Towards the development of a framework to assess Umgeni Water's environmental education programme

by

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Abstract

This study provides an overview of an environmental education programme being implemented in an organization (Umgeni Water), in Pietermaritzburg. In recent years assessment of this education programme's performance has lost its focus to the detriment of the programme. This has then led to the aim of this study which is to develop a framework to assess the programme.

The aim of the study was to develop a framework to assess Umgeni Water's environmental education programme. Four sub-objectives were identified. These are; to review three learning models and select one best suited to Umgeni Water's School Environmental Education Programme, to assess which components of the selected learning model are being practiced naturally by teachers, to assess Umgeni Water's schools environmental education programme against the selected learning model and to develop an outline of a plan for the future of Umgeni Water's environmental education programme based on the selected learning model.

A qualitative research design was used and data collection was through semi-structured interviews and a focus group. One sample of teachers was drawn from schools that had used Umgeni Water's programme of water treatment plant visits. A second sample was drawn from schools that had no exposure to this programme.
The findings revealed that, to some degree, teachers in both instances were naturally applying the components of learning from the selected learning model although they were not aware of the model as such.

The study recommends that Umgeni Water's environmental education programme needs to focus on working with schools that are naturally applying the learning components since the findings revealed that the teachers in these schools could be key in teaching teachers from other schools.

DECLARATION

I **Nomsa P Nkasa** declare that;

(i)   The research reported in this dissertation, except where otherwise indicated, is my original work.

(ii)   This dissertation has not been submitted for any degree or examination at any other university.

(iii)   This dissertation does not contain other person's data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other researchers.

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Table of Contents

List of Figures

List of Tables

List of Acronyms

EE   :   Environmental Education

EEP   :   Environmental Education Programme

EES   :   Environmental Education Services

OBE   :   Outcomes Based Education

NEMA: National Environmental Management Act

PEAP :   Public Environmental Awareness Programme

PR   :   Public Relations

UNEP :   United Nations Environment Programme

UNESCO   United Nations Education Scientific and Cultural Organization

SADC :   Southern African Development Community

Chapter 1: Introduction

1.1   Introduction

Umgeni Water conducts public awareness through its Environmental Education Services (EES) to encourage communities within the organization's operational area to manage their water resources well by reducing water pollution. This programme is comprised of the Public Environmental Awareness Programme (PEAP) and the Environmental Education Programme (EEP). While the PEAP responds to environmental issues arising from communities within Umgeni Water's area of operation, the EEP on the other hand conducts environmental education programmes to schools. Since this research seeks to develop an assessment framework for the EEP, focus will be on the schools under this programme.

To contribute to its environmental sustainability goals, Umgeni Water has committed to respond to environmental health and the reduction of environment related natural disaster vulnerability, through its water, health and hygiene awareness programme (Umgeni Water, 2010). The EEP has been running since 1992 and to date does not have a framework that its work is based upon. This leads to the existing reports not reflecting on the significance of the education programme and the amount of work that has been conducted within this programme. The main aim of this study is to therefore develop a framework that will be used to assess the Umgeni Water's Environmental Education Programme

1.2 Background on Umgeni Water

Umgeni Water was established in 1974 to supply bulk treated water to municipalities in its designated operational area. The organization's mission is "to provide effective and affordable bulk water, bulk sanitation and related solutions to local government in accelerating the water sector's national developmental agenda," Umgeni Water (2008a:9). Over the years, the organization has grown into the largest bulk water supplier in KwaZulu-Natal (KZN) serving an operational area of 21,155 square kilometers.

Umgeni Water's gazetted area of supply is bounded by uThukela River in the North, the Mtavuna River in the South, the Indian Ocean in the East and Drakensberg Mountains in the West, (Umgeni Water, 2008b).

In responding to the global and local crises on environmental issues especially those affecting water as a natural resource, the EES was established by Umgeni Water as a small 3 person outreach section with a budget of R450 000 per annum. Its aim was to provide awareness education on water to schools in KZN. With only three education officers, the programme sought to achieve the following objectives:

"(i) To raise public awareness on water related issues including health and hygiene;.
(ii) to expose schools to water treatment processes through the water classroom; and
(iii) to develop education materials that could be supplemented in the schools' curriculum."
(Umgeni Water, 2006).

These objectives were mainly focused on offering a responsive programme and as such, its focus was on raising awareness to the 'water wasting communities' that were using the rural schemes within Umgeni Water's catchment. The growing number of schools visiting Umgeni Water treatment sites was viewed in line with the awareness-raising programme and little attention was paid to how the education programme could be spread to play a significant educational role to the schools. The developments within the field of environmental education called for a shift in focus such as that of offering environmental education programmes that were sustainable and of significance to the recipients.

In 1978, the United Nations' Educational, Scientific and Cultural Organization (UNESCO), in conjunction with the United Nations' Environment Programme (UNEP), focused the aim of environmental education on creating programmes to encourage individuals and communities to participate responsibly in managing the quality of their environments. Umgeni Water subscribes to (UNESCO/UNEP) goals by - engaging communities within its catchment and providing them with knowledge that will help

them to become water literate, conserving citizens who maintain good, clean and healthy water resources, (Umgeni Water 2008b). When the EES was established, the budget allocated for education programmes was combined with the organization's Public Relations (PR) department. This budget benefited the EES by covering costs for running the education unit. PR existed to promote the public image of the organization while simultaneously advertising social services especially the schools' programme, which was offered by the organization. Schools got to know of the EEP through the Public Relation's advertising activities.

