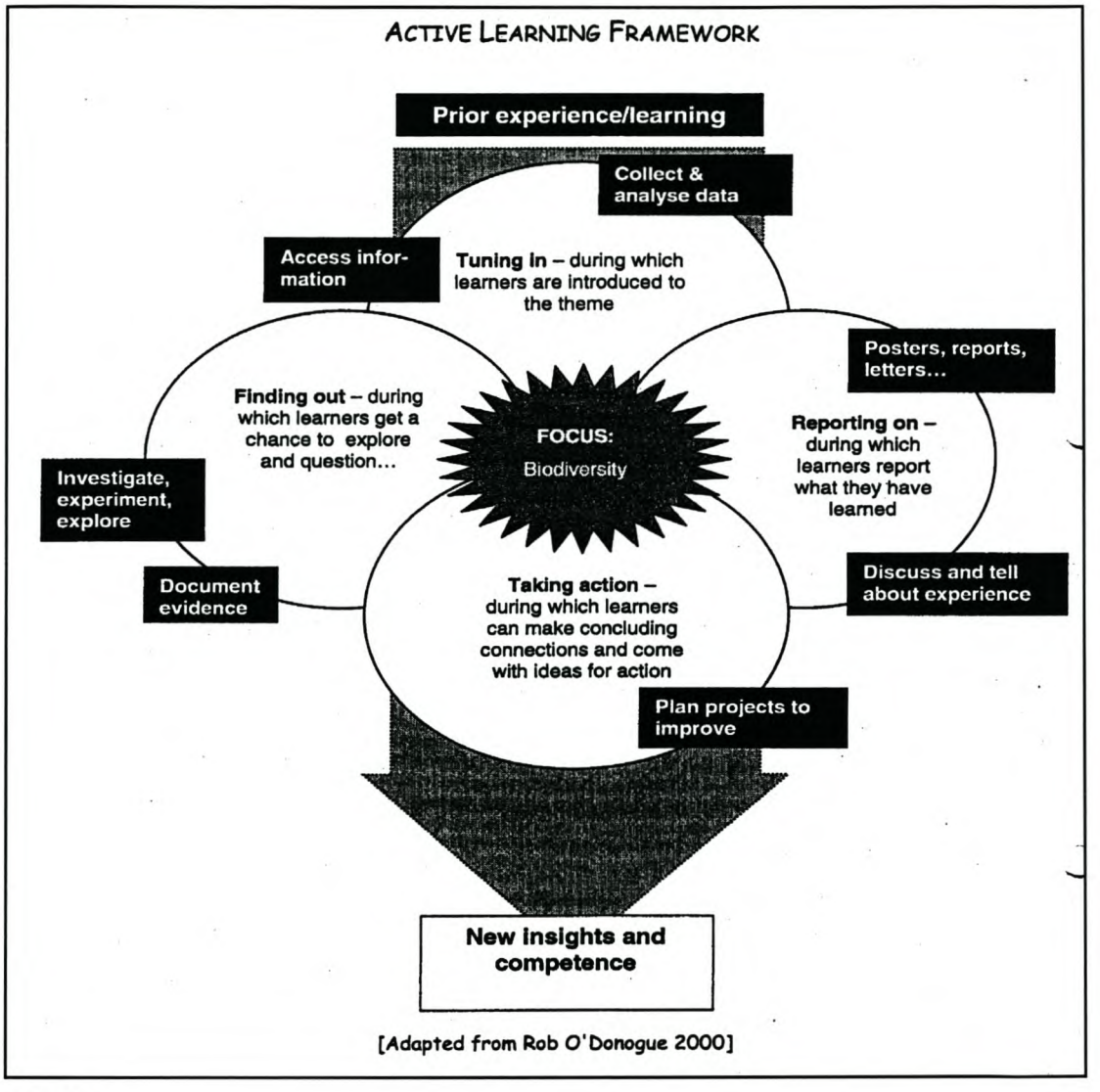
2.7.1 INTRODUCTION

Dr. Rob O'Donoghue compiled the Active Learning Framework (ALF) in partnership with Dr. Razeena Wagiet, Dr. Heila Sisitka and teachers participating in the NEEP-GET pilot project during September/October 2000. The environmental learning process in Outcomes Based Education is described as follows in the booklet *The Environment and Environmental Education processes* (O'Donoghue 2000:5):

> [...]finding information 'about' issues, exploring these through encounter experiences 'in' the environment and taking action based on what we know, 'for' a better world, all of which contributes to a better environment and sustainable environmental management.

O'Donoghue (2000:7) states that active learning can occur spontaneously, but that it appears to happen best where it is planned and enacted with learners in a local environment. The diagram, Fig 2.1, of the Active Learning Framework (ALF) shows the four different types of activities in an action learning cycle.

FIG 2.1 ACTIVE LEARNING FRAMEWORK: FOCUS ISSUE BIO-DIVERSITY



These are:

1. Tuning in – learners are introduced to the theme and pre-knowledge is explored and activated through discussion.
2. Finding out – learners get a chance to explore and question through the tests and worksheets.
3. Reporting on – during which learners report on what they have learnt and what they have found out

4. Taking action – learners get the chance to make concluding connections and come up with ideas for action.

This whole cycle ideally leads to new insights and competencies. Sometimes an "action" activity may lead to experience in a new area that may lead the learners to want to investigate further into a certain issue and we are back in the cycle again. I repeat that the cycle may be started at any point/activity and may be repeated as many times as necessary to satisfactorily explore the focus issue.

In order for maximum learning to be facilitated, all of these types of activities should be present. With a relevant risk, issue or focus at the centre, learners (or teachers) can become actively involved in three open-ended, but interlinked processes: *information finding*, *investigations* or simply participating in activities and onserving the results and then *reporting* these results. These processes can occur in any order, repeatedly, (O'Donoghue 2000: 7). The "action" speaks of critical action *for* a better environment and improved environmental management, not just undertaking being some trivial activities.

An ALF process in the pH laboratory of SWAP would look something like the following:

- Finding out "ABOUT": Read on the A1 Laboratory about pH, the importance of pH and the normal pH for your river.
- Investigating "IN": Study the pH test and physically test your river's pH.

- Reportback "IN" and "ABOUT": Report back to the class about your findings regarding the pH. Interpret the result and present possible causes for the reading.
- Doing things "FOR": Take responsible action regarding the pH of your river eg. write a letter to surrounding industries explaining the effects of effluent on the pH.

2.7.2 SWAP AND ALF TOGETHER

Just as the SWAP programme is a key to unlocking the local environment, the ALF is the key to unlocking the SWAP programme for the teachers in order to identify the different types of activities. The teachers use the ALF to identify each type of activity in the SWAP programme. They then know what the purpose of each activity is and this supports them in facilitating the discussions in their classrooms. The ALF also accentuates the balanced nature of the SWAP programme, since they explicitly see that each laboratory contains a balanced amount of each type of activity. This "proves" to them that each laboratory is an entity on its own, but also works together as a whole with the rest of the laboratories. Again, this also relates to the 'space to manoeuvre" issue mentioned by Remillard (2000). The metacognitive evaluation of the SWAP materials gives the teachers confidence to take different routes through the "investigation of the local environment".

Fig 2.1 is an example of the ALF with a focus issue: biodiversity. SWAP would have Fresh Water as primary focus issue with the secondary focuses being pH, Nitrates, Catchment Area and Health Risk.

If at any stage in the cycle you need to go back and investigate further, then you do so. The SWAP materials are incomplete without the input of the teacher. If the teacher does not discuss the importance for instance of the pH of a river for the living creatures in rivers, then the possibility exists that the learners go away from the learning experience with nothing more than an outdoor experience. I would prefer education *for* the environment where people are given the tools to interpret their actions so that it favours the environment.

2.8 POSSIBLE INDICATORS OF PROFESSIONAL DEVELOPMENT

Different authors have published different sets of indicators that can be used to evaluate the amount and quality of professional development that has taken place. Some use "retention of information" as an indicator. Others check how much the learners have learned to evaluate how much the teacher has learned (Guskey 2002). In the case where skills are emphasised, these would be related to acquisition of new skills, teaching methods, assessment strategies and other craft related activities. Since the evidence of professional development, in this case, was the main criteria by which this programme was measured, there must be some standards for "measuring" or "finding" professional development. I shall call them indicators for professional

development. I rely heavily on previous research that has been done concerning this and extract from several authors some indicators suitable for this particularly small INSET programme. In Chapter 5 these indicators are linked to incidences of professional development and self-proclaimed accounts of professional developments in the lives of the teachers.

2.8.1 BELL AND GILBERT – TEACHER DEVELOPMENT

Bell and Gilbert (1994:483-497) present professional development, which they call *teacher development*, as a process that can occur in stages and develop categories to describe these. When comparing these 3 categories with the previous definition developed for professional development and INSET, one can say that these three categories combined would equal professional development and INSET, as used in this study. They present three different categories of teacher development, each with three different levels (Table 2.1).

TABLE 2.1 STAGES OF TEACHER DEVELOPMENT: BELL AND GILBERT (1994)

Personal Development	Professional Development	Social Development
Attending to Feelings	Developing ideas and actions	Developing collaborative ways of relating to other teachers

Stage 1 Accepting an aspect of teaching as problematic.	Stage 1 Trying out new activities	Stage 1 Seeing isolation as problematic
Stage 2 Dealing with restraints	Stage 2 Development of ideas and classroom practice	Stage 2 Valuing collaborative ways of working
Stage 3 Feeling empowered	Stage 3 Initiating other development activities	Stage 3 Initiating collaborative ways of working

The three categories are:

1. Social development
2. Professional development
3. Personal development

Social development involves working and relating with teachers and students in new/different/improved ways. Professional development is all about changing concepts and beliefs about Environmental Education, changing classroom activities and improving your "job" skills. The personal development category focuses on the feelings of the teachers about the change process, being a teacher and feelings about Environmental Education.

2.8.1.1 Social Development

In Table 2.1 there are three levels indicated. Level one is characterised by a teacher expressing isolation in the classroom as problematic and voicing the fact that she needs other teachers or input to provide new ideas, support and feedback. Teachers

valueing collaborative ways of working indicate the second social development. They become more trusting and share more of what is happening in their classrooms and ask for feedback. They also support other teachers more extensively and work towards developing and sustaining collaborative relationships. Level three sees teachers actively seeking and initiating these activities that they feel foster their development. They start seeking support and giving support in settings outside of normal sessions or places. For example; they will phone a collegue to discuss a certain child/issue. They have more personal contact with other teachers regarding work related isues.

2.8.1.2 Professional Development

At level one the most important role of the facilitator is to clarify that the teacher should view their professional development as learning, and not as remedial because they were incompetent as teachers! This points to a growth approach to professional development instead of the deficit approach. During the initial stage of professional development, teachers receive new tasks which they can try out in their class when THEY feel ready. Initially, the facilitator and teachers provide support regarding class management (in our case with respect to going on a field trip). Later, in stage one, the discussion tends to focus more on the educational issues involved in using these activities.

The second level covers a number of indicators for professional development:

- Clarifying existing concepts and beliefs regarding Environmental Education
- Obtaining new information by listening and reading

- Constructing new understandings of the environment by linking new information with existing ideas
- Using newly accepted understandings in a variety of contexts with confidence

With respect to their classroom practice the teachers:

- Obtain new suggestions for teaching activities
- Plan and visualise how they will use new activities in their classroom/fieldtrip
- Use the new activities provided
- Adapt the new activities to suit their learners or their situation better
- Share their classroom experiences with others and obtain feedback about the use of the activities
- Evaluate the new teaching activities
- Find support

Teachers taking initiative to continue their development after the end of the INSET programme, indicate the third level of professional development. Some start developing more curriculum materials for their classes and even for colleagues. Others facilitate teacher development programmes themselves. The bottom line; they continue their own professional development.

2.8.1.3 Personal Development

Finding and accepting part of your teaching as problematic indicates level one in this category. Sometimes teachers enter level one because their principal sent them on

this INSET course and only then, at the course, do they actually recognise that a certain aspect of their teaching is problematic. Level two involves dealing with restraints and - in particular - attending to feelings and concerns of behaving differently in the classroom. Sometimes, these involve dealing with fears of losing control as well as the changing nature and amount of teacher interventions; clarifying meeting assessment requirements as well as the influence of new styles and materials on their relationship with their learners. The third level of personal development is best indicated by this quote from Bell and Gilbert (1994:492):

> Towards the end of the programme, the teachers' comments indicated that they were feeling more empowered to be responsible for their own development.

Developing a sense of trust that things will balance themselves out over a longer period of time is important. This speaks of a certain kind of trust in themselves as well as their ability to develop.

Although this model of Bell and Gilbert (1994) is discussed in the form of a matrix with 9 subsets (Table 2.1), this does not assume that professional development occurs in this neat linear fashion. Rather, this matrix is only a possible flow of events. All categories are seen as indicators and will be used as such to demonstrate possible professional development of teachers in this programme in Chapter 5. The indicators, which a certain organisation or person may use to measure to which extent professional development has taken place, will probably depend largely on the approach they have to professional development, i.e. deficit or growth model.

2.8.2 INDICATORS DEVELOPED WITH TEACHERS

Janse van Rensburg and Le Roux (1998) developed the following set of indicators in collaboration with participants in a participatory course in Environmental Education. In this case the indicators emerged from a post course evaluation that involved the participants. The use of this method shows that the course presenters viewed the teacher as a co-constructor of and a collaborator in the evaluation of the course. The indicators developed were:

- New understandings of Environmental Education
- New understandings of the environment
- Becoming better equipped with improved job skills
- Increased confidence in the work context
- Developing networks and learning from each other
- Developing resources: equipping ourselves with tools for the job

2.8.3 GUSKEY

Guskey (2002:45-51) indicates five categories for evaluating professional development which he calls *critical levels of professional development evaluation*. He proposes five different levels/areas where one should evaluate professional development.

2.8.3.1 Area 1: Participants reactions

Plainly put, this is looking at the participants' reactions to the professional development experience i.e. the INSET programme like SWAP. This is often measured by a "happiness quotient" survey form with questions such as:

- Was the information useful?
- Was your chair comfortable?
- Was the leader knowledgeable and helpful?

2.8.3.2 Area 2: Participants' learning

At this level, we are measuring the knowledge and skills that participants gained. This can be anything from a demonstration class to a pencil and paper test.

2.8.3.3 Area 3: Organisation Support and Change

Lack of organisation support and change can sabotage any effort. Essentially Guskey refers to systems and ideals working against one another. For example; you cannot hope to ever have cooperative learning with students helping each other if they are essentially competing for the top spot in the class to be class captain. In other words, was the INSET that you provided aligned with policies and the mission of the school?

2.8.3.4 Area 4: Participants' use of new knowledge and skills

Did the new knowledge and skills that participants acquired make a difference in their professional practice? This question can be seen as an evaluation of Bell and Gilbert's (1994) professional development stage 2. Were the new knowledge, skills and/or

activities implemented in any way? In this area, enough time must pass to allow participants to adapt the new ideas and practices in their settings.

2.8.3.5 Area 5: Student learning outcomes

Guskey states that area 5 is the most important one, since professional development always has the improvement of education as end goal and consequently the learning of the final consumers of the teaching process. The direct implication is that if the pupils demonstrate a certain type of learning, the learning first or simultaneously had to happen in the teacher. Therefore, by evaluating the learners' learning, one can indirectly come to conclusions about the teacher's understanding and implementation regarding a certain concept. The converse is not necessarily true. Veenman et. al. (1994:304) makes it clear that in order to use level 5, student learning outcomes, one must be able to demonstrate causal links between pupils' progress and the skills and knowledge being offered in the training. One must also ensure that the teachers do, in fact, use what they learned during training. This would require a much more in depth observation schedule and more time would have to be spent with the learners and teachers. Therefore, this level would maybe not be appropriate to use in this study since not enough time was spent with the teachers and learners.

TABLE 2.2 GUSKEY'S FIVE LEVELS OF EVALUATION

Level 1	Participants' Reactions	Was it a worthwhile experience?
Level 2	Participants' learning	Did you learn anything?
Level 3	Organisation, support and	Lack of organisation, support and

	Change	change can sabotage any professional development effort, even when all the individual aspects of professional development are done "right".
Level 4	Participants' use of new knowledge and skills	Did the new knowledge and skills that participants learned make a difference in their professional practice?
Level 5	Student learning outcomes	Bottom line: How did the professional development activity affect the students?

When reflecting on Guskey's five levels/areas it is clear that the emphasis is on skills and knowledge, and not so much on the decision-making aspects of teaching.

These three different models for identifying and evaluating the level of professional development that occurred will be used in Chapter 5 to identify evidence that professional development occurred.

2.9 SUCCESSFUL PROFESSIONAL DEVELOPMENT

After discussing these possible indicators for professional development, it is necessary to note that there are certain aspects that make for successful professional development. Garet, Porter, Desimone, Birman and Yoon (2001:935) note several of these.

The first is the fact that professional development initiatives should be sustained over time. The "time"-aspect provides more opportunity for in-depth discussions of content and approaches, as well as value dilemmas that teachers might be thinking about.

Secondly, it has been shown that activities that extend over a longer period of time are more likely to allow teachers to try out new practices in the classroom and obtain feedback on their teaching and activities. (Garet et. al. 2001:922) Some of the others include coherence with state goals and focus on specific content. Their results (Garet et. al. 2001:935) indicate that

> […]professional development that focuses on academic subject matter, gives teachers opportunities for 'hands-on' work (active learning), and is integrated into the daily life of the school (coherence), is more likely to produce enhanced knowledge and skills.

Other recent literature on professional development also calls for professional development that is sustained over time. There are two reasons given by Garet et al (2001:921):

> First, longer activities are more likely to provide an opportunity for in-depth discussion of content, student conceptions and misconceptions, and pedagogical strategies. Second, activities that extend over time are more likely to allow teachers to try out new practices in the classroom and obtain feedback on their teaching.

Furthermore, Garet et al (2001:922) mention, "there is a growing interest in professional development that is designed for groups of teachers from the same school, department, or grade level." Little (1982) and Rosenholtz (1991) showed that implementation of educational in-service training programmes in schools with norms of collegiality and continuous improvement, were more successful.

These three aspects would be mutually supportive in an INSET programme. This was the case in some of the schools participating in the SWAP programme - as will be discussed in Chapters 4 and 5. Each case study was made up of teachers in the same school, and sometimes all of them from the science department. Apart from the above, it presented a number of other potential advantages:

1. They shared the same curriculum and were subject to the same assessment requirements
2. They are more likely to have the opportunity to discuss concepts, skills and problems that arise during the professional development experiences
3. They can discuss the same student's needs across grades and classes.

4. Lastly, it might help to sustain changes in practice over a period of time if you focus on a group of teachers from the same school (Garet et al 2001:922).

The SWAP programme fostered "collective participation" since the programme was designed so that all the teachers from Grades 1 to 7 could participate together, like at the Somerset-West site, in keeping with Garet et al (2001:923). At the same time, it was so flexible, as described by Remillard (2000), that it allowed each school to "bite off" exactly what it could handle. In Chapter 5, it is shown how each school adapted the learning support material to suit the school's specific capacity and need. Van der Vegt and Knip (1988) state that if the programme and implementation are situated close to the educational day-to-day practice of the school, it facilitates direct transfer pertaining to the innovative concept. This correlates with Leithwood & Montgomery (1982) that active involvement and support of principals are of crucial importance to enhance implementation. Veenman et al (1994) show that schools that had principals who were giving considerable directional pressure and support, while not limiting teachers' discretionary power, had the most success.

Ashleigh and Mehl (1985:v) indicate another area where the principal can play a role:

> INSET tries to tackle the problems of the quality of teaching in the classroom, and this goes beyond formal certification. Involved here is the *personal development of teachers, and the strengthening of their motivation and commitment.* These things need to accompany the improvement of academic background and the acquisition of classroom teaching and management skills and techniques.

It is at this motivational and commitment level that principals have a role to play.

Van den Berg (1983:4) in Hathshorne (1985) writes that INSET strategies for the improvement of the quality of education are likely to succeed if they are coupled with and form part of wider strategies to bring about improvements in:

- The conditions under which the teacher works
- The provision of education more generally
- The total socio-economic, political dispensation of South Africa

Within these "generic" themes/aspects one can suggest some other guiding principles for professional development. Robottom (1987) suggests that professional development for environmental educators should be:

- Enquiry based: participants should adopt a research stance to their work
- Participatory: involve participants directly and as equitably as possible in the professional development process
- Critical: that the process of professional development look beyond the surface layers of activity and examine levels of policy, organisation and practice
- Collaborative: colleagues need to assist each other as collective action is more likely to be successful in addressing the forces that work against the improvement of Environmental Education, which is often political in character

With so many approaches, models and suggested guiding principles it seems that there is no ideal recipe for professional development. One should rather remember

that with professional development and INSET being so contextualised and needs driven, it will not be possible to get facilitation of professional development 100% right, but it is possible to constantly improve it.

In conclusion, with the role that principals play, and the fact that schools are servants of a wider community surrounding it, it is interesting to examine David Uzzell's models of school-community relationships. I explore the influence that these relationships have on the professional development that occurs. In other words, which school community relationship is most conducive to professional development?

2.10 MODELS FOR SCHOOL-COMMUNITY RELATIONSHIPS

When thinking about the concept "environment" as described in Chapter 1, one cannot deny that the school is part of a community and that the community has a direct and indirect influence in and on the school.

When discussing broad school context in Chapter 4 and 5, it is interesting to compare the amount/level of professional development that occurred in that school with the "type" of school as typified by the school-community relationships. These relationships are described by David Uzzell (1999), and I investigate if there is any connection. Uzzell (1999) discussed three models for school-community relationships. These three are reasonably familiar but then he suggests a fourth type of relationship which I will expand upon.