The increase in the number of school bookings within the EEP resulted in the EES becoming a stand-alone department conducting its business independently of PR. The growth of the EEP was assessed by counting the number of learners visiting Umgeni Water however this statistic is not a good indicator of whether the goals of the environmental education programme are being achieved. The EEP is a learning programme which seeks to increase learners' knowledge and awareness about the environment and develop skills to address environmental challenges within their communities. Seeing learners engaging in action learning projects within their schools and involving their communities is what the EEP seeks to achieve. The minimal contact time spent with schools within the EEP at Umgeni Water posed a challenge to the goal of conducting long lasting and meaningful education programmes by the EEP.

By working with schools within Umgeni Water's catchment area the EEP helps surrounding communities to be involved as part of the organization's sustainability plan of contributing towards social development. While working with these communities, there is interaction with learners who are at the forefront of programmes aimed at managing their environments. As such, Umgeni Water views the role of learners as crucial in bringing about positive change within communities. Sayers (2006) affirms that children are recognized throughout the world as effective communicators. Sayers (2006) further states that children tend to take what they learn from school to their homes and thus become very credible educators helping to change behaviours and beliefs within their communities and families. It is for these reasons that Umgeni Water programmes

are school-based and interaction with the learners is through the water classroom, plant tours and the school visit programmes which are aligned to the school curriculum.

1. 3 Statement of the problem

EEP offers services to schools per district municipality. Three environmental education officers work within uMgungundlovu, Sisonke, eThekwini, Ilembe and Ugu district municipalities, which house 2015 schools, (Umgeni Water 2008b). Since its inception in 1992, the EES section has been conducting environmental education programmes with minimal human resources. Equipped with only three education officers, the EEP targets 100 schools to work with yearly. These schools are separated into 80 water classrooms and 20 school visits. To work with the EEP targets of 100 schools per year means it would take this unit 20 years to reach out to 2000 schools. There is a high likelihood that the EEP will not manage to reach out to the 2015 schools due to the existing minimal staff capacity. The situation might worsen with the addition of new schools to the current KwaZulu Natal's school database. Therefore, the EEP must seek an effective way to integrate water related environmental education into these schools and present a justifiable education approach that can work with the current resources.

In the vision and mission of the EEP at Umgeni Water, there is a desire to build lasting education programmes for social change. This social intervention is an attempt to change conditions under which people live (Bless and Higson-Smith 1995). The attempt to build a sustainable EEP at Umgeni Water is hindered by the size of the EEP staff versus the 2015 schools that have to be reached. If the department continues to employ only 3 staff members to work with 2015 schools, it means that each school will be seen once every 20 years and this will not build the lasting education programme as desired.

The EEP is also unsuccessfully providing sustainable education programmes due to the fact that some schools are using the EEP as part of an 'outing' for learners instead of reinforcing learning that has already taken place at school. Focusing on the number of people reached as opposed to establishing how the EEP's intervention has been used by

the schools, has also contributed to the problem. Perception of the EEP as offering a Public Relations function has misplaced the educational role of this programme. While Public Relations focus on promoting and protecting the organization's image, the EEP on the other hand exists to implement meaningful community upliftment initiatives through the schools programme.

Public Relations exist to inform the public about the progress of the organization, (Sayers, 2006). The Public Relations department at Umgeni Water publishes information in line with marketing the organization externally, conducts media-releases and stakeholder road shows. The assessment framework needs to focus more on environmental education than Public Relations at Umgeni Water. This framework should be guided by a learning theory which requires continuous monitoring to enable the users to always refer back and apply its elements in the learning process.

1.4 Rationale for the study

The manner in which the EEP currently assesses its performance is not focused. At the moment, the EEP only monitors the number of learners that visit Umgeni Water sites. There is no follow-up to check how the schools incorporate what they have learnt at Umgeni Water into their school curriculum. By developing the assessment framework, the EEP at Umgeni Water will be creating a new way for assessing its own learning programmes. This framework must be self-sustaining and be able to measure the key elements of a social learning model which can organically grow the numbers of people who learn. The learning framework needs to reflect how the problem can be addressed differently.

The absence of clearly stated objectives that seek to identify schools with teachers that have a potential to nurture the objectives of the learning programme have contributed to the EEP not being focused. Daniel *et. al* (2007) regards teachers as "multipliers of impact". They argue that the long term aim of learning should be to change how fellow

teachers, their pupils and the wider community think about the environment and sustainable development. The EEP needs to identify teachers who will be supported and guided by a learning model that will be interwoven into the curriculum without altering the learning process. This will be a challenging exercise, considering the minimal contact time of 3 hours spent with schools which are only visited once in 20 years. Harrison (2002) proposes that once off events be replaced by blended learning solutions which have sustainability built into their design. Therefore, it would be ideal for the EEP to find out what schools are already doing in their environmental education programmes and build onto their work through the EEP's learning programmes.

As a way of organically growing the EEP, this study proposes that EEP knowledge be embedded into a few schools that have been identified, as explained in Chapter 5, (Section 5.5). These schools can subsequently be used as examples of learning centres, which can spread the acquired knowledge to other schools. New environment projects for learners, training other educators and involvement of the surrounding community would be evidence of such learning. The challenge currently faced by the EEP is that of identifying such schools and working with them. The development of the assessment framework for this study will therefore form part of the criteria for finding those schools.

Daniel et. al (2007) emphasizes the success of education for sustainable development as having the ability to reach the masses. The significance of working with fewer schools will begin the process of weaving the EEP elements of learning into the school community to achieve maximum programme spread through organic growth in the long term. Working with teachers will increase the number of people working on the ground and widen the scope for growth of the EEP. The work will be shared between schools and the EEP thus avoiding the concentration of workload on the three education officers.

Harrison (2002) proposes that learning must be embedded into day-to-day routines. He further supports the building of informal models within organizations. Based on Harrison's proposal, the development of the EEP framework will introduce a new way of assessing learning offered to schools. The framework will also be used as a social

learning model to influence the measuring method currently used, within Umgeni Water to assess the EEP's interventions.

1.5 Aim of the study

The overall aim of this research was to make a substantial conceptual contribution towards the development of a framework to assess Umgeni Water's Environmental Education Programme. To achieve the aim, the following objectives have been set:

1. 6 Specific Objectives

- Review three learning models and select one best suited to the Umgeni Water Schools Environmental Education Programme;
- Assess which of the components of the selected learning model are being practiced naturally, by the teachers:
- Assess Umgeni Water Schools Environmental Education Programme against the selected learning model;
- Develop the outline of a plan for the future of the Umgeni Water Schools Environmental Education Programme based on this learning model.

1.7 Research methodology

In working towards the development of an assessment framework, this study sought to find schools that were naturally following the pedagogy that is advocated in the chosen model, which emerges from the literature review (Chapter 2). A key question asked for this purpose was: are there any schools within Umgeni Water's operational area that practice any of the principles of the learning models under review, albeit that they do not realize that they are following a model? To begin the process of developing the framework:

a. Literature on the following three models was reviewed;
    (i)   Mintzberg's theory of learning (Mintzberg, 2004);
    (ii)   Scharmer's theory U, (Scharmer 2005);

(iii)   Nonaka's dynamic theory of organizational knowledge creation, (Nonaka 2004);

b. Two pilot studies were conducted to test the semi-structured interview guide before administration to the actual sample (Welman, *et al*. 2005);

c. Semi-structured interviews with 10 teachers who had made use of the EES programme were conducted to establish whether they thought about the water related education in the manner of the selected learning model, (Appendix A);

d. A focus group discussion was used to get the views of 10 teachers who had not made use of the EES programme. The questions for this discussion are presented in Appendix B;

e. Data analysis was conducted through theme identification.

1.8 Outline of the dissertation structure

Chapter 1 is an introduction to the study. It describes the purpose and provides a brief description of the problem under study. The research objectives, need for the study and research methodology used are provided.

Chapter 2 reviews literature that has contributed to shaping Environmental Education in South Africa by drawing linkages from the local and international perspectives. The chapter continues to focus on the review of learning theories with the inclusion of the three selected learning models that will be used to shape the EES programme. The role of programme assessment is also discussed because of its influence on framework development and how it can be successfully executed to achieve the objectives of the EES Programme.

In **Chapter 3**, the research approach and methods used in the study are discussed. This is followed by highlighting the procedure that was used to collect data for this study the sampling methods and the data analysis techniques.

In **Chapter 4** results are presented and analyzed in 4.2 – 4.3. The first section discusses the findings from information provided by teachers that have made use of the EES programme. This information is then contrasted with the responses from the focus group comprising teachers that had not been exposed to this education programme. Both sets of responses are used to examine the intentions of EES programme and identify the existing gaps.

Chapter 5 presents the recommendations for improving Umgeni Water's education programme and discusses the outline of a framework to be used for assessing the EES programme based on the selected learning model.

Chapter 2: Literature review

2.1 Introduction

In this chapter, the researcher explores theories that frame environmental education and upon which the EES programme's principles are based. This chapter subsequently reviews the three learning models appropriately selected for this study. Programme assessment which forms a critical part of the EES programme is also discussed with the aim of giving an indication of where Umgeni Water's programme is, conceptually at present.

2.2 Environmental Education in South Africa

The integration of environmental education into the South African schools curriculum has its roots in UNESCO's emphasis on fostering learning programmes aimed at developing environmental awareness within communities. According to UNESCO , learning is viewed as a process aimed at promoting knowledge, attitudes, motivations, commitments and skills within individuals and communities towards solutions of current environmental problems and prevention of new ones (UNESCO/UNEP, 1978).

The 1977 Tbilisi conference contributed to the development of environmental education globally and is recognized as the first intergovernmental conference on Environmental Education (EE) that set the following goals to:

a. foster clear awareness of, and concern, about economic, social, political and ecological inter-dependence in urban and rural areas;

b. provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; and

c. create new patterns of behaviour of individuals, groups, and society as a whole, towards the environment.