2.10.1 MODEL 1: THE SCHOOL AS AN ISOLATED ISLAND

In this model, there are barriers between the school and the local community. The learners learn about environmental problems through newspapers and in the classroom, but do not deal directly with the local community. This was probably the case in most of the schools I worked in before we introduced SWAP into their curriculum. With SWAP there is ample opportunity to engage with the local community regarding local environmental problems.

2.10.2 MODEL 2: THE LOCAL COMMUNITY INVITED INTO THE SCHOOL

In this model the local community is invited into the school to improve the quality of the subject content and to make the programme more involving and authentic. This is the first attempt of schools to break down barriers between themselves and the community. This happened in some schools with teachers inviting experts to do special sessions on pH, and in Somerset-West region they invited the local authorities to explain the building plans on the river bank to cater for a 50 year flood, amongst other things.

2.10.3 MODEL 3: THE SCHOOL AS GUEST IN THE LOCAL COMMUNITY

In this model there is again a partial opening of the barriers between school and local community to allow for some action possibilities. This movement is characterised by

unilateral movement, from school to community, to communicate what they have explored in their classrooms and attempt to work on and influence the conditions of their activities. This model, according to Uzzell, has a greater authenticity than the previous models. In the programme, this happened when learners contacted municipalities and local newspapers to present their findings. Sometimes the local community responded with disinterest; not placing their articles in the local newspapers or covering their river visits.

2.10.4 MODEL 4: THE SCHOOL AS SOCIAL AGENT

The fourth model is one where the barriers between school and community are permeable: community members are present in the school and the pupils are active in the local community. These situations develop action possibilities as well as concrete actions in the community, such as indirectly influencing parents or directly acting on waste or traffic problems etc. Uzzell (1999) also calls this model the "dialogue model", where the goal is for barriers to be broken down completely through cooperation and dialogue around local environmental issues and their possible sollutions. This model has a high level of authenticity because pupils have access to local assistance from the community. I do not think that any of the schools that I worked in truly progressed to this model of dialogue with the local community. The fourth model speaks of a true partnership between the school, the pupil and the local community in dealing with their environmental problems.

Of these four models, model 4 is the most conducive for professional development as will be explained in Chapters 4 and 5.

2.11 MODELLING AS A PROFESSIONAL DEVELOPMENT STRATEGY

Professional development could be instigated and supported through various didactical methods. One of these is modelling the thinking and teaching method you are promoting to the teachers, while you are busy with the training. Grossman (1991) calls this the *apprenticeship of observation*. He stresses that essentially, all teachers have been schooled in the *apprenticeship of observation* for the years they were at school themselves, and then furthermore through their professional training after school. They look and copy.

Reddy (1994) notes that teachers requested an expert to first show them how to handle a field trip, and then they would copy him/her. Grossman's (1991) study reports a teacher trainer actively challenging the status quo in a specific training course. When one "trains" teachers in something strange and new, such as Environmental Education, then one has to challenge some other views. If you train teachers by using the methods/approach that you think demonstrate first hand what you are aiming for them to achieve or how to teach or use a different kind of practice in their classes it constitutes a modelling process. Most of the SWAP activities I conducted were based on modelling as described above.

The workshops were conducted in a strongly group centred approach with me sharing experiences, examples and ideas if it did not come from the groups naturally. The workshops were ideally meant to be guided self-study sessions of groups of teachers.

Teachers were concerned about time during the workshop and this forced me to use more of a lecture style, against my will. In the focus group discussions, teachers critiqued these workshops as "not giving us enough time to look at the material ourselves." They did not feel prepared after the workshop or even after the hands-on fieldtrip. Whereas the teachers who participated in longer or more than one workshop in the group structured style, felt much more prepared.

During the fieldtrips with children and teachers, I handled the preparation of the children in the class before hand. Then I also facilitated the discussion in class or at the river after all the tests were completed. This gave the teacher a chance to see what we aimed for in the discussions, how you prevented premature closure on a difficult topic and how you highlighted different complex issues in the local environmnet by using the river as a starting point or point of reference.

The programme created the opportunity for teachers to observe me, the facilitator, presenting their class on SWAP. This can be described as an active learning opportunity for teachers while they are observing a model for the type of teaching that we are describing to them.

2.12 SUMMARY

In this chapter I presented different constructs and theoretical ideas surrounding INSET and professional development in Environmental Education. I reviewed current indicators used to evaluate professional development and discussed certain aspects that are conducive to the implementation of INSET programmes in schools. This information will be used to evaluate the case studies in Chapters 4 and 5.

The following chapter tells the story of the theoretical planning and execution of this study: the methods used, the specific paradigm which acts as interpretation backdrop and the different aspects considered in choosing the case study design for this particular study.

CHAPTER 3

RESEARCH METHODOLOGY: APPROACHES AND TECHNIQUES

3.1 INTRODUCTION

This chapter describes the journey of coming to a decision about which research paradigm should frame this study, which techniques to use for data generation and of making sure that I create the optimum coherence and validity through my choice of the different design options. The philosophical and methodological debates around the craft of educational research are essential. What is unhelpful, according to Gough and Reid (2000:47), is the need for researchers to pretend that they have sorted out the many questions of epistemology, ontology and methodology before they embark on a certain research project. The emphasis is therefore on the word "journey" when I write this chapter, as mine was a process of developing a design in a context of change.

I discuss why it is important to be aware of which paradigm you subscribe to personally, the importance of a research paradigm when undertaking a research study and lastly why I chose to use the interpretive case study method for this particular study and then discuss preferred methods for data generation and analysis of data.

3.2 DIMENSIONS OF RESEARCH DESIGN

Durrheim and Terre Blanche (1999:33-35) identify four dimensions along which a researcher makes design decisions: 1) the purpose of the research; 2) the theoretical paradigm informing the research; 3) the context or situation within which the research is carried out; and 4) the research techniques employed to collect and analyse data. According to them the multiple considerations that derive from these four dimensions must be woven together in a coherent research design in a way that will maximise the validity of the findings.

3.2.1 PURPOSE OF THE STUDY

The purpose of this study has been extensively clarified in the introductory chapter and Chapter 1. In short, could using SWAP assist to implement environmental learning and Environmental Education in the formal curriculum? As a subsection I address the seeming lack of capacity to implement Environmental Education, and the use of the local environment as further professional development processes related to using the SWAP resource. In essence, I investigate whether the availability of a resource might scaffold professional development in various ways as developed through the indicators in Chapter 2.

3.2.2 THE CONTEXT OF THE STUDY

In Chapter 1, to fully understand the research question, I discussed the broad background of Environmental Education globally and in South Africa. This might seem too broad a placement, seeing as the bounded context is schools in South Africa and curriculum implementation, but these schools in this specific study, lie within a timeframe where transformation in education took such a high priority that we need to review the foregoing circumstances to the change in education - and specifically Environmental Education. In that same chapter, I framed SWAP as a learning support resource within this specific study. The purpose of this study is framed within that broad context with the school representing a delimited or bounded case study. This will be discussed further in the section on case studies.

3.2.3 THE PARADIGM

In this section I develop arguments for/towards the relevance of research paradigm considerations and explain why the interpretive paradigm is most suitable for the purpose and context of this study.

What is the relevance of research paradigm considerations? Some researchers feel that emphasis of a paradigm is unnecessary. I rather support the argument of Durrheim and Terre Blanche (1999:37) that you cannot separate your study from

1) your personal paradigm (worldview) and 2) the paradigm you chose to frame the study in.

The reason for this is that the paradigm depicts what type of information you are looking for and what type of possible findings you are suggesting. Your personal paradigm is like the lens with which you look at the world and will determine what you see and how you interpret it, even if you are not aware of its existence. Each paradigm asks different questions about "how you come to know", "what is valuable to know" and "what type of result you are hoping/aiming for" (Durheim and Terre Blanche 1999).

3.2.3.1 What is a paradigm?

Kuhn (1970) explains that the key point about a paradigm is that it is a source of guidance (way of knowing) for conducting and evaluating (educational) research that is consensual within a particular scientific discipline. Durrheim and Terre Blanche (1999:6) clarify that "paradigms are all-encompassing systems of interrelated practice and thinking that define for researchers the nature of their enquiry". Furthermore they suggest:

> [...]the background knowledge is what the researcher makes sense against regarding their observations. Background knowledge tells us what exists, how to understand it, and - most concretely -how to study it. In the social sciences such background knowledge are called paradigms (Durrheim and Terre Blanche, 1999:3).

Hitchcock and Hughes (1995:16) describe paradigms as "some basic principles and foundations, which have developed and evolved over a long period of time. These background assumptions have come together to create different models of social and educational research".

In textbooks on research methodology, paradigms are usually defined along three dimensions: ontology, epistemology and methodology. Durrheim and Terre Blanche (1999:6) state that ontology specifies the nature of reality that is to be studied, and what can be known about it. Hitchcock and Hughes (1995:19) say that ontology is concerned with questions and assumptions regarding the nature of the subject matter. Kuhn (1970) in turn describes ontology as the commonly accepted view of the subject matter in a certain paradigm.

Epistemology (Durrheim & Terre Blanche 1999:6) specifies the nature of the relationship between the researcher (knower) and what can be known. It will also involve discussions of what can be known and if this knowledge can be obtained in a certain way. Hitchcock & Hughes (1995:19) claim that it is used as a way of justifying beliefs e.g. a Marxist epistemology.

Methodology specifies how the researcher may go about practically studying whatever he or she believes can be known (Durrheim & Terre Blanche 1999:6). This includes the different methods and techniques employed to generate meaningful data so that it

might be able to inform and answer the original research aim/question (Hitchcock & Hughes 1995:19).

In summary, Durrheim and Terre Blanche (1999:7) state that "paradigms help to determine the questions researchers ask about constructs as they go about answering them". There are four well-known paradigms within which researchers frame their research.

The Positivist research paradigm

The positivist researcher goes about research in a step-by-step, linear fashion and translates human interaction and language into mathematical variables and statistical representations. The researcher believes that he can detach himself and stay an objective observer as he analyses the information that he gathered from the outside world by means of experimental and hypothesis-testing studies, employing among others, surveys or structured interviews.

The Interpretive research paradigm

The interpretive researcher functions as part of the research process in varying degrees - depending on the type of interpretive study being executed - and has an internal reality of subjective experiences. The researcher is committed to having an interactional and empathetic stance toward the researched. There is an acute awareness of the influence of intersubjectivity and personal views during gathering,

producing and analysing the data (Durrheim & Terre Blanche 1999:6). Merriam (1998:7) posits the researcher as an integral part of the context of what is being studied and states that he/she often calls herself a participatory researcher. That means that she has a two-sided role in the study - as participant and as researcher.

In interpretive research, the researcher is the primary instrument for data collection and analysis. The data is mediated through the researcher rather than through some other instrument such as a questionnaire or a computer (Merriam 1998:7).

Methods of data production include semi-structured or unstructured interviews, field notes, summaries of interactions, analysing of documents created, artefacts and photographs. The final presentation of this type of data is usually in thick descriptions, telling the story of peoples's subjective experiences and meaning making processes.

It is evident that in interpretive research the emphasis is more on exploring and describing than on quantifying and proving, (Hitchcock & Hughes 1995:18). This is my preferred research paradigm and is discussed in more detail later in section 3.5.

The Critical Research Paradigm

The critical paradigm is suitable for studies that deal with issues of empowering and systematic dispowering, social relationships and the transformation of the situations in which we live/work (Wagiet 1996:23). Studies conducted within this paradigm usually

focus on the social relationships between people, and the interests that they serve. Furthermore, it is particularly suited for studies which aim to deal with questions about emancipation; changing and challenging imposed constraints by changing social order, and improving the participants' understanding of their social and political environment (Wagiet 1996:24).

In summary: a paradigm can thus be described as a theoretical framework, which acts as a guide for research enquiry. Each paradigm facilitates and supports the asking of certain kinds of questions and employs different methods of data production and information gathering. These specifics will be discussed shortly in the following sections.

3.3 THE NATURE OF THE STUDY AND RESEARCH QUESTION

In this section I will discuss the choice of research paradigm, the methods of data production and how the logistical processes of the study were orchestrated to answer the initial questions. During the process of consciously framing the study in terms of tradition/paradigms I carefully considered the nature of the research question.

The question, being investigative about people's thought processes and their accounts of their worlds, placed the study firmly in the qualitative framework with the choice narrowed down to being interpretive, critical or post-modern (post structural).

Durrheim and Terre Blanche (1999:123) state that:

> [...]researchers working in the interpretive tradition assume that people's subjective experiences are real and should be taken seriously, that we can understand others' experiences by interacting with them and listening to what they have to tell us (epistemology), and that qualitative research techniques are best suited to this task (methodology).

When I read this, I recognised that I personally subscribe to this paradigm and that the core ideas resonate with the aims of my study. In the light of this, I decided that - since I definitely do not want to attempt to convert my interactions with the teachers into the language of variables and mathematical formulae, the interpretive paradigm best suited the goals of this study. (Although the inherent nature of the SWAP activities could be classified as being socially critical.)

My aim is to investigate professional development processes that might have been facilitated through the project running in each school. I will present the information through a detailed description of each context and the participants within as well as information gained by way of interviews, observations and artifacts developed.

3.4 CASE STUDY DESIGN

3.4.1 CASE STUDY CHARACTERISTICS

Merriam (1998:19) explains that in case study research "The interest is in process rather than outcomes, in context rather than a specific variable, in discovery rather that confirmation." Furthermore, Merriam (1998:41) adds that a researcher selects a case study design because of the nature of the research problem and the question being asked. The case study offers a means of investigating complex social units consisting of multiple variables of potential importance in understanding the phenomenon, as is the case with schools and this programme! She defines a case study as an intensive description and analysis of a bounded system such as an individual, programme, event, group, intervention or community (Merriam 1998:19).

In this research project, a case study will be defined as an intensive description and analysis of a bounded system - in this case a specific school. Each school will be presented as a unique case. Merriam (1998:27) presents a test to see if something can qualify as a case study: a system can be called bounded if there is "a limit to the number of people involved who could be interviewed or a finite amount of time for observations".

You rarely investigate everyone and everything within a case study. Usually, a researcher focuses on some core aspect or group, but stays aware of the rest on the periphery. In the same way I, as researcher, mostly identified individual teachers to

interview because I felt that they could provide me with a rich source of information as I had worked closely with them. But the school context formed the backdrop against which this was done.

My research question, namely whether teachers experienced any professional development by being involved in the SWAP programme, speaks of a search for meaning made during and after the process of INSET. I believe this can most effectively be presented through case studies. Yin (1994) observes that case study is a design that is particularly suited to study situations where it is impossible to separate the phenomenon's (PD) variables from their context. As this is the case within schools, where micro-politics, principals and socio-political surroundings and so on have an influence on teachers teaching and learning, I felt that a case study design is perfect for this study.

As a qualitative, interpretive researcher I am interested in the new or adapted meaning that people constructed through being involved with the SWAP-programme (Merriam 1998:6). A limitation of and a very real danger in qualitative case studies is that it could be limited by the researcher's sensitivity and the integrity of the investigator.

As the researcher is the primary instrument of data collection and analysis, if the instrument/researcher is rigid and intellectually inflexible, the study might also be of sub-standard quality and tainted by bias. I was aware of this possible influence and

feel that my inexperience might have had an effect on the quality of the interviews in particular and could hence have influenced the data gathering.

Yin (1994 in Merriam 1998:29) observes that case study design is particularly suited to situations in which it is impossible to separate the phenomenon's variables from their context. This is the reason why I chose to research the professional development process within each particular context. Each case study had its own, unique context: physical location, different people that make up that specific "case study community", background and experience of teachers, intensity of programme that was run at the school and interest of the teacher(s) involved. All of these could have influenced the type/amount/grade/quality of professional development that occurred.

Merriam (1998:41) states that the case study design has proven particularly useful for studying educational innovations, for evaluating programmes, and informing policy. Furthermore, case studies are particularly suited if you are interested in the process for example, describing the context and population of the study, discovering the extent to which the program has been implemented or providing immediate feedback of a formative type (Merriam 1998:33). These elements were all present in my study and influenced my choice of case study as a research design. This brings us to the discreet evaluative nature of this study because it is in a sense evaluating SWAP as an educational programme for professional development.

3.4.2 EVALUATIVE ASPECTS OF THE CASE STUDIES

By researching the process of professional development that teachers report on during their involvement in the programme, I am indirectly evaluating the degree of influence that this teaching resource might have had on different individuals in the schoos I worked with.

Guba and Lincoln (1981:375 in Merriam 1998:39) conclude that case study is the best reporting form for evaluations. For them, case study is best because it provides thick description, is grounded, is holistic and lifelike, simplifies data to be considered by the reader, illuminates meanings, and can communicate tacit knowledge. Above all else, though, this type of case study weighs information to produce judgement. Judging, according to Merriam (1998:39) is the final and ultimate act of evaluation.

In the last chapter I, together with the teachers, will be judging the effectiveness of this programme. I will therefore be evaluating the programme through the case study methodology (Durrheim and Terre Blanche 1999:217, Merriam 1998:39, Yin 1993:55-76).

What would I be evaluating? There are obviously a numerous amount of variables and instances that could be judged. Durrheim and Terre Blanche (1999:210) name several roles of evaluative research:

- Evaluation research tracks the efficacy of social programmes in human and social terms.

- The central goal of evaluation research is to answer specific practical questions about social programmes, as well as the quality of service provided.

My particular study will indirectly be evaluating the effectiveness of the SWAP resource tool to stimulate and facilitate environmental learning - a professional development process for teachers. Data triangulation will be accomplished through interpreting different data sources and levels of human interaction, as suggested by Durrheim and Terre Blanche (1999:215) and Hoban (2002). These levels of human interaction and different influences in a complex system are explored in Chapter 5.

Durrheim and Terre Blanche (1999:217) also point out several issues in evaluative research:

- Does the evaluator judge the merit or worth of the programme?
- Or should such judgements emerge naturally from the process of information sharing in which stakeholders become engaged in the course of the evaluation?

In this process of evaluation I would like to proclaim a commitment to those involved to analyse the perspectives of the various participants in context and continually try to understand the various events and transactions involved in the evaluating of the programme (Durrheim & Terre Blanche, 1999:219).

In discussing the evaluative nature of this study, it is necessary to link the interest in process under investigation to how it can be interpreted in an evaluative manner. In this study no explicit outcomes were formulated at the start and I did not intend doing a

summative evaluation at the end of the process. In other words, the research was not designed as an experimental design in which the SWAP process served as an intervention that would be measured against formulated outcomes.

Instead I conceptulaised this as an evaluation of process (Mouton and Babbie 2001:341) where I would rather be focusing on new questions that might arise during the process; whether the management and infrastructure is in place to support implementation and how participants experience the programme. This is in keeping with what Mouton and Babbie (2001:356) describe as a naturalistic or qualitative evaluation tradition and I chose this in keeping with my overall research approach to ensure coherence.

I also felt it an appropriate approach as my question resonates with the question indicated by Mouton and Babbie (2001:357), "When the focus is more in describing the implementation process rather than on the outcomes or impacts of an intervention".

Investigation into the process of a programme can mean monitoring - which is also an evaluative action. This will be done through describing the context and population of the study and then investigating the extent to which the programme influenced their teaching practice or personal views on their local environment (Reddy 2001). To accomplish this, I will be employing specific techniques and methods of data production.

3.5 INTERPRETIVE METHODS OF DATA PRODUCTION

Interpretive research emphasises rich experiential data, and the research therefore has to be designed to produce this kind of data. From an interpretive perspective, the context of for example the environment in which an interview was conducted, is key to valid research (Durrheim & Terre Blanche 1999:35).

In my study I believe that the reality to be studied consists of people's subjective experiences of the external world, therefore I adopted an intersubjective stance toward reality and I used methodologies that relied on the subjective relationship between the researcher and the subject, such as interviewing or participant observation. This is characteristic of the interpretive approach, which aims to explain the subjective reasons and meaning that lie behind social action (Durrheim & Terre Blanche 1999:6).

This study is framed in the structure of a number of delimited or bounded case studies within an interpretive paradigm. In this case the bounded systems are primary schools represented by a selection of teachers interviewed from those schools. In conducting interpretive research using case studies, the researcher must be sensitive to the physical setting, the people, the overt and covert agendas and non-verbal behaviour among other things (Merriam 1998:21).

The different methods of data production included:

- Fieldnotes of workshop summaries - these are short researcher field notes concerning specific incidents, working programme and possible improvements to the presentation of the workshop.
- Photographs and fieldnotes of river visits - fieldtrips to local rivers using the SWAP-kit to test the water and interpreting the results afterward as preparation for using SWAP in the classroom.
- Transcriptions of interviews - formal and informal interviews with specifically chosen participants.
- Transcription of focus group discussions - groups of teachers, usually all from one school, discussing certain aspects about the programme.
- Artefacts developed by participants - this includes additional activities undertaken, such as the making of information pamphlets.
- Learning material developed - existing material was adapted and in some cases expanded to suit specific local contexts. The teachers created new materials, sometimes, for specific needs.
- Photographs of certain activities - photographs of activities at the river and in class provide a vivid description of the activity undertaken.
- E-mail correspondence - some feedback was collected via e-mail correspondence.

The formal interviews and focus group discussions are the main source of data; the rest will be used to view this information from different perspectives. The data will be presented as bounded case studies that will be cross-analysed, taking note of each

specific context. The specifics on logistical conducting of the study will be discussed within each case study.

3.5.1 THE TECHNIQUES

The term "techniques" is sometimes interchangeably used with the term "methods". Hitchcock and Hughes (1995:20) describe techniques as "ways of proceeding in the gathering and collection of data". Consequently, it addresses the way in which data will be gathered or generated/produced .