(UNESCO, 1978; UNEP 1978)

Subsequent to the 1977 Tbilisi conference, communities around the globe have engaged in environmental management initiatives. Palmer (1998) states "…the ever increasing threats to the resource of the Earth and to the health and stability of its societies justify an urgent need for an informed global citizenship". The call to promote education, public awareness and training, is also made in local Agenda 21 which flowed from the United Nations conference on Environment and Development, held in Brazil in 1992.

In South Africa the National Environmental Management Act (NEMA Act 107 of 1998) set out the following principle, to promote environmental education:

> *"community well being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means"*.

(NEMA 1998:s4(h))

NEMA was formed subsequent to the Bill of rights in the South African Constitution (Act 108 of 1996) which states that:

> "*everyone has a right to an environment that is not harmful to their health and wellbeing and to have the environment protected for the benefit of the present and future generations through reasonable legislative and other measures that:*
> *(i) prevent pollution and ecological degradation;*
> *(ii) promote conservation; and*
> *(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development"*.

RSA Constitution (1996: s24(2))

Le Roux (2000:54) observes the following trends on environmental education:

"In the 1960s and 70s the focus was largely on education about the environment, education in the environment. More recently, environmental education has come to include, along with facts and experiences, an orientation to action: education for the environment"

Le Roux (2000) argues for the success of environmental education by focusing on the transformation of the education environment. They state that this transformation would mean the inclusion of environmental education into the schools' learning areas and will allow for educators and learners to derive meaningful experiences from the learning process. This process is outlined below by Naidoo *et. al* (1990) as cited in Le Roux *et.al* (1990) :

"In practice, these processes require:

- *joint planning of teaching, curriculum and curriculum materials by teachers.*
- *the use of groupwork and other cooperative classroom techniques.*
- *problem-solving which goes far beyond the use of exercises.*
- *the type of dialogue between pupils and teachers and among pupils where mistakes and unusual ideas are welcomed. This frees and challenges all concerned.*
- *the acknowledgement of the actual or possible significance of one another's ideas*
- *the exploring of links with all fields of knowledge that may be relevant.*
- *the willingness to try out ideas."*

(Naidoo et al., 1990)

Le Grange and Reddy (2007) focus on guiding principle 2 as set down during the 1977 Tbilisi conference. This principle states that environmental education should be interdisciplinary, beginning at pre-school and continuing through all formal and non-formal stages. They further emphasize the possibility of learning in different environments (schools, places of work, local communities and natural settings) brought about by this principle. Kalantzis and Cope (2008) also agree that more and more learning is happening outside of the traditional educational institutions: on the job, at play, through the media and on the web. The provision of environmental education in South Africa has been integrated with the schools' curriculum to promote education that

is relevant to the learners' lives. Le Roux (2000) summarizes that learning programmes provide guidance for teaching and learning within an outcomes-based framework.

2.3 Overview of learning theories

Bigge and Shermis (2004:2) define a learning theory as "a designed plan for the development of a pattern of ideas accompanied by a planned procedure for carrying it out". Le Roux (2000:55) states, "trends in environmental education have largely been shaped by trends in perspectives on schooling and education". These trends have had an influence in forming the basis for the development of environmental education programmes.

2.3.1 Behaviorism and its influence in learning

Behaviorism as an approach was developed in the 1930s and impacted greatly on psychology and related fields such as education which was concerned with theories surrounding the nature of learning in people. The behaviorists were interested in people's observable behavior and not their internal states of consciousness (Land and Fotheringham, 1999). According to these theorists, the environment is the determining factor wherein learning is viewed as the conditioned response to external stimuli, (Gardener, 2006).

Originally, the aims of environmental education processes were stated in terms of behaviour change. It was not until 1992 that UNESCO/UNEP restated the aims of environmental education processes as those of creating "environmentally responsible citizens" (UNESCO/UNEP 1992). Le Roux (2000) argues for UNESCO's approach as displaying the intention of changing people's behaviour through raising their awareness. Advocates of behaviour change seek to identify relatively permanent changes in behaviour resulting in experiences while disregarding the fact that not all changes in behaviour result from experience acquired through learning, (Infed, 2010).

It was in this light that environmental education sought to raise people's awareness through experiences in their surroundings for their own benefit. Harrison (2002) argues

that communities will start living when the potential for non-localized learning is evident through integration of life, work, education and play. Therefore, evidence of development should reflect in areas such as social, physical and the economic environment in which people exist.

2.3.2 The role of constructivism in learning

Unlike behaviorists, these theorists view learning as requiring the active engagement of learners and they argue that it is determined by what goes on in people's heads. (Gardner 2006). Wirth and Perkins (2008) emphasise understanding in constructivism which is gained through experiences and interaction with the environment affording the learner a chance to use a foundation of previous knowledge to construct new understanding. In support of Wirth and Perkins, Gardner (2006) regards the role of prior knowledge as a powerful determinant of a student's capacity to learn new material. Acquired knowledge is used by the learner to create new insights and learning which will inform the decision making process, applicable in the workplace, to make positive change.

2.4 Programme assessment in learning

Environmental Education programmes seek to respond to environmental problems and issues which require the evaluation of the impact of educational interventions. Palmer (1998) states that the planet is affected by a complex array of problems and issues that are inter-related and interdependent. Pawson and Tilley (1997) emphasize the importance of considering the nature of what is being evaluated. They argue that the initiatives and programs which get scrutinized should not be treated as independent variables but rather as social programs that are constituted in complex processes of human understanding and interaction.

Rea-Dickins and Germaine (1992) agree with Pawson and Tilley (1997), by focusing on the implications for evaluation in an educational setting as being more powerful than those made in informal social settings. They (*ibid*) emphasize the importance of the criteria by which judgment is imposed when evaluating something and propose that

evaluation in an educational context should be systematic and undertaken according to certain principles using carefully designed criteria.

Meanwhile, Taylor, Gibbon and Morris (1987) adopt a formative approach to evaluate program components. They criticize comparative studies for the effects of assessing whole programs since they do not always provide the best service to the program staff or funding agency. They advocate for the evaluation of components of education programs which are also supposed to provide useful information that can be used to recommend changes for organizations. The transition from programme evaluation to monitoring is viewed as part of formative evaluation indicates the extent of programme implementation, King, Morris and Taylor Fitz-Gibbon (1987). They (*ibid*) argue that this step provides a basis for deciding whether parts of the program ought to be improved, replaced or augmented.

Chen (2005) challenges the popular view of program evaluation which assesses the merits of a program. He argues that depth of programme evaluation is far more enriching than merit assessment. He focuses on the critical role of stakeholders as beneficiaries of the evaluation results which they in turn use for progress of the programme. Chen (2005) proposes that program evaluation should equip stakeholders for appropriate actions to take in addressing problems and improving programs. Chen (2005:6) concludes by stating: "in order to be responsive and useful to stakeholders, program evaluation should meet both assessment needs and improvement needs rather than confine itself solely to merit assessment".

2.4.1 Assessment in learning

Lambert and Lines (2000) propose that a clear distinction should be made between assessment of learning for the purposes of grading and reporting, which has its well-established procedures, and assessment for learning which calls for different priorities, new procedures and a new commitment. Watson (nd) differentiates between the concepts by looking at assessment as the journey and evaluation as the snapshot. She highlights that assessment requires the gathering of evidence of student performance over a period

of time to measure learning and understanding. Evidence of learning could take the form of dialogue, journals, written work, portfolios, and tests along with many other learning tasks. While on the other hand, evaluation occurs when a mark is assigned after the completion of a task, test, quiz, lesson or learning activity. To support the definitions of evaluation that has been highlighted in this study, Frair et. al (nd) state that evaluation uses assessment information to support decisions on maintaining, changing, or discarding instructional or programmatic practices.

Learning programmes provide guidance for teaching and learning within an outcomes-based framework, le Roux (2000). Lambert and Lines (2000) view assessment as a fact of life for teachers, part of what teachers do. They also promote the assessment as part of teaching and learning and that using assessment evidence is regarded as part of the planning process. Weeden *et.al* (2002) argue that the purpose of assessment is to improve standards, not merely to measure them. They identify:

(i) Formative assessment as assessment which is part of the process of teaching and learning – *assessment for learning*.

(ii) Summative assessment as the process of summing up or checking what has been learned at the end of a particular stage of learning, whether this is a module or a course – *assessment of learning*.

Mc Donald (2005) proposes that assessment has to move beyond factual recall to the application of knowledge and skills to increasingly complex situations, involving a range of intellectual and practical activities in a variety of contexts.

2.4.2 The value of programme assessment

According to Stufflebeam and Shinkfield (1985:151) "the most important purpose of evaluation is not to prove but to improve". This study seeks to develop an assessment framework for Umgeni Water's EEP. Therefore, for the purposes of this study, assessment is defined as data-gathering strategies, analyses, and reporting processes that provide information that can be used to determine whether or not intended outcomes of the programme are being achieved, (Frair et. al nd).

Depending on the nature of the programme, assessment can be conducted at various phases and for varying reasons of the project/programme. Clarke (1999) states that it does not matter whether reference is made to the formal systematic examination of a planned social intervention, as undertaken by a professional evaluator, or the kind of informal subjective assessments people make in the course of their everyday lives, the activity involves judging the value, merit or worth of something.

"Program evaluation is the systematic collection of information about the activities, characteristics, and outcomes of programs for use by specific people to reduce uncertainties, improve effectiveness, and make decisions with regard to what those programs are doing and affecting", (Patton, 1986:14). Kellaghan and Stufflebeam (2003) argue that the evaluators usually observe the programme's activities, interview those who have some role or stake in the program, examine relevant documents so as to become acquainted with the issues. Taylor, Gibbon and Morris (1987) caution the formative evaluator to include a source of comparative information, a control group or data from time series measures in any information. They argue that this gathering effort makes the information more interpretable since some formative measurement happens in a vacuum making it difficult to judge programme progress.

The essential feature of the responsive evaluation approach is responsiveness to key issues or problems, especially those recognized by people at the site. It is not particularly responsive to program theory or stated goals but more stakeholder concerns. Its design usually develops slowly, with continuing adaptation of evaluators becoming well acquainted with the program and its contexts.