If the techniques of data collection/generating that you use are not compatible to your chosen paradigm, and vice versa, you might become frustrated with not being able to find what you are looking for. A set survey with only "yes" or "no" answers will probably not provide the depth of insight you were looking for if you were conducting a study on the thought processes of teachers while they were involved in an INSET workshop. Therefore, in this study I used interviews with open-ended questions to allow participants to digress and explore their experiences in their own words. Photographs gave a vivid picture of activities in specific contexts. River visits provided me with first hand interaction with both teachers and learners. The data produced using these techniques illuminated my research question and curiosity by providing multiple sources of evidence. This gave me insights into the complexity of the professional development processes in a variety of contexts.

3.5.2 THE RESEARCHER'S ROLE

I conducted myself as a "participatory researcher" since I believe that the research question could best be answered through my direct involvement with the teachers and the learners, in the context of each delimited case study. This is in line with Durrheim and Terre Blanche's (1999:123) description of the interpretive paradigm as one that relies on first-hand accounts and tries to describe what it sees in rich detail. It is also because of the above that, after investigation, I was convinced that the most effective way to present this study was to use delimited or bounded case studies.

3.6 SUMMARY

In this chapter I discussed the different design options a researcher has to consider to create a valid and coherent study. I stated my case for choosing the interpretive framework in which to conduct the study, and why the case study design is particularly suited to this study. In conclusion, I posited the different techniques for data production and briefly noted how these will be analysed. In the next chapter I will describe each case in detail.

CHAPTER 4

CASE STUDY REPORTS

INTRODUCTION

In this chapter, I present case studies of the Primary schools that I studied in the Western Cape. All of them were involved in the Catchment Stormwater and River Management Project launched in partnership with the Environmental Education Programme of the University of Stellenbosch (EEPUS) during 2001/2002.

In 2001, the CMC and EEPUS engaged in talks to develop a partnership arrangement that would see the University of Stellenbosch and the CMC Storm Water Section involved in joint water quality awareness programmes in schools situated in or near catchment areas. Essentially, this was developed as a mutualistic partnership in which the University would provide expertise related to resource materials (SWAP kits) and professional development of teachers, and the City of Cape Town would provide information on catchments as well as financial support for the project. The participating schools that provided local context knowledge and school knowledge (what is possible at school) and access to communities around schools constituted the third partner.

The partnership between the CMC and EEPUS aimed at promoting water quality awareness by empowering teachers to use an environmental education resource in their daily practice. The extent to which this was done and ways in which teachers might have adapted the resource were monitored as indicators of professional development.

The case studies involved schools located close to a water source. These are:

1. Somerset-West region – Lourens river
2. Oceanview region - Bokramspruit
3. Table View region - Rietvlei
4. Table View Home School - Rietvlei
5. Houtbay region – Disa river

All the schools except the home school was suggested by the CMC and I followed up on the recommendation. Access was gained by way of a formal meeting to which principals were invited, at the CMC offices. Principals were briefed on the proposed programme and were requested to take the invitation and details back to their schools. I followed up a week later and set up dates with the schools who agreed to be participants in the programme. All the schools accepted the proposal and agreed to participate. Dates were organized with them for the "training programme".

4.1 CASE STUDY 1: SOMERSET-WEST REGION, LOURENSRIVER

4.1.1 BROAD CONTEXT OF THE SCHOOL

This school, a former model C[2] school is situated in the centre of Somerset-West and has a diverse community of learners. The school is housed in a well-built brick building and has good facilities for sport and extra mural activities. The learners come from a variety of backgrounds ranging from economically well off, white upper middle class families to less economically viable families. This school is definitely one of the more fortunate schools in terms of funding and it seems as though there are enough funds to host different extra-curricular activities and resources were seemingly not a problem at this school.

The physical setting of the school is interesting. On the one side the town centre borders the school with residential area on the other. Ten minutes walk from the school, there is an industrial area situated on the banks of the Lourens River. Access to the river is not a problem for most of its course. Some parts of the river are however fenced off by private properties; other parts flow through the premises of industries,

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[2] Schools open only to white learners for a long time but which were allowed to enroll learners from other communities. These schools operated on a semi-autonomous basis and charged fees for entry set by the school board and allowed only selective enrolment at the school. They funded maintenance but the state paid teaching staff.

and then there are places like Radloff Park where the river is used for recreational purposes such as jogging, children playing and families picnicking on the river banks.

The organization and general running of this school is excellent. The principal is a firm driving force ensuring that everything is done to the letter according to school policy and general regulations for schools. They used the SWAP resource and activities as their "Environmental Education" programme, which is imperative to the new curriculum and required by school legislation. They arranged their activities according to a whole school programme and included all grades in their field trips. They hired a few busses and used the three school busses to transport children to and from the different test sites at the river. Parents are quite involved in this school and the school also endeavors to make them feel welcome. They have just recently renovated one of the second floor classrooms, overlooking the rugby field, into a clubhouse/tearoom where parents can relax while they wait for their children to finish sport activities.

Well-trained teachers make up the teacher corps. This school is actively involved in different INSET seminars concerning OBE as well as management and mission/vision issues. While I was working in the school, they were busy with a whole-school evaluation project to optimise the functioning of the school.

4.1.2 PROGRAMME AT THE SCHOOL

The training of Somerset-West teachers started in the fourth term of 2001. The training was in the form of an afternoon workshop and a river visit the following morning. All teachers attended the workshop. The teachers divided themselves into groups of four to six people. I discussed each SWAP lab after they had 15 minutes to read and engage with the material, laboratories, test tools and worksheets. The workshop was held during the last four days of school, after the learners have already left for the end of the year. These teachers were busy with planning for the next year and there was pressure on them to finish the planning in the four days. Because of all that, they were exhausted and could not extract the maximum from the workshop. During the workshop, (Fig. 4.1.1) I noticed that the teachers were tired and as a result I tried to shorten the workshop by leaving out discussions about the construct *environment* as well as any mention of the Active learning framework. They just engaged with the physical SWAP kit and accompanying laboratories and worksheets.

In 2002, we started running the programme in the school soon after schools re-opened. On 20 February I delivered 26 SWAP kits to the school. One teacher took responsibility for the logistical organisation of the project and she divided each grade into 18 groups. The whole river, from the origin to where it flowed into the sea, was divided into 18 sections. She assigned a laboratory to each grade, according to level of difficulty. The Grade 1's did the turbidity laboratory where they tested the muddiness or clarity of the water. Their teachers created worksheets with pictures so

that they need not be able to read to complete it. (appendix C). The Grade 7's at each point helped the Grade 1's and 2's to complete their worksheets and tests.

Various Labs and tests were assigned to different grades

Grade	Laboratory	Grade	Laboratory
Grade 1	Turbidity	Grade 5	Catchment and Health Risk
Grade 2	Turbidity and Health Risk	Grade 6	Water Life
Grade 3	pH	Grade 7	Oxy-Bac Lab
Grade 4	Nitrates		

TABLE 4.1 ALLOCATION OF LABORATORIES

On 1 March, the whole school visited the whole of the Lourens River which had been organized into 18 sections. In this manner, they tested the whole river in one day and could paste together a very comprehensive picture of the river's water quality at 18 different points! They asked parents to come and help on the day of the river outing. Each group had at least one teacher and two parents to escort 42 children to their designated point. At each point, the learners would execute their tests and then they would have a teacher facilitated whole group discussion. Feedback in the interviews showed that this did not happen at every point.

The learners, parents and teachers returned with the most interesting stories. The pupils up at the source of the river could not stop talking about how beautiful it was, how clean the water was. Other stories included flood levels, changes to the riverbank by the local government, koi-fish in strange places and even Pick and Pay trolleys

found in the river. Thankfully, they also remembered to do the tests amidst all the excitement.

The teachers, in their own time, had class discussions regarding the specific laboratory that their classes were working on. In grade 4 they handled Nitrates. The class could present information regarding the Nitrate reading at 18 different points in the river. The teachers expressed a need to actually have some of the other labs represented since they wanted some information gathered by the Catchment and Health risk laboratories, which could maybe shed light on the different Nitrate levels.

At the end of the first term, the teacher in charge of coordinating the project at the school gave the labs to the classes to be completed. On Sunday 14 April, I visited this teacher at her home and we reflected on the project so far. For two hours we discussed the next phase of the project: the second river visit.

One of the shortcomings of the previous river visit was that the parents felt unsure because they had no information about what to do before the time. In response to this, the second visit on 26 April we commenced with 30 minutes of parent training in the staff room. I prepared A3 information pages incorporating the labs and worksheets, explaining first how to do the test, secondly how to interpret it, and thirdly why this aspect is important to river quality. Afterwards the parents came back to me and said that they gained new insights using these A3 pages at the river.

After the parent training, I presented a talk on finding and classifying the water life in the river, in the hall. This talk was actually scheduled for one of the council members to come and talk to the children about the riverbank widening in preparation for the 50 year flood (Fig.4.1.5). They could not come, so I had the opportunity to talk to the whole school.

In the talk, I explained how living creatures serve as indicators of the quality of the river water. I used colour transparencies of some of the most commonly found water life in the river: water striders, whirligig beetles, snails, rat-tailed maggots, mayfly nymphs and dragonfly nymphs. This talk sparked a previously unseen amount of interest in the children, and although we asked them not to, they came back to school with buckets full of bugs, larvae, insects, and worms of all kinds! (Fig. 4.1.7) Having the whole school in front of me was a huge privilege, because not only did I personally train the children, but the teachers were also going through a second round of training, although they might not have realised it. I used the opportunity to touch on safety issues such as wearing gloves when working in the river and NOT drinking the water under ANY circumstances.

In one of the Grade 6 classes, after the second visit, we classified all these strange living invertebrates. Afterwards, the information was plotted at the specific point at the river where they were found, e.g. the mayfly and the stonefly at point 1 at Lourensford Farm (the origin of the river) and the rat-tailed maggot at Pick 'n Pay, near to the point where the river flowed into the sea.

On their first visit to a specific part of the river, a group of learners discovered three nests of a rare indigenous bird – the Cape Oystercatcher. With the second visit to the site the group was given permission to stay longer to help the nature conservation guards to clean up the area so that the birds could breed more easily. The teacher of this grade 5 class created a worksheet about these birds from a pamphlet that I faxed through to the school. This worksheet is also an indicator of professional development that happened.

I visited the school twice more after that; once to visit the Grade 1 class and investigate what they gained from this project, the other to support and monitor what teachers did with the information that they produced by testing the river water quality. The Grade one teacher created a little book in which the learners drew the weather, scenery and interesting things that they saw. The Grade 1's did the turbidity test where they tested the muddiness or clarity of the water. The teacher told me that she was astounded by the amount of insight and different information that these learners brought back to the classroom. She said that she could actually hear at which points at the river the groups had a whole-group discussion. These little Grade 1's presented information about the bio-indicators, nitrates, catchment area and health risks.

The school programme easily supported and incorporated SWAP, but this school needed support in terms of establishing a report back-system to the municipality. I gave them a copy of the Environmental database CD in which they could find ANY

type of organisation which they might need to contact. Furthermore, we established an e-mail address, SWAP@sun.ac.za that could be used as a report back system, as well as an enquiry service.

These river visits happened once every term for a whole year. In a talk with the principal, he said that this project sparked a huge amount of positive interest with the parents and that he would like to continue with it. In this way, SWAP reached a community that reached beyond the immediate boundaries of the school, into the parent community.

Parents were involved in one of the training sessions and assisted teachers with managing learners during field trips. Some parents also assisted with transport in addition to the school vehicles. They were willing to transport groups of learners in private vehicles.

I conducted interviews with teachers spread across the grades. Generally, teachers were happy to include the SWAP activities into their programmes although they were very busy when we started the process. The teachers at this school developed their own work sheets for various grades and adapted SWAP materials to suit different phase levels at the school. The principal was accommodating and adjusted the timetable to fit in fieldwork activities in every term.

PHOTOGRAPHIC RECORD:
Case Study 1
Lourensriver

Fig. 4.1.1 Workshop on SWAP materials.

Fig. 4.1.2 Teachers on their way to the river.

Fig. 4.1.3 Looking for bugs and other living organisms to give us a clue of the state of the river.

Fig. 4.1.4 Packed boxes ready to go to different parts of the river.

PHOTOGRAPHIC RECORD:
Case Study 1
Lourensriver

Fig. 4.1.5 The Council widening the banks of the river in preparation for the fifty year flood.

Fig. 4.1.6 Group discussion at the river.

Fig, 4.1.7 Using a bug-dail to identify living organisms.

4.2 CASE STUDY 2: OCEANVIEW REGION - BOKRAMSPRUIT

4.2.1 BROAD CONTEXT OF THE SCHOOL

This primary school is situated in the middle of the Ocean View residential area in the Southern Peninsula, on the banks of the Bokramspruit - a partly canalized river. (Fig 4.2.3) There are about twenty members on the staff and the school has an enrolment of more than one thousand children. The school is a prefabricated building of which parts are in a state of disrepair and partial decay. Other parts of the building have been vandalised and walls have been defaced by graffiti.

The school building is located in an area surrounded by high-density sub-economic and informal housing. Poverty is rampant and the river is used in many cases as a place to conduct criminal activities such as drug dealing and alcohol abuse. The population is mainly poor with low levels of literacy. A large percentage of the people living here were forcibly removed from the Simon's Town area when that area was declared a white area in terms of the Group Areas Act(1950), a law which enforced racial separation of residential areas. The broader community is largely uninvolved in the school activities. Teachers receive little or no support from parents for fundraising projects and other school based projects.

The learner and staff composition is mainly people historically classified as coloured and black people. The school seems to be well supported by some sponsors such as Sasko Sam, a bread manufacturing company. Posters from school projects, such as

AIDS awareness, Metro Rail competitions and the like are common in this school. They seem to grab every opportunity that arises to improve the school.

Access to the river is easy. There are no fences and a large part of the river is within walking distance from the school. Some parts of the river have been canalised and there we encountered a safety hazard with notices warning not to swim or play in the water. (Fig. 4.2.1, Fig. 4.2.2)

4.2.2 PROGRAMME AT THE SCHOOL

This school was one of the SWAP project schools initially suggested by the Catchment River and Stormwater management Department. I contacted the principal in November 2001 and she attended the initial meeting between the CMC, the university and the school principals. At this meeting, we discussed each of the partners' roles and the envisaged programme. In February 2002, I met with the principal and on the same day did a 10-minute presentation to the staff about SWAP and the programme. The teachers agreed to be part of the programme and immediately booked a workshop for early March 2002.

The workshop was held in the staff room and the whole staff attended (Fig. 4.2.4). These teachers were prepared to stay until 15h30, which gave me enough time to do an activity about the construct environment and issues in their immediate environment (Fig. 4.2.5). When we identified an issue in their local environment lively discussion

followed about where this issue actually originated, in which dimension of the environment, and where/how it is impacting on other dimensions. On many issues we could not reach consensus about where they actually originated, which was a realistic experience of the integrated and complicated nature of environmental issues. I emphasised that the critical discussion was the valuable part of this exercise and stressed that that was what they were to aim for in their classes. This discussion also sensitised the teachers, and activated their latent knowledge about their local environment and the issues in it.

Alongside the drawing of the environment (Fig. 4.2.5), I drew an Active Learning Framework on a page of newsprint. As we discussed each SWAP laboratory I asked them: "Where does this activity fit in the active learning framework?" Is it an enquiry activity, an investigating activity, or is it a reporting activity. (Discussed in Chapter 2) In this workshop, each group had to study a certain laboratory and then present its goal, test and interpretation to the rest of the staff. This focused their attention on the different goals of different laboratories.

They appeared to enjoy the workshop, and it was satisfying to see how well they worked together as a group. There were heated discussions and meaningful questions were asked. This group of teachers was not afraid to acknowledge when they did not understand something, and were quick to respond to difficult questions.

Questions such as: "Is neglect of children, a social, political or economic problem?" We had some heated discussions around issues such as child abuse, rape, child neglect and whose fault it really was and whether it was an economic, political, social problem (Fig. 1.4).

The next day, we went on a fieldtrip to the Bokramspruit (Fig. 4.2.6). When I arrived at the school, there was a tangible excitement in the staff room. These teachers were dressed for the occasion; tracksuit pants and plastic bags to serve as shoe covers (Fig. 4.2.7). Although the weather was inclement, they never once hinted that we should not proceed. It was windy and raining. In my opinion, these reactions showed commitment and an enthusiasm for working differently.

Furthermore, these teachers found practical solutions to overcome obstacles - like a pair of waterproof boots substituted by plastic bags around the shoes. Some of the other schools I worked with did not manage to overcome such hindrances.

We spent a focused hour at the river. The teachers were pre-split into groups of two or three. Each had to complete one of the tests, such as pH or water life (appendix A). After a focused afternoon hour at the river, we all went back to the staff room, had a discussion on how the laboratories support and inform each other in creating a picture of the quality of their specific river's water. These innovative people really did everything! They even interviewed a lady who lived close to the river to ascertain what it looked like around there 10 years ago.

Later, through the focus group discussion, I found that they implemented most of what I modelled during those two days, in their classroom practices concerning SWAP. I found that they managed to conduct a fruitful Environmental Education activity in their classrooms in my absence. I modelled one river visit with children from the school in Grade 7, which only their register teacher attended (Fig. 4.2.8). He then supported the other teachers when they had questions.

The ceremony at the MTN Sciencentre where they could see exhibitions of other school's use of SWAP inspired them to do some more. The Grade 7 teacher used another school's idea of building a model of something that works with water as inspiration to have his Grade 7's build a model of the river in technology. In this way, the teachers could see that they were part of a bigger picture; they did not feel so isolated. Most of them expressed surprise at the size of the project and were proud to be part of the bigger process.

The school was invited to participate in the Marine Day exhibition, which lasted for a week at a nearby high school. I talked to the principal and she said that this teacher took her own initiative and had the photo's laminated, made a banner and used the Grade 7 laboratories at the exhibition.

There was no parental involvement on the field trip I conducted with the teacher. On our way to the river we passed many people who just seemed to be lazing around with

very little to do. Problems of poverty and deprivation were visible all over as we passed through the informal settlement close to the river, an area where some of the learners at the school live.

The teachers generally seemed to be motivated to try new ideas and to implement the activities suggested in the SWAP kits. During the training sessions, teachers were eager to try out the tests themselves and much deliberation ensued when results of the tests were available. It was however evident that teachers felt burdened by the increasing workload and sometimes overwhelmed by the multiple changes they needed to contend with. It was also mentioned that the lack of support from parents was a demoralising factor that often served to hamper initiatives and plans for innovation.

While teachers started to include SWAP activities in their general classroom practice, no artefacts such as work sheets or other material based on the SWAP resource were developed. No artefacts were available for scrutiny on my follow-up visit to the school. The ideas developed for technology and language learning areas were implemented, but no products were available for me to observe and discuss with the teachers.

PHOTOGRAPHIC RECORD:

Case Study 2

Bokramspruit

Fig. 4.2.1 We know we were testing a polluted river,

Fig. 4.2.2 Children climb into these stormwater drains for fun.

Fig. 4.2.3 They exit the stormwater drain at this point.

Fig. 4.2.4 Teachers working on labs.

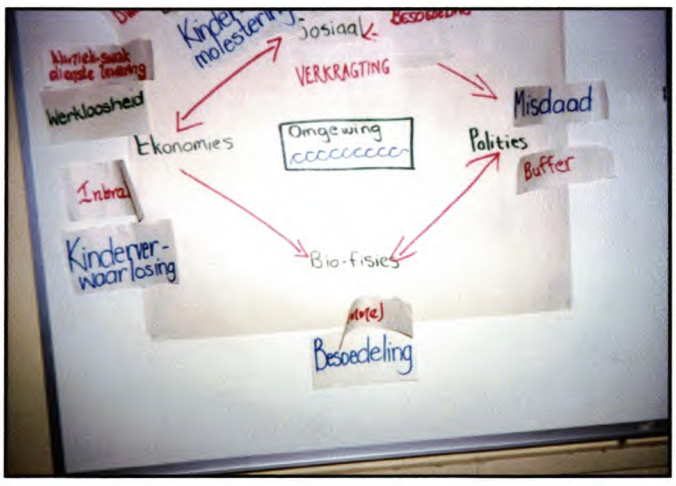

Fig. 4.2.5 Teachers' evaluation of the problems in their local environment.

PHOTOGRAPHIC RECORD:

Case Study 2

Bokramspruit

Fig. 4.2.6 Teachers doing the test at the river.

Fig. 4.2.7 Using plastic bags in stead of waterboots.

Fig. 4.2.8 Teacher explaining a pH test.

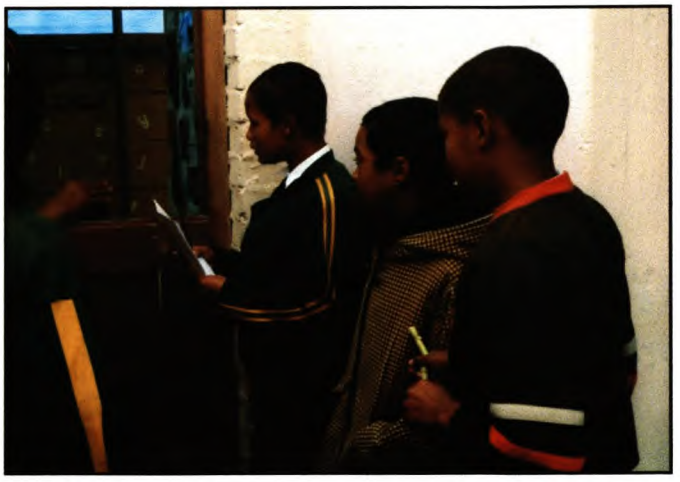

Fig. 4.2.9 Learners interviewing members of the community.

Fig. 4.2.10 Learners doing tests and looking for living organisms.

4.3 CASE STUDY 3: TABLE VIEW REGION - RIETVLEI

4.3.1 BROAD CONTEXT OF THE SCHOOL

This school is surrounded by middle class suburban homes, there is a large oil refinery, a sewage treatment plant and other industries close by. The children in the school come from middle class homes surrounding the school, which include some relatively upper middle class homes. This is also an ex-model C school and is well resourced with a good quality and well-maintained school building and sports facilities.