2.5   Understanding the learning models reviewed in this study
2.5.1 Nonaka's dynamic theory of learning
Nonaka's theory places the individual at the centre of knowledge creation. According to Nonaka (2004:171) "the prime mover in the process of organizational knowledge creation is the individual". Nonaka views knowledge creation as a spiraling process of

interactions between explicit and tacit knowledge which lead to the creation of new knowledge. An illustration of Nonaka's theory is presented in Figure 2.1 below:

Epistemology :- the theory of knowledge
Ontology :- the science that investigates the nature of pure being, its essential properties and
the relation one universal bears to another. (the socialization dimension)
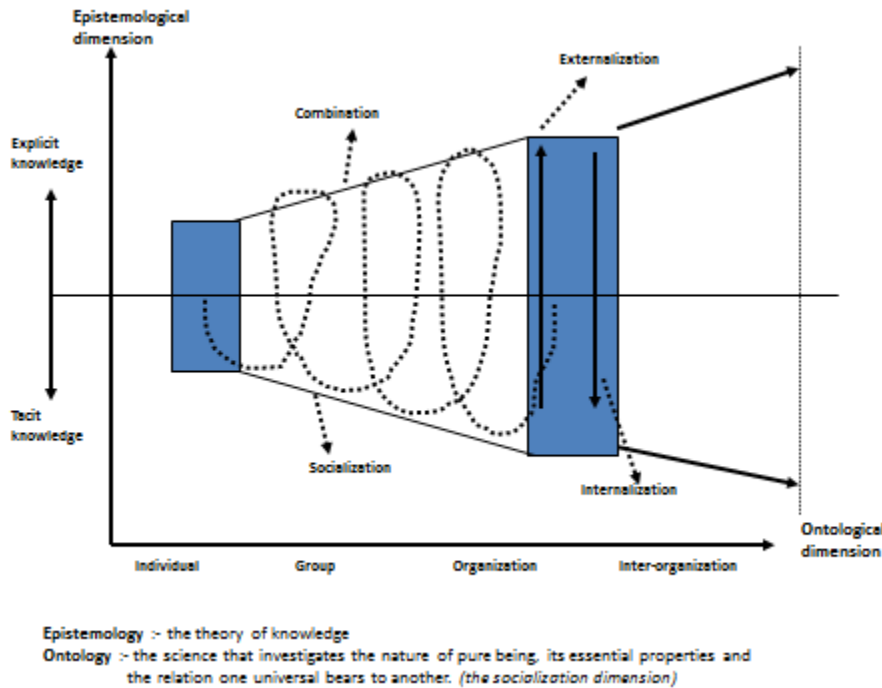
Figure 2.1: *Dynamic theory of organizational knowledge creation* (Nonaka 2004:173)

In this learning model, four integrated processes were identified by Nonaka. These were socialization, combination, internalization and externalization. Socialization includes the sharing of knowledge between individuals. According to Nonaka (2004) the acquisition of knowledge at this stage is not dependent on language but is through observation. Externalization on the other hand involves the expression and translation of tacit knowledge into forms of knowledge (verbal; print; diagrams) that is understandable by others. Of importance in this phase is that the individual becomes one with the group by committing to them. The combination phase involves the conversion of explicit knowledge into more complex sets of explicit knowledge. In this stage, the key issues are communication and diffusion processes and the systemization of knowledge. Here, new knowledge generated in the externalization stage transcends the ground in analogues or digital signals. The final phase in Nonaka's model is internalization where the explicit knowledge is converted into an organization's tacit knowledge. The benefit of this phase

is that an individual is afforded an opportunity to access knowledge that is available within groups and the organization allowing for better understanding of themselves and organizations they serve.

2.5.2 Scharmer's deeper levels of learning theory

This theory, also referred to as the U theory is achieved through the relationship between thought and action. Lewin cited by Starkey *et. al* (2004), emphasizes the cycle through which an individual is exposed to learning by acquiring experience, making observations and reflections, forming abstract concepts and then testing those ideas on new situations. The following diagram shows the relationship between thought and action and how they impact on the awareness levels:
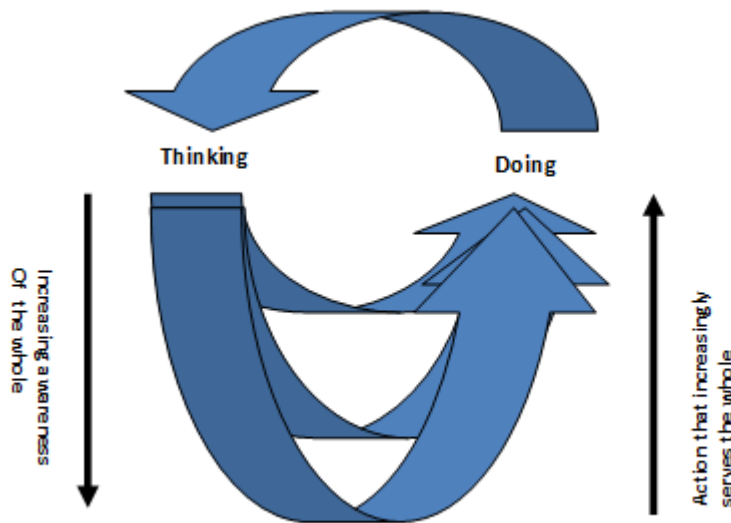
Figure 2.2: *Deeper levels of learning diagram (create increasing awareness of the larger whole)* (Senge, Scharmer, Jaworski, and Flowers 2005)

Hassan (2006) believes that people can gain insight into their most intractable problems by cultivating certain capacities and the right conditions through the U theory. The U process is based on the belief that people respond to challenges by deploying solutions they are most familiar with, an approach referred to as reacting, Scharmer (2007).

Scharmer (2007) discusses sensing, presencing and realizing as the three learning phases involved in the U theory. During the sensing phase, Scharmer (2007) indicates that an individual opens himself up, uncovers reality and sees the system he is part of. This phase allows the individual to gain better understanding for self (downloading) before engaging others through dialogue or debate. Throughout this process, the individual acquires a deeper sense of understanding which influences action to be taken.

In the presencing phase Hassan (2006) argues that the individual has to be aware of his current reality of the system as a whole. Senge (1990) views presencing as arriving at a deep knowledge and profound clarity to what the following course of action must be. Hjalmarson (2007) argues that this stage is marked by uncertainty and the choice between running back to what has been known and feeling secure or remaining with uncertainty. He (*ibid*) suggests that this phase is not to be rushed nor avoided but needs full engagement.

The last phase is the upward swing of the U and is referred to as realizing. At this stage, individuals need to be aware of the next action to take. Hjalmarson (2005) states that *Realizing* involves bringing something new into reality.

2.5.3 Mintzberg's theory of learning

Mintzberg (2004) challenges the way in which conventional lecturing is conducted. He argues that in his early learning life, the lecturers' aim was to get the learners to absorb a lot of information. Mintzberg, (2004) focuses on a new process of management education that he refers to as experienced reflection wherein managers bring their own experience to the learning process. Mintzberg's theory is applicable to the schools that visit Umgeni Water since it advocates learning by doing, reflecting and re-doing which are generic elements of learning which can be applied at all levels of education and not necessarily on conventional management education. Mintzberg focuses on other significant aspects that shape the learners' thinking ways such as lectures, cases, action learning, reflection and the application of learning. The components of the Mintzberg's model are shown in the following diagram:
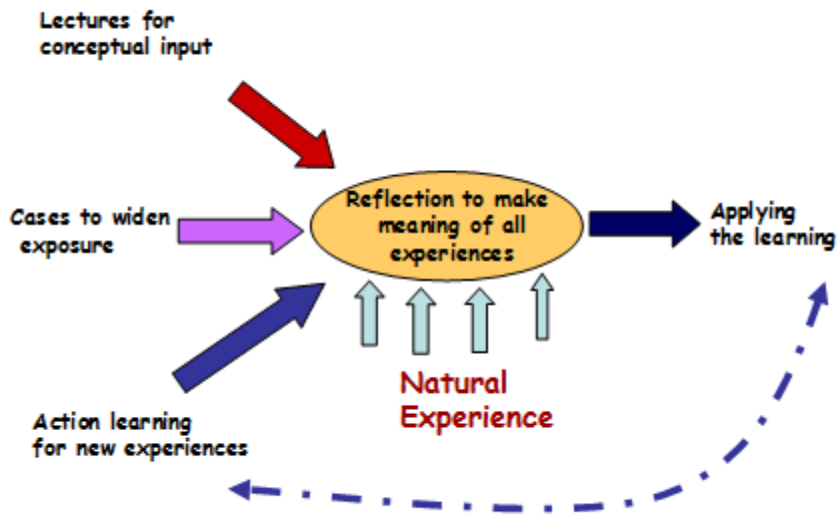
Figure 2.3: *Mintzberg's theoretical framework* (Mintzberg, 2004:267)

The first step in Mintzberg's theory is characterised by lectures for conceptual input. Lectures form the basis for theory imparted during the teaching process. Theory is important as it forms the basis for the learning process to take place. For any learning process there must be content that is relevant to the subject being taught. In the transmission learning perspective, the goal of the lecturer is to pass a specific body of knowledge or skill to the learners, (Pratt nd). Pratt (nd) argues that while in a developmental perspective the primary goal of education is to develop increasingly complex and sophisticated ways of reasoning and problem solving within a content area or field of practice. The role of theory in this perspective is thus looked at in terms of changing the way learners think rather than increasing their storage of knowledge.

The main goal of exposing learners to real life cases is to promote self-discovery and the ability to apply acquired knowledge in their daily lives. In support for OBE on learner centeredness, Loubser (2005) places emphasis on what the learner should be able to know, understand, do and become. Reflection is important in the learning process as it encourages learners to make sense of the absorbed theory to give meaning to the learnt concepts. While Nonaka (2004) acknowledges the role of hands-on experience as giving learners practical exposure; he cautions that it neglects the importance of reflection and

logical thinking. Price (2004) on the other hand argues for the reflective aspect of Mintzberg's theory since it views the learner as an explorer portraying learning as an individual endeavor albeit with the guidance of the teacher who acts as a mentor. In the action stage, learners are seen to be involved in action projects.

Tell me, and I will forget
Show me, and I may remember
Involve me, and I will understand.

Confucius, circa 450 BC

Sayers (2006) cites the above proverb to indicate the role of action learning. Action learning focuses on involving students in action-oriented activities. It is of importance to note that the U theory also encompasses the relationship between thought and actions. This theory focuses on the interaction between people and the world by monitoring how their level of awareness determines the action they will take. Wirth and Perkins (2008) state that the best learning occurs when students are engaged in active learning, when they are doing things, instead of sitting passively and listening. As the learner is engaged in the cycle of learning reflected by Mintzberg's theory, the knowledge acquired through the process is evident in the manner in which new information becomes part of the learning process thus showing the influence of the learner's natural experience.