This school has a well-trained teacher corps. The two teachers who were involved with SWAP in this school were both dynamic people. The "library lady", as the learners called her, has previous experience in Environmental Education. The other teacher, the Grade 6 teacher, was an optimistic person wanting to implement OBE teaching in her classroom.

The Rietvlei Wetland is within walking distance from the school. The learners performed the SWAP tests on this water body during field trips. Access to the Vlei was not difficult and learners went there for several visits.

4.3.2 PROGRAMME AT THE SCHOOL

Access to the school was gained via a third party I met at a workshop discussing a strategy of implementation for the Integrated Metropolitan Environmental Policy (IMEP) for the City of Cape Town, where I exhibited the SWAP materials. I was approached by Guilma van Wyk, working at SANCCOB[3], pleading with me to start this project with a school close to Rietvlei. She was concerned about the number of birds that they find dead in the middle of the Vlei, and many others being brought in to be treated at the SANCCOB centre for rehabilitation and polluted birds. She thought that the reason might be high levels of bacteria in the water. She faxed a list of schools in the area to me and I chose this particular school because they already had a nature club in existence at the school.

I contacted the school and they put me in contact with the nature club teacher (the "library teacher"). We conversed on the telephone for 10 minutes and then I made an appointment to come and see her. On that afternoon she had another teacher with her who was interested in becoming involved in the nature club. We read the materials together and they spontaneously discussed how it could be used in Rietvlei. When I returned a week after that for the second discussion, there was another teacher who joined and I was told that the nature club teacher had presented these materials to the principal and she advocated that they should be used in the formal curriculum. One of

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[3] South African National Foundation for the Conservation of Coastal Birds

the Grade 6 teachers volunteered to try this in her classroom. The fact that they used SWAP in the formal curriculum shows an inclination to do things differently. I never trained them like the other schools because we were just two people. We sat down and talked about the materials, discussed links with other learning areas and what form it would take in a classroom.

Two weeks after that we had our first river visit. One of the biggest surprises awaited me when I arrived at the schools. The children were all wearing SWAP T-shirts which they designed themselves! The T-shirts had the icons of all the different laboratories on the back and "SWAP" on the front. It was printed on blue Golf-shirts, blending with the school uniform (Figure 4.3.1). The children held cake sales to raise the money to buy their shirts. The teacher had the children draw up income and expense sheets as part of their Mathematical literacy training. The T-shirts were printed at a local printing and clothing company. We had discussed in the training that previous projects included the making of T-shirts, but I never expected them to actually do it!

For the first visit, the children gathered in the library where we had group preparations focusing on the laboratories; played a game on how to use the bug dial and familiarise them with some of the bugs. (Fig. 4.3.2) Each group had to explain what their laboratory was about, and how their tests worked. We packed all their "science tools" in plastic see-through envelopes. Before the visit, the children had to plot their position on an aerial photograph of Rietvlei. They drew this in their workbooks and had to plot north as well. In this way they incorporated learning about the different compass

directions. The children were well prepared and they were all armed with yellow dishwashing gloves and an abundance of 2L bottles and ice cream containers (Fig 4.3.3). There were no "problems" with a lack of physical resources in this case. The teachers mentioned that they had learned from me in my presentation of this group method of teaching.

The site of the first visit was at the boat club at Rietvlei. The learners took a walk along the Vlei and read the posters explaining the seasonal changes in the Vlei, the vegetation, living animals and fishing issues. After that, we conducted the tests and gathered the information. The teachers let the children do the tests in their own time, and without much supervision (Fig. 4.3.5). Afterwards, I facilitated a class discussion about the different results and links between the laboratories - with support and helpful comments from the teachers.

The second visit was focused on an inlet of the Rietvlei, the Black river. This river flows past some informal settlements before it reaches the Vlei. The River is partially canalised, hyacinths abound and nitrification is evident. The walk to the river provided useful insights into the activities conducted near the river such as nurseries, people littering on the banks and the clearing of hyacinths. The children met up in the class after the field trip. The discussion that followed was a heated one, as they had seen more clear evidence of different types of pollution at this part of the Rietvlei than at the previous site.

They ventured out on two more visits without my presence (Fig. 4.3.4). At the end of the programme at the school, they telephoned me to present certificates to the learners. The teacher made them herself. All the learners were seated in the front of the hall, proudly wearing their SWAP T-shirts. I presented them with the certificates. I was pleasantly surprised with an exhibition in the foyer of the school where all the laboratories were exhibited with the pamphlets, essays, letters and informative carton pictures of indigenous birds.

These teachers adapted SWAP suggestion materials and developed work sheets and activities for their learners based on these materials. These included work sheets, activity sheets and ideas to implement in learning areas other than science. They made the SWAP materials their own and worked with confidence after an initial introductory session I conducted with them. The teachers used the materials to develop an Outcomes Based approach to their teaching and also included the local environment in their curriculum.

PHOTOGRAPHIC RECORD:
Case Study 3
Rietvlei

Fig. 4.3.1 The "learner-designed" SWAP T-shirt.

Fig. 4.3.2 A group of boys reading their laboratory.

Fig. 4.3.3 Safety wear.

Fig. 4.3.4 A later visit with a ranger from Rietvlei.

Fig. 4.3.5 Doing the tests.

Fig. 4.3.6 Completing their labs at the river.

4.4 CASE STUDY 4: TABLE VIEW HOME SCHOOL - RIETVLEI

4.4.1 BROAD CONTEXT

This case study is particularly interesting since it is not a formal school, in the usual sense of the word, but a group of parents that are home schooling their children. To describe the context is even more difficult. These children come from different social classes, but they have a strong common ground - their religion. The fact that they attend home-school enables them to have more time and be more flexible in their scheduling of projects than a normal school. These parents spend as much time on a particular aspect/project/subject as they choose to. They are well resourced and have time available to try other programmes. Furthermore, their religious beliefs compel them to care about the less fortunate, or in other words, the economically disadvantaged communities. They support each other in resources, time and teaching efforts. One mom would for instance take all the children on a Tuesday and would then work on their "water projects" in groups at one specific house. Also, because of their small number, about 15-20 learners, much more attention is paid to each child and his/her learning. In this case, it enabled even an 8 year old to successfully complete all the tests in the SWAP programme.

4.4.2 PROGRAMME FOR THE HOME SCHOOLERS

This group of about 15 families contacted me via the CMC and volunteered to participate in the programme. The training for this group of people is even more interesting than trying to describe their context. They asked me to present an outside day for their children. What made this so interesting was that for every learner present, there were either one or both parents present too, and that on a Thursday morning. For these people, spending time with their children, being part of their education, and making sure that the education complies with their religious beliefs, are of utmost importance.

I organised the learners into groups in the little outdoor amphitheatre at Rietvlei. I sent the learners on a discovery expedition, telling them about the posters about Rietvlei that are situated all around the wetland. They had to go walk about and return with as much information as possible. The parents embarked on this expedition with the learners. On returning, I organised them into age groups with parents supervising. I used the Somerset-West idea and gave the younger learners laboratories such as the pH and Nitrate laboratories. I explained to the whole group what every laboratory was about, and then I demonstrated the tests and every group had to come and collect their tools. Then they were off!

During the testing and the information gathering (Fig. 4.4.1 – 4.4.4), these children interviewed a fisherman as well as the local Nature Conservation Officer. We promptly

asked this gentleman if he could tell us a little about the history and current state of Rietvlei. I think the most interesting fact, for me, was that Rietvlei was man made, and not a natural wetland (Although it is very old).

Secondly, he explained why they were letting people fish in Rietvlei; they had a problem with an alien type of fish that eats the roots of plants in the water and causes soil erosion to occur. The parents were especially impressed with these facts, since they originally thought that it was irresponsible to let people fish in the Vlei.

The whole morning was captured on video and apparently they all watched it afterwards in a group session to review the morning. At the end of the morning, after our group discussions and coming to a conclusion about the state of Rietvlei, the children and parents were very concerned about what could be done to better the water quality in this water body. Some action plans were discussed, like joining "Friends of Rietvlei", writing to the local newspaper and fighting alien plants.

These parents went home with copies of the worksheets as well as the adapted A3 laboratory pages. Apparently they copied a set for each family and each "parent-teacher", then used this as they saw fit. About two months later, I received a call from the lady that organised the whole outing who invited me to their water day exhibition. This was held on a farm in Atlantis (a semi-rural suburb on the outskirts of Cape Town) on the Saturday.

This was a feedback day where all the learners, about 25 in all, presented to the parents what they had learned in the past two months. They presented a game they had made which uses the knowledge they gained in the SWAP programme. It is entitled "Waterfalls and Wetlands" and is a game based on the snakes and ladders game. Two girls (Grade 2 and 3) made cards with questions that you must answer before you are allowed to throw the dice and proceed. There were also "pitfalls" on the board such as: "the pH of your river is 9. Too high! Move back 2 spaces and stop putting washing powder in the water!"

The Grade 5 learners built models on the water cycle and explained different types of pollution that could happen at different stages in the cycle. This was maybe the most meaningful use of the water cycle I have ever seen! The Grade 7 learners built a model that showed how water could be used to move a water wheel and then turn another wheel on the "bank" of the river.

At this farm, there was a dam with drinking water for the animals. The children tested the pH and Nitrate level of this water and searched for water life (animals). No water life of any kind could be found. The pH was off the chart acidic and we had some interesting hypotheses on why this was the case.

The parents presented me with a video of the day we spent at Rietvlei. After the project was completed, they continued to phone me to ask for information related to the activities for children and issues regarding water quality management. The SWAP

suggestion materials were fruitfully used to develop worksheets that were context sensitive to the home school setting. These teachers used the materials to develop curricula for various grades in their school and for personal use on fieldtrips.

PHOTOGRAPHIC RECORD:
Case Study 4
Rietvlei

Fig. 4.4.1 Helping to classify living organisms.

Fig. 4.4.2 Fascinated by a flatworm.

Fig.4.4.3 Doing the pH test.

Fig. 4.4.4 Comparing the result with the colour chart.

Fig. 4.4.5 Relating our pH test with the information on our laboratory.

4.5 CASE STUDY 5: HOUT BAY REGION

4.5.1 BROAD CONTEXT OF THE SCHOOL

This school was founded by Moravian missionaries who came to South Africa to evangelise and do community work. In 2002, the school celebrated its fiftieth birthday. The school still has an explicit Christian ethos with emphasis on moral standards. At the initial meeting of the CMC, SWAP and some schools, the school principal volunteered the school to be part of this programme.

The building is situated in the midst of the affluent community of Houtbay, surrounded by estates, privately owned smallholdings and houses, which could be described as mansions. The school community though, largely drawn from the informal settlement of Imizamo Yethu, less that 1 kilometre from the school. The surrounding community is thus one of great wealth, but the learners and their parents are poor, having to cope with communal taps, unrest and regular unrest related to availability of jobs, human rights violations and other social problems. It can be said that the true socio-economic context of this school is one of poverty, disinterested parents, lack of funds, problems with drug-abuse, gangsters, teenage pregnancies and HIV-AIDS.

The Disa River is within walking distance of the school. Access to the river is complicated because large areas of the river are “owned” by private landowners, who have fenced in their properties up to the riverbank, with large dogs and high security.

It is only at bridges, where the road crosses the river, and at some small conservation areas, where access to the river was possible (Fig. 4.5.1).

4.5.2 PROGRAMME AT THE SCHOOL

This school was one of the original schools suggested by the Catchment Stormwater and River Management department of the CMC. I contacted the principal and did a short introduction to the programme in his office in February 2002 and invited him and his school to participate in the programme. He was excited about the project and asked that I prepare an info-sheet for the teachers about the project. I copied the first three pages of the teachers' guide that included the goals of the SWAP-kit and the history of SWAP. We set up a date and time on which I would contact him to book a workshop. He requested that we do that early in the second term, since they were celebrating their fiftieth birthday during the first term. I phoned in the second term on the 11 April, 10:00, as requested. We booked the workshop for 15 and 16 April 2002.

On the afternoon of 15 April, we all met in one of the newly built classrooms. They received some funding from the Moravian Council to build some more classrooms. The staff of about 18 members was present and the workshop was conducted in English - since some of the teachers could not understand Afrikaans. The teachers worked in groups of four and together we studied each of the laboratories. The teachers were to leave for home at 15h20 but the workshop only started at 14h45. For that reason, I felt that I could not give them enough time to read the material

themselves. After a few minutes, I would ask different groups to give feedback about different aspects of a laboratory, e.g. "What is the main aim of this laboratory?" "How do you do the test for this laboratory?" "Is this suitable to use in your specific class?" "What problems do you expect in presenting and doing this test?" The teachers experienced difficulties in answering these questions because of the short period of time allocated to each laboratory. They seemed a bit disinterested, and not all that positive about staying until 15h20. During this workshop, I did not have time to have an interactive session on the construct of environment or mention the Active Learning Framework. I did mention and highlighted explicit the links between the tests and how they provide certain information about the social, political and economical issues in the specific community. I emphasised that these three ultimately impact on the biophysical - in this case the Disa River.

The next afternoon, we went on a field trip to the river to do the tests first hand (Fig. 4.5.2). The teachers were very excited and they used the worksheets and the mini-labs (on A3), which I had prepared for easy use at the river (Fig. 4.5.3). Each group was involved in two or three specific tests. We did not do the Catchment and Health risk laboratory or the Historical research laboratory. Afterwards, we sat down on the grass and discussed our findings (Fig. 4.5.4)

After the workshops, there was a period of waiting for the laboratories to be printed. Eventually, I could send a fax to ask the schools to order the number of kits they needed. This school ordered 5 kits, one for each of the Grade 6 and Grade 7 classes.

The result then: 18 teachers were trained, 5 kits were ordered. From the focus group discussion I conducted with teachers during a later visit, it was evident that they felt that this project was only suitable for Grade 6 and Grade 7. The follow-up visit accompanying one of the teachers, to the river with her class, was scheduled in the last week of the second term. When I arrived, the class was handed over to me and the teacher was not involved at all. The teacher watched me as I did the pre-visit introduction, asking them what they know about the river, whether they had ever been to a river or had ever swum in a river. Other questions were, "who polluted the river?" I also asked why they felt people were disrespectful towards the river.

The walk to the river was quite stressful. We had to walk down a busy narrow road with grade 7 learners. Big dogs were barking at us through high fences. We did the tests at an open field next to the river, at a place where they build yachts. The learners did the tests at the river and then we returned to the classroom.

These learners were uninformed about their local environment; for some of them it was their first visit to the river. The teachers, in the focus group discussion, also discussed the fact that they were themselves uninformed about the local environment where they teach. Most of them do not live there and travel to school to teach.

After the outing to the river, I facilitated a discussion around the results and what they mean. The discussion was strained, the learners could only relate to things like AIDS

and littering. I showed them some examples of what other schools created, like the nets to catch bugs with and pamphlets promoting environmentally responsible behaviour. The teacher did not participate in the class discussion. She actually left the class for a while and left me with the learners.

A focus group discussion was held about 2 months later with all the teachers that wanted kits. From the discussions here, it was clear that teachers were negatively disposed to the inclusion of SWAP activities in their formal curricula. They sited high workload and poorly motivated learners as reasons for their lack of interest. One teacher also mentioned the lack of support from the parent community indicating that parents were not prepared, and not able in some cases, to provide basic things like empty coke bottles and ice cream tubs as these items are important resources in the informal settlement community they live in. This, according to the teacher, puts the onus on them to provide these resources and increases their already heavy burden as teachers.

Teachers at this school were not working well with the resource and did not seem keen to develop materials based on the resource or even implement the activities as set out in the guide book. There was a general pessimism in this school regarding curriculum innovation and adoption of new curriculum imperatives, as set out in policy documents. No artefacts were developed and I struggled to set dates for follow up interviews. One focus group session was arranged during which teachers indicated that they were experiencing high workloads and that they felt isolated and pressurised to implement

innovations that were unrealistic for their school context. The SWAP resource was not well received and certainly not put into use in the time the project operated.

PHOTOGRAPHIC RECORD:
Case Study 5
Disariver

Fig. 4.5.1 Walking to the river.

Fig. 4.5.2 Collecting some water samples.

Fig. 4.5.3 Group discussion at the river.

Fig. 4.5.4 Teacher giving feedback.

4.6 SUMMARY

In this chapter, I reported what happened at every school during the period I facilitated the SWAP project at the participating schools. The implementation and general process varied at the different schools with some schools showing a lot of enthusiasm and a willingness to adapt and implement new activities while others seemed reluctant to engage with the innovation. All schools were given access to the same INSET programme and were provided with the same resource material i.e. The SWAP-kits.

In the following chapter, I evaluate and look for indications of professional development that might have occurred at each school - using the indicators for professional development I developed in Chapter 2. Further, I use the complexity theory developed by Hoban (2002), to try to account for the different responses in the different schools. I will identify possible evidence of professional development through in-depth evaluation of the interviews, focus group discussions, workshop and field trip observations.

CHAPTER 5

DISCUSSION OF DATA

INTRODUCTION

Each case presented in the previous chapter is now discussed using the different indicators for professional development that were developed in Chapter 2. Possible evidence of professional development that did happen or possible hindrances to professional development are identified and indicators that professional development did take place and why, are evaluated.

Each case study is evaluated in terms of the degree of evidence that can be found of professional development. The research question, "Did involvement with SWAP lead to some kind of professional development in teachers, and to which extent was the SWAP learning support materials responsible for that development?" is investigated in terms of the evidence provided in the data produced.

The suggestion from Hoban (2002:11) that teachers' workplaces is not a static environment that will readily accommodate the introduction of an innovation was evident in the cases in this study. What was seen is that the school system is one which is dynamic, complex and characterized by layers of contextual realities. The

complexity of educational contexts is aptly described by Grossman and Stodolsky (1994:181) when they refer to the complexity of education contexts or settings:

> If context is described as, the whole situation, background or environment relevant to some happening, the enormity of studying the context of teaching becomes apparent. Part of what makes teaching so complex, are the multiple and overlapping contexts that can influence teaching and learning. Schools are part of the context for teaching, but so are districts and the larger communities they serve. Classrooms represent yet another level of context, but the students who inhabit [high] school classrooms can change the character of that context from period to period.

The professional development and change processes were influenced by a number of factors, which would rule out a simplistic mechanistic approach to in-service processes. The process I was involved with largely served as a starting point for professional development and had some characteristics of a "one step learning process" Hoban (2002:12).

Hoban (2002:13) describes this approach as a top down or workshop model of introducing innovation as a "one step approach" for teacher learning. This one step linear approach for teacher learning can be presented as:

Arrival of innovation _____> Teacher use_____>Teacher change

Adapted from Hoban (2002:13)

This assumes that the professional development process of a teacher is linear and that educational change is a natural consequence of receiving and implementing well-

written and comprehensive instructional materials like the SWAP kits. A further assumption is that teacher learning is context independent and ignores the complex system of teaching that already exists in classrooms. This kind of model is individualistic and ignores the social, cultural and physical factors that influence learning and hence the chances of innovation adoption.

While some innovation and change in practice did occur in some schools, it was never an intention of the process to serve as a mechanistic learning experience. Although all participants were involved in the same training process and received the same resources, the responses were markedly different in the different case studies. In this section I probe the processes in the case studies using a framework developed for complexity of learning and a professional learning system by Hoban (2002).

The professional development has seemed to be a catalyst for change and teacher learning has occurred in terms of the indicators developed by Bell and Gilbert (1994), Janse van Rensburg and Le Roux (1995), Veenman, Van Tulder and Voeten (1994) and Guskey (2000). Some teachers indicated that they developed new skills, but these are not readily transferable to their work setting as the contexts vary greatly. It is this area wherein the complexity lies and that I will probe in terms of PD indicators and interview data as well as details of the broader context of each case.

The essence of this framework for analysis, adapted from Hoban (2002), suggests that context is an important factor in professional development processes and various

dimensions, in which complex interactions occur, characterize that professional development. Hoban (2002) likens this to a system with many aspects which interact randomly and which eventually lead to adoption of innovations that might lead to changes in practice. The framework is therefore based on the existence of multiple conditions that need to interrelate as a system to increase the possibilities for managing educational change.

Hoban (2002:22) further identifies multiple elements interacting in society and places these into ideas related to chaos, complexity, holistic approaches and ecological understanding. Each of these terms represents the antithesis of mechanistic thinking, which proposes step-by-step change. Both chaos and complexity have been used to describe interactions between multiple elements. Common to both elements is the notion that the behaviour within systems is not due to linear cause effect relationships between independent elements, but instead the behaviour within systems is caused by non-linear interactions because of the interrelationships that exist between a combination of elements and groups of elements.

Marion (1999) contends that chaos is more suitable for physical systems such as geographical weather patterns, turbulence and so on whereas complexity theory is more appropriate for social systems and social interactions that carry some information about themselves and allow them to self organize.

Hoban (2002: 22) suggests a complexity view of educational change in which various aspects of the change process are inter-related. A change in one influences the other, and inter-relationships are thus important between the different aspects of change processes. According to Hoban (2002:37), these include social, political, personal culture, structure, leadership, teacher learning, teachers' lives and work. I briefly describe some aspects as developed by Hoban (2002:37):

- School leadership: how principals can promote a shared vision for change as well as instigating and supporting the process (Fullan 1982 and 1993 in Hoban 2002:35)
- Teachers lives and their work: teachers tend to be more receptive to change up to the age of 40 but then tend to resist change or to become disenchanted due to teacher burnout (Huberman 1993 in Hoban 2002)
- School culture: shared beliefs and values are important in terms of establishing a collaborative relationship amongst teachers. This may be too difficult to maintain when sub-cultures exist in schools (Hoban 2002: 36).
- Structure: changes within school organisation including decisions about time, space, school timetables as well as jobs and role descriptions.
- Politics: include those external to a school such as government and district policies as well as those internal to a school, particularly how power is distributed.
- Context: the broad composition and background of the school including the pupils, location, subjects and departments, teachers, community (local), district educational bodies, teacher unions and national priorities.

- Teacher learning: any infrastructure provided to support teachers to cope with new ideas and the process of educational change.

The changes in South Africa are complex and schools needed to cope with multiple changes on various levels. I chose five categories from the above list to be used as a reference framework to discuss the variations observed in the change process and PD at various schools in the project. All the schools were offered the same INSET programme, but PD varied in different schools. Each case will be viewed against these aspects of schools as a complex system and inferences will be made regarding the degree of PD (as a complex process) will be discussed against this backdrop. The categories are:

- School leadership
- Teachers lives and their work
- School culture
- Structure: changes within school
- Context: the broad composition and background of the school/case

It is my view that efforts to facilitate teacher professional development need to take into account the unique context of each school and the difficulties of changing classroom practice. Implications for classrooms include changing practice, changing assessment as well as classroom organization. These are difficult and complex to change and have as an overlaying change process the broader social and socio-economic contexts of the school, as well as the personal context of the teachers.

Existing literature on teacher learning is fragmented and inadequately theorized to guide teacher learning through a non-linear process of change. Complexity theory views schools and classrooms as complex systems and systems theory compliments complexity theory to pull together ideas from existing learning perspectives in education to propose a new theoretical framework for long-term teacher learning (Hoban 2002). This is further justification for my choice of this as an underlying framework for analysis of the activities in the various schools that serve as cases in this study.

TABLE 5.1 SUMMARY OF EACH CASE STUDY

	School Leadership	Teachers Lives and Work	School Culture	Structure	Context
S-West Region	Sensitive to curriculum changes, implementation effective, compulsory. Top down management, no "discussion". Not really democratic. Principal led school into the process of using SWAP as well as larger transformation. They operated within a façade of democracy, not real democracy because the principal is actually autocratic.	Well-trained teachers corps. Teachers live and work in the same community. High workload, high expectations, not always enough support and compassion from management. Two factions, you are either part of management or you are not. Some negativity between principal and teachers	Extremely high work ethic, Lots of pressure to perform. Not always focussed on the learning of the child, more on what the parents may think about the school. School culture focussed on doing the politically correct thing. Principal driven.	Admin and work are handled extremely efficient by a designated number of people. Some teachers feel left out of the process and "in the dark". The principal and his management staff make the decisions.	Formerly a Model C school. Now have to deal with socio-political changes in the school. Not only white middle class anymore. In the middle of town, learners come from diverse socio-economic circumstances. School has to cater for rich and poor.
Ocean View	Principal drove the process. She volunteered the school for the project. Focussed principal that pushes any kind of project that can enrich the school. Several projects running at the same time. Principal pushed dates and workshops.	Teachers do not live in the same community. They therefore bring resources from home to this resource poor school. Teachers committed to uplift children and community. Have qualified teachers.	A culture of creatively using what you have to facilitate maximum learning. Focussed on looking good and teaching well.	High teacher to pupil ratio. At least 38 learners per class. Principal organised the school.	Diverse cultures, but the same poor socio-economic conditions. Uninterested parents, no money. Poverty and unemployment.

Table View	Involved principal. Principal supports Environmental Education.	Teachers live and work in the community. They are involved in other Environmental societies like "Friends of Rietvlei". Well-trained teachers, committed to their work.	A strong culture of learning with an emphasis on environmental learning	Structure of delegated authority. Once you have cleared something with the principal he trusts you completely to implement it.	A wide range of socio economic classes. Surrounded by urban housing, huge industries and Rietvlei.
Table View Home school	No principal involved. All parents motivated to teach their own children. Flexible, each one his/her own leader.	Parents not trained in educational methods, but lots of enthusiasm and commitment. Trained by hands on use of SWAP.	The culture of learning is focussed on the principles of a Godly life and what humans' role are towards it. Collective teaching through forming communities of parents that teach together.	Have a quality controlling body that checks assessment and curriculum. They do not prescribe the content, but do support with planning.	Mostly white learners, from a high middle class. Very high moral values.
Hout Bay	Attended the initial meeting with the CMC. Committed the school to the process. At school though: Negative towards curriculum changes. Negative towards C 2005. Very little principal involvement in the project process.	Teachers not involved with the community. They do not live nearby. They feel detached from the community and parents.	Not a strong culture of learning. Teachers believe that their learners are less intelligent than other schools'. They struggle with absenteeism, teenage pregnancies	Management are controlling, but not supportive. Teachers' experience of them negative, just handing out work. No consultation in decisions.	School situated within an affluent community, but school created for the children from an informal settlement about 1km from there. Immediate community not involved with the school at all.

5.1 SOMERSET-WEST REGION - LOURENSRIVER

As indicated in Chapter 4, this school involved a whole school participating and working on the SWAP project. This created the opportunity for Bell and Gilbert's (1994) social development aspect of teacher development to be expanded and fostered. Since all teachers were using the SWAP materials in their classrooms, collective ongoing discussion could be facilitated. In the foundation phase, the three teachers collectively developed new activities to suit their classes (Appendix C). These worksheets used assessment icons, smiley faces and frowning faces, that the learners used in class everyday to assess their understanding of work. These teachers planned their classroom discussions and other activities together. Regarding the aspect of teachers' life and work, there is a strong collaborative work ethic that function through support and input from all involved teachers to plan classes. This collaborative ethic could have been fostered by the fact that the principal places a high priority on collective planning of work. In terms of school leadership, this principal was pushing the project because in the light of curriculum imperatives it was the right thing to do. They conformed to the new curriculum initiatives and policy documents.

The principal created space for it in the timetable by scheduling every last Friday of the term as a SWAP outing/field trip day. This school chose to organise the logistics differently by dividing different grades of learners into the same group. This way everybody received a multifaceted experience at the river, including the teacher, who maybe now has to work with Grade 4's while she only ever teaches Grade 1's.

Therefore, the personal experiences of teachers were broadened. The one Grade 1 teacher, in an interview, stated that she was amazed by what her learners could report back after the session to the river. In this way, her view of the Grade 1 learner's capabilities was renewed through this project. The use of new activities, the adaptation of new activities to suit specific learners' needs and the obtaining of new information through listening and reading, is classified as professional development level 2 by Bell and Gilbert (1994). Other professional development level 2 activities that I witnessed were:

- The obtaining of suggestions for new teaching activities
- The planning and visualisation of how they will use these new activities in their classrooms
- Sharing their classroom experiences with others and obtaining feedback about the use of the activities.
- Evaluating the new teaching activities.

During the workshop and the following fieldtrip I observed the above developments as the teachers discussed and evaluated the activities after they had done them themselves. Furthermore, after evaluating them they created adapted activities for their foundation phase learners that they could easily read and understand. In developing these activities, the teachers demonstrated aspects of social development level 1 and 2 (Bell and Gilbert 1994). Firstly, they asked for support from their colleagues in order to develop the adapted activities, and secondly they expressed that they valued working together. These teachers even met each other after school to

evaluate the first visit to the river with their learners, and to strategically plan the second visit.

Some of the senior primary teachers, because they had to take a mixed group of learners to the river, were confronted with having to deal with the little ones finding it difficult to read their worksheets and doing their tests. Some experienced trouble with handling the different age groups, but that lead them to being creative in solving the problem. The one teacher used the Grade 7's in her group as mentors to help the Grade 1's to do their turbidity test. In an interview, the senior primary teacher expressed that this gave her insight into her little grade 4's and where they were coming from when they start in her class in the beginning of the year. It increased her sympathy towards them. She indicated that she would like to talk more with the foundation phase teachers so that she can understand better what they do in their classes.

Regarding Environmental Education specifically, this teacher expressed that it was the first time ever that she thought about using the river as a teaching tool in her class. She also expressed her astonishment at the fact that the river was so close to the school, and she did not even know about it.

> I think the fact that I became aware of the fact that there is a river physically running through the town. I did not realise that. When you drive through Strand, you see this river running into the sea, and you don't really know where it comes from. Now I know, it comes from Lourensford. That

> is interesting. And what happened with the SWAP experience is that I can now make reference to things at the river sometimes in Maths, or in Natural Sciences. I use a comparison or a reference to make what we do in class relevant. Because some learners saw certain things at the river we can even have a bit of a critical discussion because they have a background experience *(Translated from Afrikaans).*

Janse van Rensburg and Le Roux (1998) classify the above-indicated professional development as changing approaches to work and becoming better equipped with improved job skills. The fact that the teacher referenced the river experience in the class means that she is implementing what she learnt to enrich her classroom practice. In terms of Guskey (2000), this is area 4 of professional development where they would be evaluating the participants' use of new knowledge and skills.

This teacher also clarified and developed her concept of local environment. She indicated that she feels that the local environment is important to her learners as a resource to learn from.

> Yes, I think the child's' frame of reference should be, and is, his local environment, his immediate environment, and this must surely impact him. I feel the curriculum should be focussed on the local environment so that the learner can go from the known to the unknown. He can first see things in his local natural environment and then he can later see other things as well.

By using SWAP the teachers saw examples of what good quality outcomes based activities looked like. It was interesting to note that some teachers indicated that they have never seen any activities of this nature before. They also stated that they have never used the local environment in this way in their classrooms before. All of this comes back to Bell and Gilbert's (1994) professional development level 2, where the use of new activities acts as evidence of professional development.

These teachers, after spending one trip to the river with the parents, suggested that we have a training session with the parents so that they also know what it is about. This suggests the start of level three social development according to Bell and Gilbert (1994), where teachers suggest and initiate other training for other people.

As one evaluates the amount of professional development witnessed and the actual events at the school one has to look at the whole school situation. Where and how does this school fit into the community?

This school implemented SWAP on a large scale. The principal acted as a driving force, applying pressure to implement it throughout the whole school. He devoted a whole Friday, once a term, to the implementation of the SWAP project in the school. His main aim was to implement political agreed upon motivations in school, (Veenman, Van Tulder and Voeten 1994:303) since Environmental Education took such high priority in the revised curriculum.

The principal indicated that they see themselves serving the local community. That means the school wants to reach out to positively influence the community. This school also indicated, by inviting the council to come and explain the changes to the river banks in preparation of the 50 year flood (Fig. 4.1.5), that they would like the community to be involved in the school and they would want to be involved in the community. At this stage, when we started the programme, the school could be described as a guest in the community, but they expressed their inclination to have permeable relationships with the community so that two-way communication was possible. This school did not want to be an isolated island, but wanted to be a model 2 school (Uzzell 1999), where the local community is invited into the school to improve the learning.

They also made their involvement in this project clear through articles in the local newspapers. This again was a reaching out from their side to let the community know what they are doing, trying to make the walls between the community and the school more permeable. Another way that the school reached out to the community was by involving parents in the outings.

The way this school innovatively handled the logistics of the outings, suggests innovative practices classified as Bell and Gilberts' (1994) second level of professional development. Each point's tools were pre-packed in a photocopy paper box (Fig 4.1.4). Each box was labelled with a sticker with the point number on it. Inside the box, was everything the learners needed for the outing, including 2 litre bottles to do

the turbidity test, and the special worksheets for Grades 1 to 3. Included was a summary of each lab and the main aims of the tests. After each visit, the boxes' pH and Nitrate strips were replaced, as well as the worksheets, and it was ready for the next outing.

SWAP activities have a unique quality - teachers as technicians and as novices, and not only experts, can use it (Bell & Gilbert 1994). They can be used by anyone, if you read and study the laboratories with them. Furthermore, the SWAP activities have the added benefit that they can either be used as small units, at any time, or as we used them, as a whole programme running over a period of time. The information gathered and interpreted has the potential to compel one to create further new activities regarding specific needs and interests such as Black Oyster Catcher worksheet that one teacher created after his learners encountered these birds at their visit to the river. This creation of new activities is classified as professional development 2 by Bell and Gilbert (1994:485). The use of new activities provided by the INSET trainers are classified as professional development 1 by Bell and Gilbert (1994:485).

5.1.1 HINDRANCES TO PD

From the interviews that were held during and after the completion of the project, in terms of Bell and Gilbert (1994), some hindrances and obstacles to professional development could be identified.

Firstly, this school organised SWAP in a different way so that the whole school could participate in it. These organisations were met with mixed feelings.

> It was very, very difficult administratively, to handle all the children from different grades. First you have to check that they are all there, and then you can go to the river. The teacher made worksheets for the Gr. 1's with pictures, but they still took a whole hour to complete it. You actually need one teacher JUST to sit with the Gr. 1's at each point. Also, this whole mix is fine at the river, but back at school, where they have to work on the labs, initially nobody knew what to do or where to go. During the first outing all the grade 4's, for example, met in one class. During the very last outing, number 4, it worked well. The whole group from each point met in one class and worked on their lab. *(Translated from Afrikaans).*

From this quote it is evident that the logistics of attempting to involve your whole school could have interfered with the teachers' focus on the actual facilitation of learning at the river. The disorganisation after the first visit prevented the teachers from properly having a whole group discussion on all the tests and interpreting them. This might have prevented new perspectives from forming and less integrated learning was experienced.

There was also, because of the strong support in that area from the principal, reflection on each outing and then they changed things that did not work so well. This is evidence of professional development level 3 (Bell and Gilbert 1994).

Also, in the professional development level 2 of Bell and Gilbert (1994), there was evidence that teachers' views on their local environment were expanded. Newfound knowledge and facts about their local environment could be observed.

> Previously, because I did not know Somerset-West all that well, I thought it was just a town with the sea on the one side, and a mountain behind the town. For me it was very much industries, buildings etc. I never knew that there was a river running through the town! I was so astounded to find the river three blocks from the school! *(Translated from Afrikaans)*

Another teacher said that she knew about the river but did not realise that there were ways in which she could use the river to teach in her class and work at the river.

> What did happen in a positive sense, was that now, when I teach Natural Sciences or even Maths, I can refer to what they did with SWAP and make the work that we are doing relevant. Because the children have seen certain things at the river, we are able to have a discussion (debate) *(Translated from Afrikaans).*

This is evidence that this teacher did change in her teaching practice in class. In terms of Janse van Rensburg and Le Roux (1998), this teacher showed new understandings of her environment, she also changed some of her approaches to work. In the process she became better equipped for the job with improved job skills and increased confidence in the work context.

This particular teacher found the logistical part of SWAP extremely problematic, primarily because she was not involved in the planning of the project. She did not feel

part of the process or in control of the content. The politics in the school regarding the top-down management style with the teachers being divided into two sub sets influenced this teacher's experience of the programme at ground level. She stated that she only felt comfortable with the content after the fourth visit to the river. Even through all this uncertainty, this was her view on using SWAP in the curriculum:

> Q: Do you think the local environment can be of any value in curriculum 2005?
>
> T: Yes, definitely I think so. Because this is the child's frame of reference. Personally, I think that the whole curriculum should be focussed on the child's local environment so that he can go from the known to the unknown *(Translated from Afrikaans).*

She stated that there were no other activities that she knew of at that stage that used the local environment in the school. On the next question, about links between SWAP and other learning areas, she could describe how she would use SWAP to include the functioning of factories, Social Sciences and Natural Sciences. Furthermore,

> In Maths you can include things like the speed at which the river flows, as well as some technology, like building a bridge *(Translated from Afrikaans).*

This sounds a bit superficial, but to me it signifies that this teacher is thinking about linking and expanding the information found to enrich other learning areas and vice versa. Therefore, even though this particular teacher was negative about the way SWAP was logistically implemented and how the principal and the main logistical

organiser treated her, she still experienced gains in personal knowledge regarding her own local environment, and she could see possibilities for using SWAP in her daily class curriculum. This is a perfect example of a complex system at work. Even though there were hindrances to professional development - such as the personal relationship between the teacher and principal, the lack of knowledge about the content of the programme and the logistical problems on the day - there were some positive supportive influences such as the fact that the visits to the river happened four times, the SWAP facilitator joined her group on the outing twice and therefore could still facilitate at the river, training the teacher in an informal way. So, as Hoban (2002) explains, in this self-regulating complex system, with the positive and negative influences, the final result was that there was some evidence of professional development that has taken place.

The principal provided strong support and leadership regarding the SWAP programme at this school. Teachers also adopted the programme very well and developed their own activities. Another supporting factor was the parent community who not only assisted with transport on the fieldtrips, but also played a role in the facilitation of activities for learners. The various components of the complex system used by Hoban (2002) seem to work in harmony and support each other to enhance the chances of professional development of teachers and the adoption of the programme into the formal curriculum. Overall, the school is well resourced, the teachers are well educated and well qualified, they are enthusiastic and receptive to innovation and the school community is supportive.

5.2 OCEAN VIEW REGION - BOKRAMSPRUIT

This school is one of the schools that could be classified as disadvantaged, but they did not let that stop them! This school was probably the group of teachers that exhibited the most excitement and collegiality and a commitment to continuous improvement.

On the day of training they gave me enough time to do an activity about the construct "environment" with them. I also used the Action Learning Framework to classify each activity in every lab as we went. This means that this school had a more socially critical experience of SWAP as a whole, which gave a more in-depth experience of the real nature of Environmental Education.

There were a number of new activities, which I classify as Bell and Gilbert's (1994) professional development levels 1 and 2. Firstly, most of the teachers used the new activities in their classrooms, from Grade 5 to 7. Some of them adapted suggestions that I made in the workshop to suit other learning areas and they then added that onto the programme.

> In technology I had them build a model of the river in full colour! In Arts and Culture we went to the river and made sketches of the river *(Translated from Afrikaans).*

Another teacher used a story told by one of the facilitators, Danie Schreuder, (Fig. 4.1.1) of lying next to the river, flat on his tummy, and talking to the little drops passing

him by, asking what they have seen this morning, as inspiration to write an essay on a little drop in the Bokramspruit. The learners did not have photographs of themselves to paste into the little space on the labs, so the teachers said they must draw themselves. This was another innovation and evidence of professional development in terms of Janse van Rensburg and Le Roux (1998), who mention adopting new ways of doing as an indicator for PD.

On the day that we went to the river with the teachers it was raining. These teachers put plastic bags around their shoes because they did not have water boots to wear. They had every reason to cancel the visit; in many aspects they could have excuses such as not enough resources, yet they chose to make plans! In terms of Bell and Gilbert's (1994) social developments, these teachers used each other to support and inform. I presented only one model class to the grade sevens, and this teacher helped the others afterwards.

During the focus group discussion, after hearing how other teachers experienced their classes at the river, one teacher acknowledged that she did not do enough preparation beforehand with her children, and that is probably why they were unfocussed and rowdy at the river. This type of collective reflection is classified as social development level 3 (Bell and Gilbert 1994). The others then shared how they let their learners make summaries from the labs in their books before they went to the river. They also handed out their equipment in class before the outing, where she only handed it out at the river. She then decided to organise her class a little differently the next time.

The teachers used the interviews for the historical research laboratory as a multiple learning experience. They reported that not only did the children learn about their own river, but they also learned and practiced how to interview a person. Furthermore, all the children could participate in this; they each had their own question to ask, which they prepared as a group beforehand. The teachers were impressed that even the shy children asked their questions. The one teacher stated that it was a development of the children's self-confidence.

An even greater social development aspect became evident when the teachers all came to the MTN Sciencentre for the certificate ceremony. On this occasion, this school saw what other schools did and this inspired them to expand SWAP into other learning areas. This is social development level 2 according to Bell and Gilbert (1994).

> There, [at the sciencentre] one could see the different things that schools did. Because they did not only focus on the labs, they took it a step further. And that is why I built those things, models. You don't have to stop there. You can involve all the different learning areas *(Translated from Afrikaans).*

The type of school these teachers would like to be in the community became clear during the focus group discussion. Firstly, they see this community as despondent and disinterested. The school is a type of day care centre that people send their children to

because they do not want them at home. Parents are not involved in their children's learning.

The teachers indicated that they feel an obligation to share the knowledge that they developed about the Bokramspruit with the people in a hope that it would foster a bit more respect for the river.

> How are we going to involve the public now? We must raise the awareness of the people living next to the river, so that they do not pollute the river as much. Maybe we should get the learners to talk to them. We need a law, an authority. *(Translated from Afrikaans)*

The school also became involved, voluntarily, in a "Development Trust Environmental Exhibition". The teacher laminated some photographs of the SWAP project and exhibited it, for a whole week, to the public at a high school in the region. Again, they did not receive any feedback from the community. This proves that this school does want to reach out to permeate the walls between community and school, but also that the community is really not interested in responding.

At this stage, one could say that the school is an isolated island in this community, at most a guest. There is however the ideal in the school's heart to be an agent for social change in their community and in their learners.

> I think that SWAP is a good thing. Look, it is OUR river, WE live here. Many of the children live next to the river and they know nothing about it. So, now we actually know something about our river and hopefully, we reach the point where we have respect for our river. That is our goal. And hopefully it will start with the river, then the whole

> environment and also the school buildings *(Translated from Afrikaans).*

This is not an easy task as another teacher explained:

> It is very difficult. Our people do not even have respect for teachers any more. I cannot even tell another adult that what they are doing is wrong. They just ask you: 'And WHO do you think YOU are?' *(Translated from Afrikaans)*

As previously explained, the principal is a deciding factor in the success of an INSET programme. This principal gave permission for the learners to go to the river for full two-hour stretches at a time, during the period between first and second break. This shows this school's commitment to implementing and presenting new types of teaching strategies and fostering a caring attitude towards their local environment. They overcame the timetable constraints that are often mentioned by others as a hindrance.

The one teacher said that she was a bit insecure, even after the training, but she used the booklet to the letter and that made her feel relaxed because everything was so well worked out. She was impressed with the quality of the worksheets. This teacher overcame her personal development level 1 fears by obtaining and using new information and the learning support material. This is professional development level 2, according to Bell and Gilbert (1994) and Janse Van Rensburg and Le Roux (1998) who mention new knowledge and new skills as important PD indicators.

There was support and interest among the different teachers and how they each tackled this programme in their classes. The learners, among themselves, were just as curious about what their friends were doing. This fostered spontaneous group work and investigations. During and after the programme, the children exhibited behaviour which showed that they are more aware of their environment around them. They spontaneously reported on illegal dumping, other hazardous activities that they witnessed and generally had more respect, maybe even a sense of awe, for their river. They asked a lot of questions. Where does the river go from here? Why is the stream stronger in certain areas than others? Why is it cleaner in some areas than others?

All these questions opened the way for new investigations and new learning opportunities to be facilitated. The fact that the learners asked these questions shows up Guskey's (2000) level 5 professional developments, which is "evaluation of student learning outcomes". There was certainly some evidence of learning on the side of the learners. A teacher mentioned that her personal knowledge about the river was expanded.

> I never knew that I could learn so much from a jam tin! I have never known these things before. I have never even encountered things like this. The nitrate and pH sticks, I had to figure out which was which before I went to the children. I felt like a real scientist! *(Translated from Afrikaans)*

When the teachers and learners went to the river, the community peeped over walls and asked what the children were doing, and they could explain that they were testing the quality of the river water. In that way, community awareness was already raised. During the focus group discussion, the teachers expressed their need for more resources like SWAP continually. During the discussion, ideas around how SWAP could be used the following year and for a longer, more consistent monitoring of the river were exchanged. All these are evidence of different levels of professional development that occurred during the use of the SWAP materials.

We also discussed further topics, which could flow forth from a SWAP programme - such as the study of estuaries; they have one walking distance from the school. Another option is to focus on coastal care using the Coastal Care Fact File series. This means that they would want to implement what they learnt during this programme on an ongoing basis.

In the discussion, it was evident that the teachers were informed about the current happenings on the banks of the river. They gave recent accounts of pollution incidents. They also compared the river flowing through this community with the same river and what it looks like in another community and said that that tells a story about the people living next to the river. They have truly learnt that your river tells the dirty secrets of the community living next to it. It also tells the story of the council and where they spend their money to upgrade and maintain the river. The group

mentioned that what they enjoyed about SWAP was that it cost nothing to take your children on an outing, and you can go more than once!

This school wanted to be, as classified by Uzzell (1999), a social agent, allowing the community members into the school and the pupils of the school to be so actively involved in the community that they develop action possibilities to address problems in the local community. The goal is therefore for barriers to be completely broken down. This is not to say that they have an ideal model of interaction with the community, far from it, but they express the desire to be in that position. The teachers expressed their dismay at people misusing the river and making it dangerous for people to go there and enjoy it - through alcohol abuse and other criminal activities.

Another factor that hinders this school in becoming an agent for social change in their community, is the lack of positive parental involvement in the school. The school is used as a type of day care centre to get the learners out of the way of the parents. Even if the parent lives just across the street, they do not come to the school when they are needed or requested to come. In this sense, the crossing of boundaries is being complicated, since most of the parent community are unemployed and despondent. They are not interested in what goes on in school.

As we review this particular case study, it seems that the teachers have overcome the "despondence of the parent community" hindrance to professional development. They seem to tackle this head on, through reaching out to the community all the time. The

question comes to mind: what is it that tips the scale in favour of professional development? Why do they not just let it go? I contend that it is the total support from the principal, the strong social relations between the teachers and the professional support they give each other that makes sure that they move forward all the time. We cannot deny that the despondent community and lack of parental involvement have a negative influence, but again the complex system (Hoban 2002) balanced itself out and some evidence of professional development could be found.

5.3 TABLE VIEW REGION - RIETVLEI

The most evidence of professional development in this case could be seen by the amount of learning exhibited by the students and the range of artefacts produced (Appendix D). This links to Guskey's (2000) fifth area of evaluation: the student outcomes/learning. The Grade 6 teacher in this school integrated SWAP into all the learning areas.

At the exhibition in the MTN Sciencentre, she presented a wheel with the different learning areas and which activities regarding SWAP she incorporated in each one. With the exhibition at the MTN Sciencentre, they presented all that they had done: poems they wrote about the river, gift bags they made with information about how to keep the water clean. They even created water bottles with information about the importance of fresh water on the label (I thought that the water bottles were actually quite a marketable idea). They created posters and pamphlets in their language

periods, promoting the visiting of the Vlei and the rescuing of the birds from pollution (appendix D). Little standing models of some of the indigenous birds at Rietvlei were displayed and the learners collected some feathers from Rietvlei to add to their exhibition. Some of these artefacts are also presented in appendix D. I received a flip file full of thank you letters addressed to me, which they created as part of an English assignment. For each of the laboratories, a report was written giving an account of findings and work approach by the learners.

The most obvious professional development that I could witness was that the learners showed extreme insight and understanding into the SWAP materials and what each test meant, in comparison to other schools. This I had to trace back to the influence of the teacher and how she presented the materials to the learners (Remillard 2000, Guskey 2000). The amount of learning exhibited by the learners could be a clear indication of the amount of learning that the teacher experienced.

After the project ended formally, I was contacted by the school to present the learners with a certificate of recognition in the hall. This was the initiative of their teacher who also created the certificates. I presented them to the learners, who were all wearing their SWAP T-shirts, during assembly.

The focus group discussion included the Grade 6 teacher involved as well as the nature club teacher who runs the library at the school. They continually worked together on this project. The nature club teacher did the research of finding aerial

photos of Rietvlei, and the other teacher managed this project in her class. They definitely reached level three in the social development area of Bell and Gilbert (1994). In terms of Janse van Rensburg and Le Roux (1998), they developed new job skills, tried out new strategies and worked together with colleagues.

The Grade 6 teacher believed that ALL the children have learnt because SWAP was dealing with something that was REAL to them, something that was right on their doorstep, which they could go and see. After the project, the children continued to report pollution that they had seen at the Vlei. The teacher reports that the learners continually referred back to SWAP in further modules.

> The children did not only learn a couple of facts, they really made it their own and have been awakened to another reality "out there".

In this interview, it was clear that the student learning, regarding their local environment, has improved greatly with the use of SWAP. Guskey (2000: 46-51) states that his level 5 is the most important outcome since professional development has as end goal, always, the improvement of education and consequently the learning of the end consumers of the teaching process. He states that by evaluating the learners' learning, one can indirectly come to a conclusion about the teacher's understanding regarding a certain concept.

The teacher reported in the interview that the learners' whole perception of environment changed. They are apparently much more aware of their environment,

pollution and things around them. During the three visits we witnessed a progression from destroying reeds where birds were breeding just for the fun during the first visit, to a shift towards a much more caring attitude.

The fact that these teachers implemented the programme, so intricately interwoven with their formal curriculum, and broadened it to include all learning areas are evidence of Bell and Gilbert's (1994) professional development level 2, using and developing new activities, as well as professional development 3, where a teacher initiates new collaborative ways of working.

These two teachers were already well trained in using OBE and they had previous experience of organising field trips. It is notable that these teachers integrated the SWAP material most successfully into their formal curriculum and that they facilitated the whole process with greater ease than some of the other regions. Maybe the most prominent gain from this region was the fact that I could witness what could be done in terms of integration across Learning Areas when the teachers are comfortable with Environmental Education and OBE. There is room, however, for improvement regarding emphasising the socially critical nature of Environmental Education, as well as the expansion of their concept of the environment as only the biophysical.

To return to the complexity theory of Hoban (2002), one can mention the different layers that influenced these two teachers' professional development. The exterior layer, I would say is the Cape Town City Council and how they manage Rietvlei and

treat people that want to come to Rietvlei. We had an extremely positive experience with one of the rangers at Rietvlei that told the learners all about the history of the Vlei. A little closer to home would be the principal and the fact that he supported this initiative 100%. In actual fact, it was his idea to integrate it in the formal curriculum in Grade 6.

This gave the teacher the self-confidence to use her own initiative, develop new plans and filter it through to all learning areas. At the inner most circle of influence, we find the two colleagues who supported each other throughout the programme. The one had a wealth of at least 15 years worth of Outdoor Education and now also Environmental Education experience. The other has just started teaching again after a 6-year break, so she was motivated and excited to make the most of this. Viewed on every level, these teachers had maximum support for professional development.

5.4 TABLE VIEW HOME SCHOOL - RIETVLEI

This particular case study presented extreme challenges for me as a facilitator. Firstly, there was no available literature about Home Schooling parents. My mentors also had no experience in this area. The involvement with this group was a positive experience though, since they are committed to giving their children the best education possible.

These parents and their children grabbed hold of this programme. As indicated in Chapter 4, I sent each family home with a copy of the A3 laboratories as well as

worksheets and a bug dial. They made a video of the morning I presented at Rietvlei and I later found out that they used that to teach the learners at home again.

The cooperation of the parents, organising a project day once a week at a specific house and talking and planning what to do with the children, are evidence of creative ways of working together, social development 3, according to Bell and Gilbert (1994).

Regarding the Uzzell (1999) model of what type of school this might be, I had an interesting situation to deal with. These home schooling parents are the community and therefore there are no walls to permeate. They can immediately act as social change agents in their community because they are the community. The spontaneous "want to change something" attitude these parents exhibited after testing Rietvlei themselves, was encouraging. It showed me what the result would be if we could get the community directly involved with the "looking after" of their environment. These parents would not stop asking questions about how to help or where to become involved. Their perceptions regarding fishing in Rietvlei changed when they found out that only a certain type of fish were being taken out of the water because it destroyed the plants in the Vlei.

I conducted interviews with two families. Both times, only the mothers were home and it turned out that they were the main teachers at home.

I investigated their collaborative ways of working:

> We did [work together], we were working on the project together, and that's why we went together like that, and it was lovely. We were four, five families getting together on a Tuesday, and we were doing project work. So we were specifically [focussed on water] and we went from water into the hydro-electricity, into electricity. From here we went to the Palmiet Water Scheme, (Roy works for Eskom) and he organised it for us to go up there. And then we came back and we did electricity, and then we went to Varsity, to Cape Town University, and they took us to the Engineering department, and showed us a whole lot of things, you know, the engineering side of using water.

This continuing of the water education, inspired by SWAP, can be classified as professional development level 2 (Bell and Gilbert 1994), finding and creating new activities. These parents also expanded the SWAP materials to involve their learners in other learning areas at the same time. One parent stated that her children did orals with SWAP.

> I: Did you do language with them through this or not?
>
> J: Well, we had lots of orals with it. Talking about, discussing it, and then some of the report stuff that they had to do. So it is language to a certain extent.

I found that these parents have a different attitude to change than some of the teachers in schools, and that they are not afraid of new information or contexts.

> I: Were you not afraid of all the new information?
>
> J: No, because we are so used to doing it all the time, and if we battle with something, we go to the library or we go

> through World Book, or something. So it's part of our schooling to actually do that. So that's why I don't think any of us were being thrown. It was just a case of O.K., let's GO! And if we need to know anything, we'll just ask Heleen. So, that I think is why we approach it like we do, because that's what we do all the time. And I think, I know from being in the classroom situation, I used to swot up before I do anything with the children, in case there are questions and stuff, so there's much more from a...You are teaching the children where as here, we are learning together. So, they learnt as much as I learnt.

This parent/teacher indicates here some self-professed development regarding her perceptions of Rietvlei, water and Environmental Education. She also indicates that it has had a long-term effect on her children.

> [Using SWAP] just made us very much more aware of what we were actually doing, and how we need to look after our rivers that flow into these places because of pollution and, generally, things like that. And that this water is actually there and it supplies certain things. But they still, when we passed there the other day, we saw somebody fishing there and Kirsten said, 'Ya, they must get all those gappies hey? Yah they must get all those fish out because they eat away at the roots and then the banks cave in.'

Kirsten is 7 years old, and took part in the programme. Involvement with SWAP raised their awareness about their local environment and also fostered a sense of responsibility towards it.

The parent explains that because they are home schooling, and it's their own children, they are much more flexible with less time constraints and no red tape that can boycott outings.

> The thing is, I think in many ways, we have SO much more flexibility in actually implementing this whole thing than the schools do, to a certain extent. Because they are restricted to 30 children in a class, they are restricted to AN outing, things like that. Where as we can just pop in our cars and say, listen we are just going down there to sort that thing out over there. Zip - off we go! I was very interested to find out the number of those high schools, the camps that they do (Zeekoevlei). So I came home and said to Bernard, I wouldn't mind if the children could actually go on one of those things at some stage. We were actually working with it. But they are too young now.

The Home Schooling groups' common ground is their faith. That is the reason that they do home schooling. With SWAP, they aimed to raise their children's' awareness about the limited nature of fresh water, that is a precious resource given by God which we must use responsibly. In the interview, the one parent indicates that she would like to teach her children to be good stewards of the earth, not a ruler of the earth as such.

Although these parents did not explicitly design new worksheets for their younger children, they did simplify the work and explain it in simple ways. Even the 7 year old little girl could explain to me what turbidity was and furthermore, how to use and interpret the bug dial. She mentioned, on her own, the control and test bottles from the

Oxy-Bac lab. This is evidence of Guskey's (2000) fifth indicator of professional development - the evidence of student learning.

The Home Schooling group was an example to me of what could be achieved if one put your mind to it, and believed in your children. These parents have no formal training as teachers and have no real knowledge about OBE or Environmental Education. Despite these constraints, they still used the worksheets extremely successfully, which is an indication of the accessibility of the material as well as the supportive (scaffolding) abilities of the material.

Complex system theory could be applied to this situation as well. Here we had the parent being equal to the teacher, being equal to the community. An interesting situation since these were different layers of influence in the previous case studies. Furthermore, there are no "leadership" influences via principals as such. It is only their own motivation and own decisions that either support or inhibits the use of this project. Generally there were very few hindrances to professional development in this case, the most obvious one being maybe the lack of teaching training of the parents, and their idealistic belief that they are doing the perfect thing for their kids.

5.5 HOUTBAY REGION - DISARIVER

In terms of professional development as Bell and Gilbert (1994) define it, I could find very little evidence in this region. There are however possible reasons for this.

During the focus group discussion, these teachers claimed that the worksheets of the SWAP programme are only suitable for Grade 6 and up. Their learners have Xhosa as first language at home, but are being taught in English. The translation of the worksheets in the correct language seemed to be a barrier since the teachers were over tired and unmotivated.

Furthermore, the lack of resources such as 2 litre bottles and ice cream containers seemed to discourage the teachers, as they had to provide it themselves. The single thing that hampered them the most was the disinterested parents.

> Even if you ask them to come and look at the kids books or you want to talk to them about problems with the kids, they don't come. So, there is no co-operation from the parents' side. And that makes it difficult for us. Materials and things, we had to bring. They can't bring 2 litre bottles from home; you have to collect them.

It seems that these teachers found a certain aspect of their teaching problematic and, in so doing, they can be classified as being in professional development level 1. They did use the new activities, which is Bell and Gilbert's (1999) professional development level 2, but they did not develop new or even adapt the activities for their learners. They just stated that it was unsuitable for their learners.

There was no evidence of collaborative ways of working at this school. Time was mentioned as the biggest constraint in that sense.

> I spoke to the learners about what we were planning to do, bit I just did not get ANY chance to do it in the end. Time was really a problem. But it will be better next year.

The teachers who did use the programme in their classes, Grades 6 and 7, did experience some personal gains.

> T1: I never knew you could test the amount of pollution by the animals living there! T2: And it is the first time that I have been to the river. I have never been there.

They are demotivated and feel disempowered because they are confused by the new education system. This is an example of how an external body, like the WCED, can influence what happens in the classroom at ground level, another example of the interconnectedness of the professional development process.

> We've gone through training, but I mean, already they are talking about re-training! And they trained US on the OLD system - the old training methods, but now they are actually going to retrain everybody because certain things or aspects have changed! So really, pretty much confusion from our side! And, I mean, if we are confused the kids are confused!

Another teacher described it this way:

> We are just fumbling trying to do what we can where we can, and also in terms of admin it's terrible. You are MORE busy than you are actually teaching!

It seems that in this specific school with the learners all coming from the informal settlement - the teachers feel that their learners are behind other schools' learners.

> Our kids are very slow! You write something on the board, they will take like forever! Where, if you go to a school that side (rich side) the kids are, you go to a different school, any other school, I would say that our kids are a grade lower, in terms of what they can do. You know, in terms of conceptualising.

It is necessary at this point to mention the influence of teacher expectations on the performance of their learners. This in itself is another study on its own, but Timperley & Phillips (2003:628) quote Good & Brophy (1997) that teacher's beliefs about their students' academic potential become their goals for the students and shape their daily classroom decisions and actions, including what they believe to be appropriate curricula and instructional practices. Therefore, one has to ask what the effect of these teachers' beliefs about their students had on the implementation (or non-implementation) of the programme.

This perception/belief that their learners are not able to do this programme kept many of the teachers, who were trained, from actually trying the activities. This acted as a barrier to professional development because they did not actually even use the new activities, which would be a level 2 professional development (Bell and Gilbert 1999). Furthermore, the Grade 6 and 7 teachers that did use it, did not work in collaborative ways, so no social developments could be observed.

In terms of personal development I did observe some gains in the teachers who did use SWAP in their classrooms, as well as some reported learning gains for the students who participated in the programme.

> I: Do you think that SWAP added anything to the kids' view of their local environment?
>
> T: Yes definitely, because they learnt to know that it was important to keep their rivers clean. You know, where they live, in Imizamo Yetho, it's very dirty. The people are not concerned about pollution and things like that. But now, we actually brought it to their attention that they actually - what they do has consequences. Like for instance, for the rivers. So yes, our children, they realise now they need to take care of and lower the pollution.

This was the region in which the least amount of professional development, in the broadest sense, could be witnessed. The pre-mentioned factors could be seen as the barriers to these developments.

The teachers were concerned about the safety of the children when sending them out to do interviews in the community about what the river looked like in the past. They also felt that no one there had really been living next to the river for a long time, and that they had to be careful because the people living there now had big dogs.

> We didn't get to that [interviews] actually because we don't know the people - and people living there now wasn't residents a long time ago. And the thing is, we didn't also want to send kids out to these people, we have to be careful, especially the people living there now got dogs and things. Anything happens to the child, we are responsible.

The relationship of school to community is also a strange one, since it seems as if there are two communities surrounding this school; firstly the wealthy estate owners living around the school, and then the poor community of Imizamo Yetho. Both these communities are disinterested and the school feels isolated. In this case, the school can be described in terms of the isolated island model of Uzzell (1999). It also does not seem as if the school wants to be a social change agent and furthermore, they are too scared of the community to even reach out and invite them into the school. There is no evidence of communication and co-operation between the parties.

The only collaborative activity that occurred was when this school attended the MTN Sciencentre ceremony. They did not exhibit anything but did view the other schools exhibitions. Maybe this inspired them to do more, but I do not know, because I did not do any follow-up visits after that. This school is truly an isolated island in the middle of a community that are strangers to them (Uzzell 1999).

The teachers at this school seem to be in an environment where different aspects of the complex system work against each other and not in harmony with each other. The aspect of teachers' lives and culture seems to be a strong negative factor. Teachers are demotivated and unsupportive of change. This could be because they do not understand change, but are rather opposed to change (Fullan 1991). The broader school environment is one of poverty and despair and not supportive of the school in any way. This seems to have added to the negative feelings of the teachers. The

poorly resourced school and a lack of support from the principal served only to exacerbate the teachers' despondent feelings as evidenced in the transcripts from the focus group interview. Some teachers however expressed positive sentiments regarding the SWAP resource. This may yet prove to be a positive influence that could impact on the way teachers work and feel about innovation and change. At the moment though teachers seem to be overwhelmed by multiple changes in their work and not positively disposed to transformation processes.

5.6 GENERAL DISCUSSION

I am not sure, at this stage, if one could honestly compare these case studies and come to some overarching general conclusions. The various case studies have - as is common in most case studies - idiosyncrasies that distinguish them from each other. In general, the location of the school, socio-economic conditions of the surrounding communities and the school culture represent important facets of the school context which impacted on the adoption and adaptation of the programme presented. The fact of the matter is, and I strongly believe, that the context of each school is just so unique, and there are so many factors that one cannot measure, that it is safest to keep each case as a story on it's own.

In the Somerset West School, parents were involved and played a crucial role in the implementation related to the field trips conducted. The role of the principal was also an important influence as this set the tone for the school culture and the fact that the

programme was accepted in the first place and then that it was accepted as a whole school project. Making space in the timetable also shows how the school is able to cope with change and how the school is open to new innovations and change.

In Ocean View, the teachers were highly motivated and led by an organized and committed principal. They also showed flexibility and were willing to adapt and adjust to include SWAP activities in their school programme. The school is however poorly resourced, located in an impoverished and isolated community and parent support for the school is lacking. The school culture is supportive under the able leadership of a committed principal but implementation was hampered by an unsupportive parent community and poor access to resources.

Houtbay Moravian School had a similar overall context to the Ocean View primary school. The parents live in an informal housing complex riddled with poverty, unemployment and social problems such as gangsterism and alcohol abuse. In this case teachers were demotivated by the conditions at the school and in the community. Many teachers live outside of the area and commute in daily. Teachers seem to lack enthusiasm for the programme on more than one occasion and almost seem to co-operate "under protest".

The home school and Table View Primary who both worked in the Rietvlei area, displayed strong enthusiasm for the programme. In both cases teachers and learners developed techniques for testing quickly and developed resources based on the

SWAP kit. Table View primary school learners designed a T-shirt that the members of the SWAP team wore on one of the river visits we went on. Some children even developed little poems and slogans. This is indicative of adoption and adaptation of the SWAP materials and definite implementation in their formal curriculum. The school community was supportive, children had easy access to resources and there was strong parental and school support for the project. The principal supported the project and gave the teachers freedom to run the programme as they wished and even made adjustments to the time- table to accommodate field trips to the river.

For the sake of argument though, the temptation is just too great for me to not compare the Oceanview and Houtbay regions with each other. In both we mainly had learners from informal settlements. The teachers had approximately the same amount of time being invested in them by the trainer. So what was different?

Oceanview had a principal who was keen on being at the forefront of change and implementing new strategies. They were actively seeking sponsors and donations in all areas of their school to supplement any shortfalls. Although their parents were not involved, they did not let that stop them from getting out there and doing it. This was not the case in Houtbay area.

The set-up of the two communities was a bit different though. In the Houtbay region, the school was surrounded by rich people living in big houses with high walls with the informal settlement situated about 1,5 km from there. In Oceanview, everybody

around the school was poor. The river was not fenced off and the community was easy to reach. The parents and teachers were comfortable with their learners talking to some of the community members. Some of the other constraints for the Houtbay region were discussed within the case study.

These schools seem to bear out Jansen's (2000) assertion that better resourced schools are able to adjust more easily to changing conditions and would be better able to cope with the multiple changes schools need to cope with in the period of transformation in education in South Africa. What is also clear is that professional development and teacher learning is a complex process linked to a number of interacting processes. Although the training and resource materials provided to all the schools were the same the results at the different schools varied greatly. This links to what Hoban (2002) described as complex systems with varying dimensions; all interacting with each other to produce an end result, rather than a linear process developed in line with an intervention that leads to learning and a result.

In summary, with both small and large-scale implementation in schools, all the teachers involved showed evidence of professional development. Because I was so inexperienced, and the training periods so short, I can only attribute the professional development to the use of the SWAP materials, but that would bring us back to the opening paragraph in this chapter where we compare the linear approach to professional development to the complex system theory regarding professional development. The SWAP materials, well written and adaptable to many situations,

seem to have been a larger influence in tipping the scales to the favour of professional development than initially projected.

In Chapter 6 I explore different shortcomings in the study and develop certain themes that emerged from the discussed case studies. Suggestions for further research shall also be made.

CHAPTER 6

CONCLUSIONS AND REFLECTIONS

INTRODUCTION

This study was contextualised in a broad process of change happening in education in South Africa. A more focused view of the study is that of a research process of professional development in environmental education. The research question was stimulated by the fact that Environmental Education was included in the formal curriculum and that many teachers lacked capacity to implement environmental education (Lotz and Robottom 1998). The underlying thinking was that this process of professional development could serve as a partial response to this lack of capacity identified and that the SWAP materials as a resource and suggestion materials for teachers to help them better understand environment and curriculum processes related to implementation of environment in their classroom practice. To this end teachers were presented with an INSET programme and follow-up support at school level to assist with the adoption of the innovation with a view to implementation of curriculum imperatives. Important outcomes for the process were a better understanding of the construct environment and implementation of Environmental Education processes with a focus on the local environment. I reflect briefly on the process with specific reference to the achievements, limitations and opportunities for further research.

6.1 ENVIRONMENTAL EDUCATION PRINCIPLES AND PROCESSES.

Workshop training sessions started with an activity aimed at familiarising teachers with Environmental Education and a critical discussion of the construct environment. In all the cases this was considered to be a useful exercise as teachers indicated that they had in many cases formerly viewed the environment as nature (plants and animals in their surroundings) and had not seen the human impact and influence on the environment. Many teachers also indicated that the revelation of the local environment as a resource was a particularly useful spin off from this process. Both these are seen as professional development processes according to indicators developed by Bell and Gilbert (1994), Janse van Rensburg and Le Roux (1998) as discussed in Chapter 2.

6.2 PROFESSIONAL DEVELOPMENT

The essence of my research was to enable professional development by way of a process, which provided teachers with learning support materials (SWAP) and training support in the use of the materials. All the schools were afforded the same development opportunities and the same learning materials and INSET. There were definite indications that the process had enabled professional development in terms of the indicators formulated and developed in the literature I surveyed. This however was visible to varying degrees in the different schools and amongst different teachers. It is here that the complexity and difficulties of PD processes were revealed. The

processes implemented and the broad school context has been two important factors impacting on the PD processes.

Generally, in-service processes have been seen as once off training sessions, which introduce teachers to new approaches or materials. Hoban (2002) describes this as mechanistic approaches to training that assumes that teachers will leave the process with new ideas, which they will implement immediately. A further assumption of such processes is that teacher learning is context independent and these consequently ignore the complex system of teaching that already exists in classrooms, as well as the broader context in which teachers work. This kind of model according to Hoban (2002) is individualistic and ignores the social, cultural and physical factors that influences learning and hence the chances of innovation adoption.

In this study the complexity of the working context of teachers (schools and communities), became glaringly apparent. Harley (et al, 1998) draws our attention to the need for a better understanding of teachers' contexts when introducing and working with policy. He notes that:

> Policy assumptions about the context in which policy is to be implemented are problematic. Teacher roles were very clearly affected very substantially by different school contexts. While differing levels of resourcing was a major factor, differing value systems appeared to be a crucial factor. Different value systems were evident at the level of the individual teacher, the culture of the school, and community.

In the different case studies context emerged as a crucial factor in teachers' views on change and preparedness to adopt innovation. The influence of the principal, school culture, school resources as well as the broader school community were all aspects of the broader context that impacted on the PD process in various ways. In schools where the principal provided clear leadership and played a supportive role the programme ran smoothly and strong PD trends were seen amongst teachers; new ways of doing, new skills, new knowledge and new networks.

The better-resourced and historically advantaged schools seemed to be better able to cope with innovation in the curriculum and also more willing to work with the project. This can probably be ascribed to the fact that such schools have a history of involvement with in-service processes. There was however much enthusiasm amongst the teachers in the historically disadvantaged schools for the SWAP programme. Many teachers welcomed the new ideas and skills they were able use after working on the programme. There was also a difference between the PD processes and the implementation of ideas presented in the SWAP resource at the disadvantaged schools. The schools are in similar communities but differ in terms of the school ethos, leadership and general management. The various factors making up the complex system and therefore, develop differently in the similar but yet different contexts as described by Hoban (2002). Although there was definite evidence of PD in all the cases the process had limitations, which I discuss briefly in the next section.

6.3 LIMITATIONS OF THE PROCESS

A major shortcoming I identified in the in-service professional development process was the time spent on training and support of teachers. The INSET workshop was however viewed as a process and this initial INSET programme was the start of a longterm professional development process that would be refined and improved with time. My intention and thinking in the process was to, in keeping with Bell and Gilbert (1994:493), that "teacher development can be viewed as teachers learning and not others getting teachers to change". It was my view that the SWAP materials would enable and stimulate further learning as teachers become more confident at using the resource. I concur with Garet, Porter, Desimone and Yoon (2001:917) who indicate that a number of recent studies suggest that the "[...]duration of professional development is related to the depth of teacher change." More in depth engagement would have been possible and possibly enabled PD at deeper levels if the INSET programme could have been extended over a longer period of time.

Bell and Gilbert (1994:494) indicate that teacher development can be seen as having two aspects: one is the input of new theoretical ideas and teaching suggestions and the second trying out new ideas in the classroom. While this process introduced teachers to new ideas for classroom implementation the trying out period was limited by the duration of the project. Generally in-service processes require a longer period of implementation and support to enable teacher learning, particularly in complex

contexts as indicated in the different cases. Bagwandeen and Louw (1993:64) mention:

> [...]the critical factor is obviously whether INSET involves the teacher and whether they are given an opportunity to follow through not only by suggesting what to do but also how to do it and deciding in the end how effective the activity has been.

I feel that such an opportunity was not provided and thus represents one of the limitations of the process.

Another limitation I identified is my own capacity as a facilitator of in-service processes. I feel that my own inexperience as a researcher and specifically as an INSET facilitator was a shortcoming that had an influence on the project. To explore my own training as facilitator we have to trace back to my first degree in music where I studied an Environmental Education module as part of my Higher Education Diploma. I also followed a post-graduate course in Environmental Education as part of a B. Ed (Hons) degree. The lecturers that presented the modules in these courses became my role models as INSET facilitators when I started working as a research assistant in the education faculty. When we embarked on the INSET partnership programme of which this research forms a part, I observed them presenting the first two workshops in the programme and after that I went about it on my own. In short then, I had no training or previous experience in the facilitation of an INSET programme and furthermore, I have never formally taught in a school before.

Bagwandeen and Louw (1993:66) state that it is important for INSET facilitators to note the following:

> It is important to note that for the teacher, the personal-psychological dimension which engenders vitality and a spirit of expectation in response to INSET as demonstrated by the in-service tutor or facilitator, in the final analysis will determine the success or failure of INSET efforts.

This quote emphasises the importance of the "personality" of the INSET trainer/facilitator towards the success of the programme. I was admittedly inexperienced but I think I made up for this in enthusiasm and commitment to the environment. While I see my inexperience as a limitation and believe that it was, most participants felt that I had done quite a good job.

Despite my own and other limitations in the research process there was undoubted evidence of professional development of and implementation of Environmental Education processes by teachers. I feel that the self-regulating mechanisms of complex systems as described by Hoban (2002) and applied to the school contexts in the different cases in this study probably played an important role in this process. In addition I feel that the SWAP materials also played a cardinal role in making the short process a beneficial and useful one for the participating teachers as indicated by Remillard (2000:331), who states that materials most likely to foster teacher learning are those that engage teachers in analysing student tasks and requires teachers to make suggestions about how to proceed further. Reys, Reys, Lapan and Holliday

(2003:74) write that curriculum materials provide guidance and structure to teachers as they enact the intended school (mathematics) curriculum. Likewise they say, instructional approaches suggested by materials often influences teachers' pedagogical strategies. In Environmental Education this is important as the implemented curriculum often closely mirrors the content and pedagogical approaches in the curriculum materials. This approach forms part of the thinking in the SWAP materials provided to teachers in various contexts to assist with professional development processes.

The most important factor I feel in teacher development and change experienced in this project is summarised by Sarason (1982) cited in Remillard (2000:332)

> The failure of the teacher proof curriculum materials of the 1950s and 1960s to facilitate substantial curricular change suggest that teachers, rather than texts, ultimately determine what is taught.

This in my opinion was the case in this research, namely that teachers were crucial in using the materials in ways that fitted their contexts

6.4 OPPORTUNITIES FOR FURTHER RESEARCH.

The time and length of in-service processes are important in ensuring successful programmes. Materials can serve as important catalysts for in-service development and implementation processes as well as curricular innovations. I feel that this area of professional development that involves the triadic relationship (Reddy and Schreuder

2004) between materials development, curriculum development and professional development as demonstrated in this project is worthy of further investigation. Teachers use these suggestion materials (SWAP-kit), develop new teaching and learning materials (learning programmes) that is suited to their context and use them. This constitutes a curriculum development process for teachers and is at the same time a professional development opportunity for the teacher.

Closer co-operation between researchers and teachers, closer observation of classroom implementation and stronger recognition of the complexities of contexts are important aspects of professional development processes that need to be probed and studied.

Research dedicated to and focussed on the above issues in my opinion would shed light on the important processes of professional development, curriculum development (school based) and materials development that can form an important part of professional development of teachers in this period of educational transformation. It is well documented that teachers are central to education transformation and change and research as mentioned above would go some way to enabling teacher professional development that could contribute to change and innovation in classrooms in South Africa.

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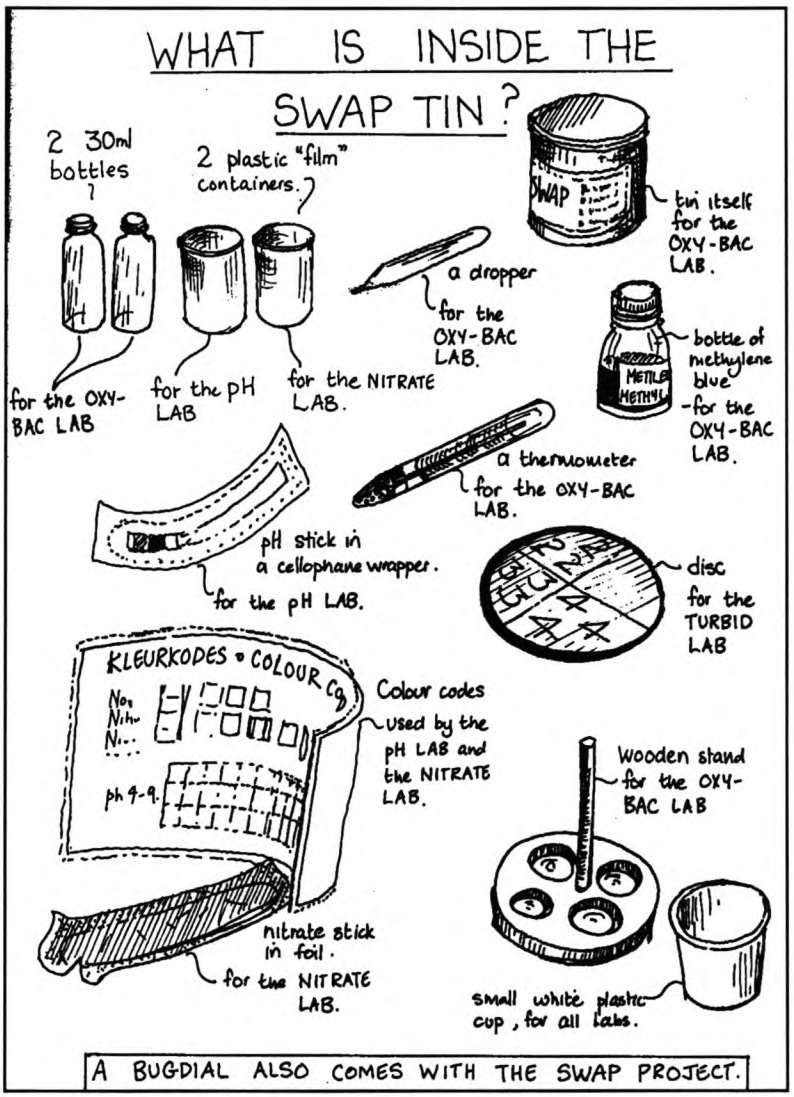
APPENDICES

APPENDIX A

The SWAP programme consists of a workbook with worksheets to copy for the learners and notes on each laboratory for the teachers. Each worksheet is reported on a big A1 poster called a laboratory. The workbook holds suggestions of timeframes for the project, actions that can be taken and contact details of important organisations.

The following are extracts from the workbook.

Diagram A1: What is inside the SWAP tin?



The laboratories

The SWAP kit consists of 7 different laboratories that each investigates a different aspect that could be an indication of the river's health.

These 7 laboratories are:

Room 1: The Historical Research Lab

Room 2: The Catchment Area and Health Risk Lab

Room 3: The Water life Lab

Room 4: The Oxy-Bac Lab (Testing for unwanted bacteria that deplete the oxygen)

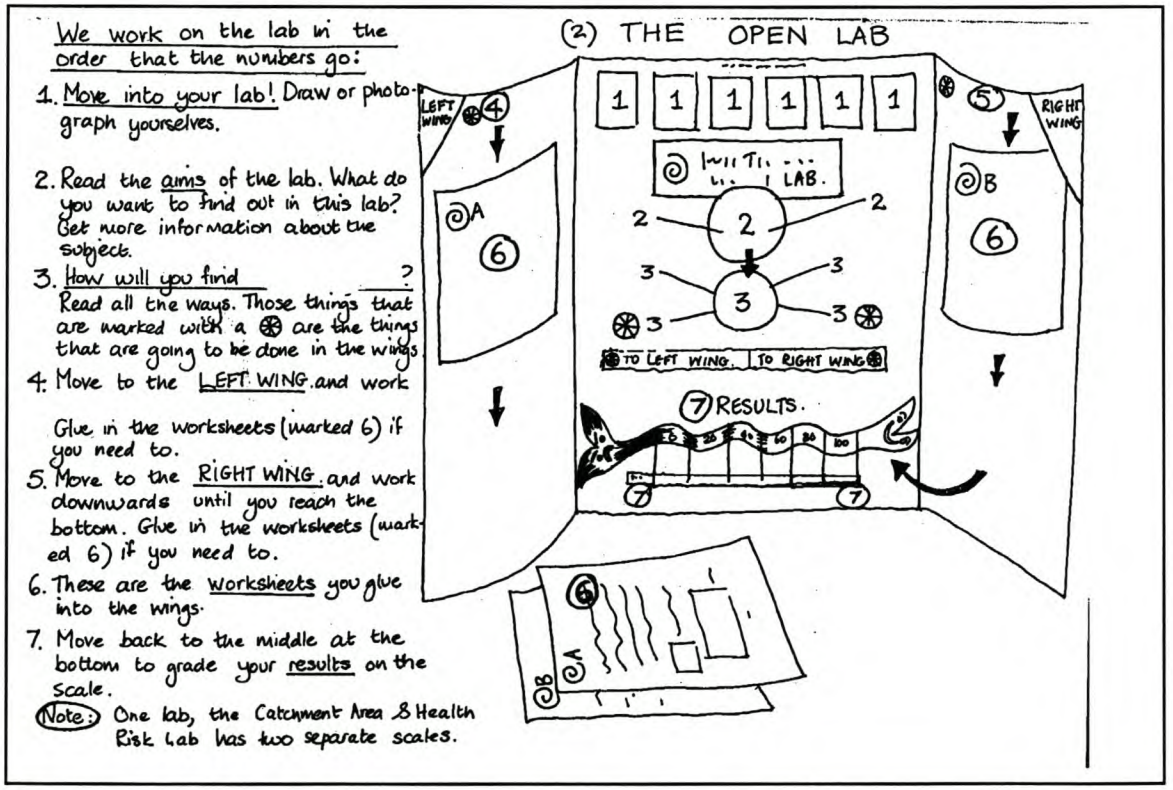
Room 5: The pH Lab

Room 6: The Nitrate Lab

Room 7: The Turbid Lab

The 8th poster is completed when the results of the 7 experiments are reviewed at the end of the project.

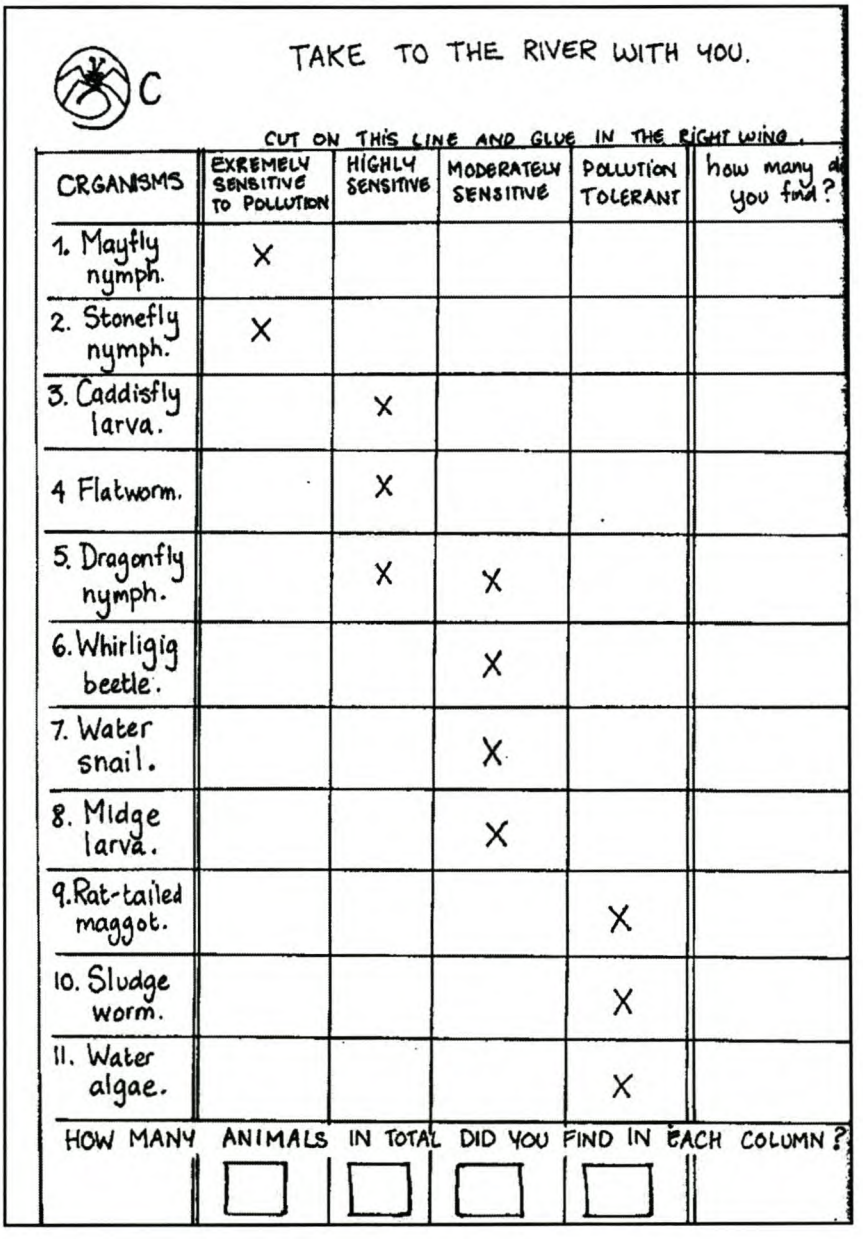
Diagram A2. How does the inside of the laboratory work?



The water life laboratory

The water life laboratory sends the partaker out on an adventure to find different living creatures in the water. The participants are encouraged to classify these insects and invertebrates but to carefully replace them after they have finished the classification. Each creature is graded on a pollution scale, which in the end presents us with a very clear indication of the river Water quality. The participants use a bugdial to classify the water life. This table is another way of making a decision as to what the state of the water quality is.

Diagram A3: The pollution classification table – Waterlife Lab



APPENDIX B

INTERVIEW SCHEDULE

Introduction:

- Did you become involved in this project voluntarily?
- What were the initial reactions to the project in the school with your colleagues?
- Why did your school become involved in the project?

Training and implementation:

- The workshop and the river visit. Was it sufficient to prepare you to use SWAP in your classroom? Did you feel equipped after the training? Did you feel confidant?
- Did you have any further needs and questions that weren't answered or did you need any further support?
- In retrospect, explain how your involvement in the project - SWAP influenced you as a teacher. (Made a contribution to your INSET training as a teacher?)
- If you were to advise someone else on presenting a SWAP workshop, what advise would you give him or her?
- If you were to advise the principal on the use of SWAP in your school, what would you suggest to him?
- The parent involvement, whose idea was it, and how did you experience the parent involvement?

Local environment:

- If I say the word "environment". What is your definition or view of that term?
- Have you ever thought about that before your involvement with the project?
- What do you think was some of the other teachers' view on environment?
- Did you have any contact with parents talking to you or someone else about what they experienced in the project?
- What was your attitude toward the local environment before the project, and how do you view the local environment now? (Better understanding, surprised to see what's happening out there?)
- How do you view the local environment in terms of school curriculum and value to school activities?

Classroom Practice:

- Do you think that your involvement with SWAP changed/enriched anything in your teaching practices?
- How did you use SWAP in your class?
- Did SWAP in any way inform your classroom practice?
- Did you experience any difficulties using it?
- Suppose you were to motivate why SWAP should or should not be incorporated into the school curriculum, what would you say?
- Could you see any links between SWAP and outcomes Based Education?
- How do you feel about Curriculum 2005 and what they expect of you? – Specific learning areas
- Do you see any potential for SWAP helping you to reach some of the outcomes?
- Which learning areas did you see potential in? or did you use it in?
- Did you adapt some of the activities or created new ones for your class?
- Do you have any other ideas that you haven't got round to incorporating yet?

Personal Change:

- How has your own view on "what is the environment" changed or developed?
- Did you experience any personal change of attitude towards the local environment? What new things did you discover through this project?
- Do you think there was something that acted as an obstacle for you or your children to get the MAXIMUM learning from this? And for yourself?
- What was your previous knowledge about "fresh water issues" before this? Has it expanded or changed in any way?
- Do you think you will go on being involved in EE after this experience?
- In what ways?

Anything Else?

Is there anything else you would like to add or a comment you would like to make?

CONSENT FORM

Each participating teacher signed a consent from giving me permission to use the gathered information in my thesis and in any other publication flowing from it.
Most of the teachers were Afrikaans, and therefor the disclaimer form was in Afrikaans.

Diagram B1: Letter of consent

Naam:_____

Datum:_____

Skool:_____

TER INLIGTING:

- Alle inligting sal as vertroulik en anoniem hanteer word.
- Ek vra hiermee toestemming dat ek aanhalings uit onderhoude mag gebruik.
- U mag op enige stadium weier om 'n vraag te antwoord of onttrek van die studie.

Handtekening:_____ Datum:_____

Naam in blokletters_____
Ek bevestig dat aanhalings van hierdie onderhoud in die finale navorsingsverslag en ander publikasies gebruik mag word. Ek verstaan dat dit anoniem gebruik sal word.

Handtekening:_____ Datum:_____

Naam in Blokletters:_____

TRANSCRIBED INTERVIEW

Each interview and focus group discussion were recorded on audiocassette and transcribed by the researcher immediately after the discussion. The researcher aimed to capture not only facts, but also emotions and body language in the transcriptions.
Some of the interviews were submitted to the interviewed teachers to be checked for accuracy.
Please note that the names of teachers involved and the school has been changed to protect their identity.

Diagram B2: Extract from transcribed focus group discussion

School: Oceanview region

Date: June 2002

Teachers involved:

(D)D, (T1)

(T)T (T2)

(Dz)D (T3)

(F)F (T4)

(I) Interviewer (researcher)

I: Het elkeen van julle vrywilliglik betrokke geraak by die projek?

Dz: Ja, ek het dit gesien as 'n "outing" , net WEG te breek van daai KLAS-atmosfeer. En dit was, op my dag toe ek gegaan het, was 'n lekker dag.Toe span ek sommer uit – die HELE middel sessie.

I: Middel sessie?

Dz. Tussen die twee pouses.

F: Twee ure basies

I: Dis 'n baie groot tyd – baie lekker tyd.

T: Ek het ook daai tyd gegaan, vir my was dit ook lekker. 'n Paar van die kinders het bietjie uit die wil uit geraak, maar hulle het dit geniet. Meeste van hulle

F: Ek dink die belangrikste was seker die verandering in klasatmosfeer. Kyk in plass van sit binne in 'n klaskamer kon jy nou dieselfde ding gaan doen aan die buitekant waar die kind nou meer betrokke kan wees. Dit was belangrik gewees.

D: Onse kinders is nie eintlik gewoond aan sulke goed nie. Ons BLY in die klas. Ons kry twee periodes per week vir L.O. Daai's maar AL wat hulle buite toe gaan voor. En as dit reën dan kan ons nie gaan nie. So disvir hulle 'n "outing" soos Dess sê.

I: Vir jou ook!

D: Oe! Vir my ook ja,

Dz: Dis relaxing! Ek het daai boekie wat jy vir ons gegee het, Daai boekie het ek NET so gevolg, As Heleen sê "maak sê so en vra so" dan vra ek dit net so.

I: Hoe het dit gegaan?

Dz: Dit het lekker gewerk.

D: Die kinders het gehou daarvan om te eksperimenteer, vir hulle was dit heel iets nuut om met die goed te werk. En dan het hulle vir mekaar gesê "Hoe het julle s'n gewerk? Of so. Hulle het dit interessant gevind.

APPENDIX C

LEARNING PROGRAMME DEVELOPMENTS: SOMERSET-WEST, LOURENSRIVER

Fig C1: Grade 1&2 worksheets, Turbidity Lab, adapted from SWAP worksheets

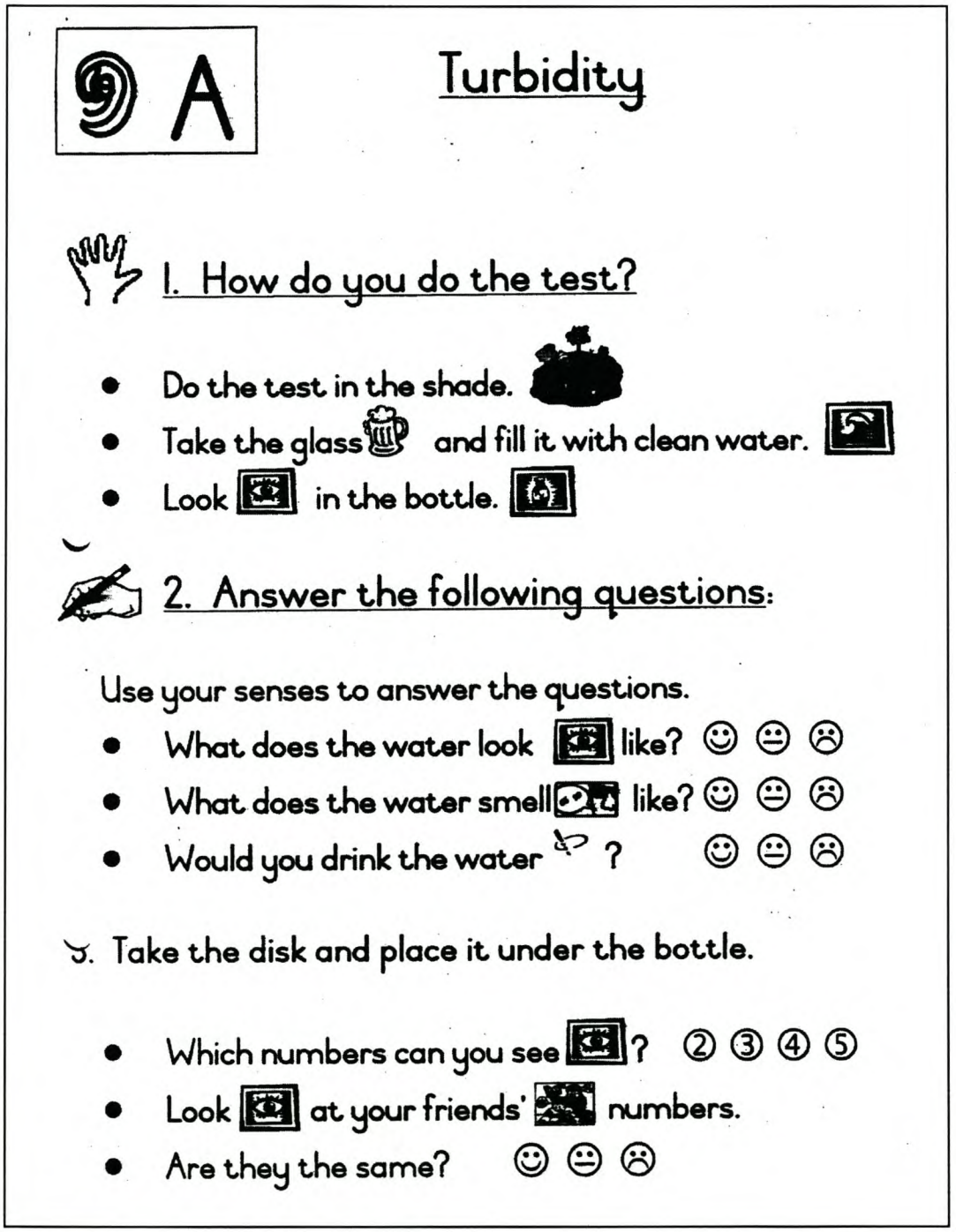


Fig C2: Corresponding SWAP worksheet – Turbidity

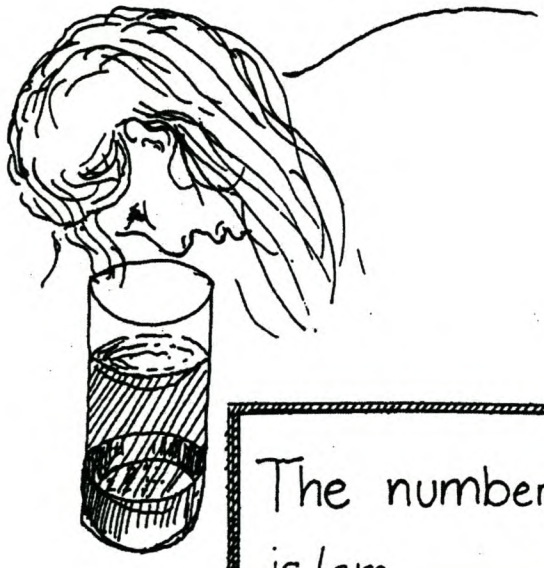
TAKE TO THE RIVER

A

CUT HERE AND GLUE IN THE LEFT WING AFTER COMPLETING

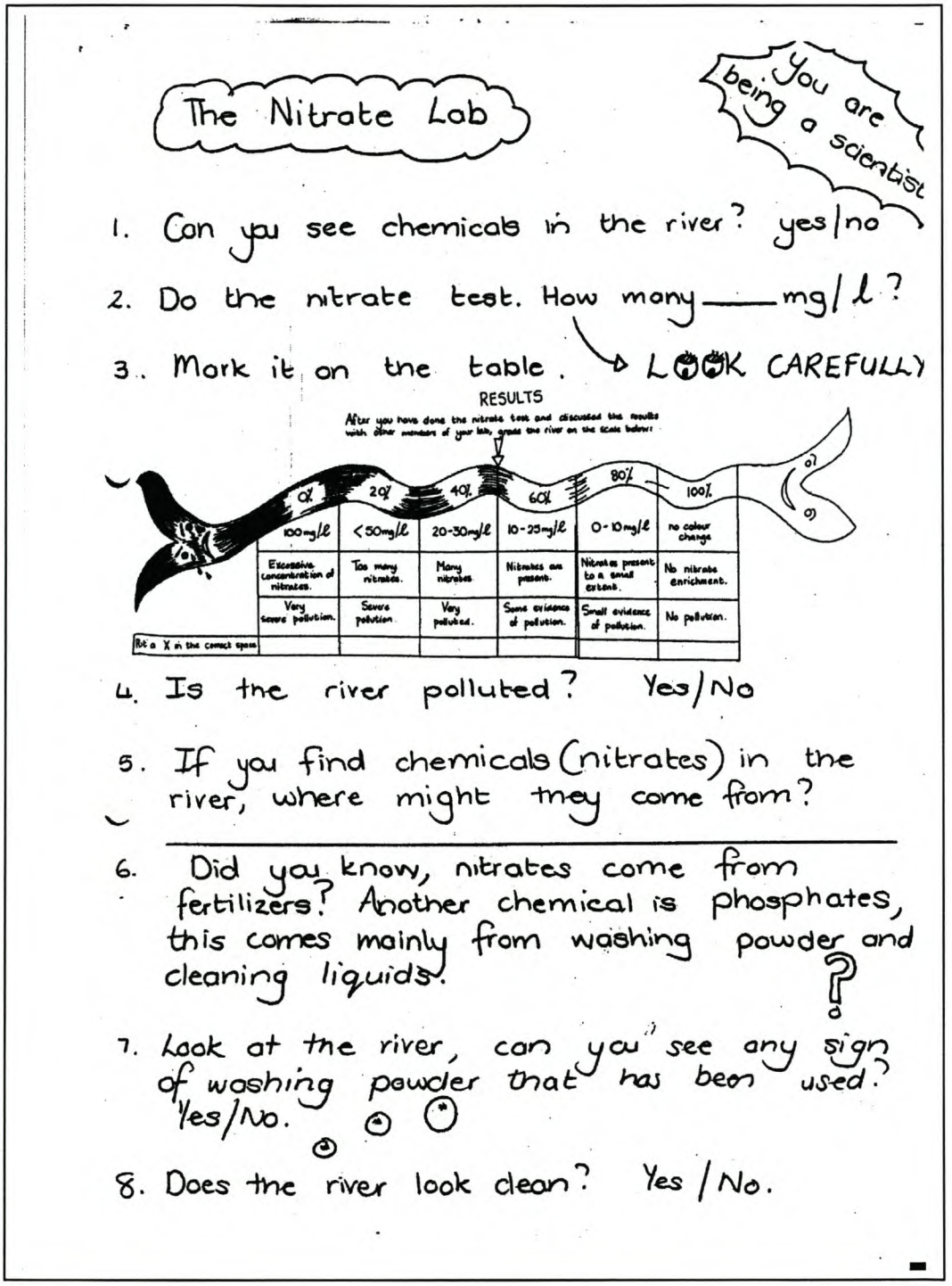
HOW TO DO THE TEST. AT THE RIVER

- Do this test in a shady area.
- Fill up the bottle with river water. The water must be at least 20cm high.
  Take water from the clearest part of the river. It must have no extra mud or sand from the banks.
- Look into the bottle and see which numbers are visible (you can see)



The number/s visible is/are _____

Fig C3: Grade 4&5 worksheets, Nitrate Lab, adapted from SWAP worksheets



The Nitrate Lab

You are being a scientist

1. Can you see chemicals in the river? yes/no
2. Do the nitrate test. How many ____ mg/l?
3. Mark it on the table. → LOOK CAREFULLY

RESULTS

After you have done the nitrate test and discussed the results with other members of your lab, grade the river on the scale below:

	0%	20%	40%	60%	80%	100%
	100 mg/l	<50 mg/l	20-30 mg/l	10-25 mg/l	0-10 mg/l	no colour change
	Excessive concentration of nitrates.	Too many nitrates.	Many nitrates	Nitrates are present.	Nitrates present to a small extent.	No nitrate enrichment.
	Very severe pollution.	Severe pollution	Very polluted.	Some evidence of pollution.	Small evidence of pollution.	No pollution.
Put a X in the correct space						

4. Is the river polluted? Yes/No
5. If you find chemicals (nitrates) in the river, where might they come from?
6. Did you know, nitrates come from fertilizers? Another chemical is phosphates, this comes mainly from washing powder and cleaning liquids.
7. Look at the river, can you see any sign of washing powder that has been used? Yes/No.
8. Does the river look clean? Yes / No.

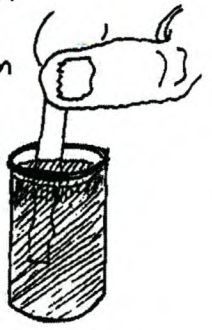
Fig C4: SWAP worksheet – Nitrate lab

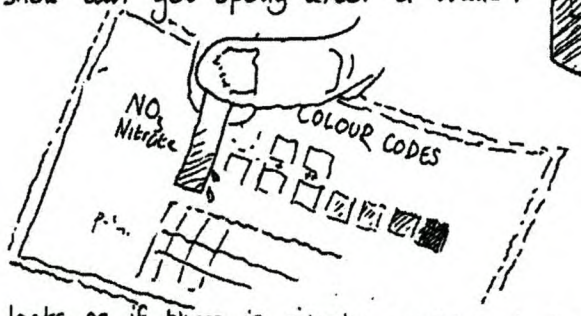
Ni B. TAKE TO THE RIVER WITH YOU

CUT HERE, THEN GLUE INTO THE RIGHT WING OF THE LAB.

HOW TO DO THE NITRATE TEST

- Fill the plastic "film" bottle with river water.
- Unwrap the foil from the nitrate stick.
- Put the nitrate stick into the water. Shake the stick to make the air bubbles disappear and say 101 slowly. Remove the stick.
- Wait at least one minute and then compare the nitrate stick with the colour code. Do not take longer than 5 minutes because the colour on the stick can get spotty after a while.





If it looks as if there is nitrate enrichment but your results are nil, do this: Take a large water sample to the classroom and boil it on the stove until only half the water is left. Let the water cool and redo the test using a nitrate stick as before. (Boiling the water makes it more concentrated.)

The nitrate level in the river water is____ mg/ℓ

Fig C5: Catchment and Health Risk – SWAP

This worksheet was combined with turbidity in Fig C1 by the teacher.

A TAKE TO THE RIVER WITH YOU.

CUT ON THIS LINE AND GLUE INTO LEFT WING AFTER COMPLETING.

A SIMPLE TEST TO FIND OUT THE HEALTH RISK OF WATER FROM OUR RIVER.

Fill a glass with river water and .....

..... LOOK at the colour , and

..... SMELL the water.

DO NOT DRINK THE WATER HOWEVER CLEAN IT LOOKS !

Do you think the water is suitable for people or animals to drink ? Circle your answer.

Definitely not. Maybe not. Smells clean Looks clean.

Why do you say so? What did you observe ?

APPENDIX D

ARTEFACTS: TABLE VIEW - RIETVLEI

Fig D1: Aerial photo, Rietvlei

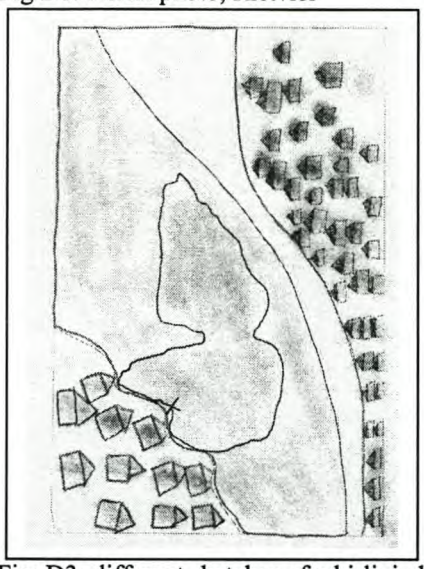


Fig D2: Poster about dying birds

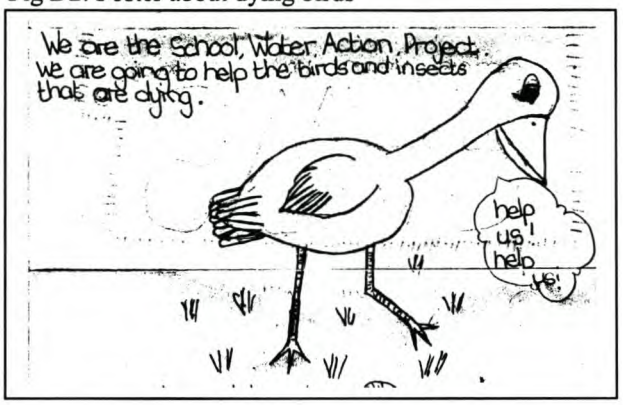


Fig: D3: different sketches of whirligig beatles

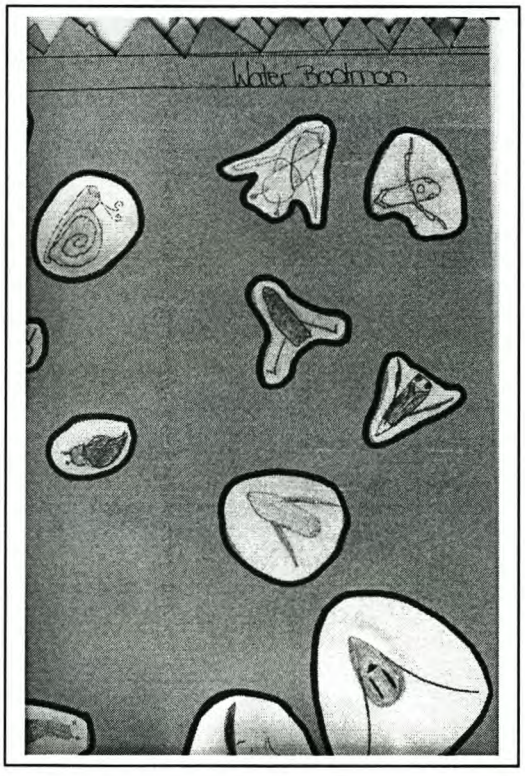


Fig D4: Pamphlet promoting SWAP