2.6 Summary

Chapter 2 described the three theories under which this study is based; Nonaka's dynamic theory of learning (2004), Scharmer's deeper levels of learning theory (2005) and Mintzberg's theory of learning (2004). This chapter also discussed the roots of environmental education and its inclusion into the schools' curriculum. Chapter 3 will discuss the design of this research by specifically focusing on the Environmental Education Programme at Umgeni Water. The methodology on the identification of the teachers who were naturally using the components of the selected learning model will be discussed.

Chapter 3: Research methodology

3.1 Introduction

The aim of this chapter is to provide a detailed account of the research design and methods used to collect data. An interpretative research paradigm was adopted for this study since, according to Cohen *et.al* (2000); it prioritizes the respondents and their perspectives. McKenzie *et.al* (1997) state that the researcher's initial hunches, hypotheses and conjectures are gradually refined and reformulated as the fieldwork proceeds, and this acts progressively to focus analysis and reorganize data collection methods. The literature review and the author's many years of operational experience in this field served to fast track this process to the method as reported. This means that there is no report in this dissertation of early prototype methods that would usually be associated with the iterative and interpretive research paradigm.

3.2 Research methodology and design

A qualitative research methodology was used in this study since the 'traditional' qualitative research assumption that knowledge is subjective rather than being objective (Marshall and Rossman, 1999) was relevant for this research. Educators, as the main subjects in this research, are viewed by the researcher as working in 'natural environments' when interacting with the learners. Therefore, their responses will be viewed as the day-to-day experience that they encounter in the work life. The researcher used skills like probing, asking for clarity and allowing the participant to take full advantage of the open ended nature of questions to understand how educators are naturally using the components of the selected learning model within the context of their curriculum and teaching methods. The use of open-ended questions was crucial in this study as they allowed the respondents to express opinions without being influenced by the researcher (Foddy, 1993 cited in Reja *et.al*, 2003). Another advantage of using open-ended questions during interviews was enabling the researcher to explore the reasons for peoples' responses and verify the reliability of answers with further questioning, Keats (2000).

The study employed in depth semi-structured interviews with selected teachers who had made use of the EES programme. The questions used in the semi-structured interviews (Appendix A), considered the prior learning that the learners were bringing to the EES programme. This was a key question that would indicate how the educators prepared learners before their visit to Umgeni Water. A focus group was used to get the views of the teachers who had not made use of the EES programme. The responses of this group would provide a holistic view as to how teachers teach in their natural environments. This view would be irrespective of whether the teachers bring their learners to Umgeni Water or not, it is what they teach their learners that would determine their selection for the EEP. The focus group was guided by the discussion questions presented in Appendix B.

Purposive sampling was chosen based on the judgment of the researcher regarding the characteristics of a representative sample, Bless and Higson-Smith (1995). The advantage of using purposive sampling in case studies is that according to Stake (1995), it allows the researcher to use the best persons, places and occasions to understand the case.

3.3 Research methods

The following research methods were used in the study:

3.3.1   Literature review

3.3.2   Pilot study

3.3.3   Semi-structured interviews

3.3.4   Focus group

3.3.1 Literature review

Literature review was conducted to select the learning model which was most appropriate for this study. The three learning theories that were reviewed were Nonaka's dynamic theory of learning (2004), Scharmer's deeper levels of learning theory (2005) and Mintzberg's theory of learning (2004). Of these 3, one that was mostly relevant for this

study was chosen. The selected model was chosen based on its relevance and practicality of its application to the EEP.

3.3.2 Pilot study

The second research method used in this study was the pilot study. It was of advantage to conduct a pilot study since it enabled the researcher to refine data collection plans with respect to both the content of the data and the procedures to be followed (Yin 1984 *cited* by Schulze 1992). Two pilot studies were conducted using six educators from Pietermaritzburg schools that had visited Umgeni Water classrooms. The results of these pilot studies indicated that:

- some questions could not be understood by the respondents as they were too broad and muddled up, for example, reflecting on the experience they gained at Umgeni Water could have been interpreted differently by different teachers, there was no clear guideline to specify the type of response that was expected.
- there was ambiguity in some questions to an extent that they were interpreted differently by the respondents.
- the questions appeared too long and exceeded the time that had been stipulated in the consent form (45 minutes).
- there was no flow between questions : for example reflecting on their experience gained during their visits to Umgeni Water as well as the number of visits their schools had had in the past three years.

The responses obtained from the pre-tests were used to modify the interview question guide by firstly, shortening the questionnaire and focusing on the study objectives. The pilot study enabled the researcher to focus on the main aim of the semi structured interviews which was to understand what the teachers taught their learners before visiting Umgeni Water. Subsequent questions were mainly to elicit the topics that were taught and their relevance to the water treatment processes.

3.3.3 Semi-structured interviews:

Teachers from schools that had visited Umgeni Water treatment plants were used for the semi-structured interviews. Ten Primary schools that had brought their learners to the water classrooms every year for the past three years were chosen. These schools were all located in Pietermaritzburg.

3.3.4 Focus group

Ten Primary school teachers from the semi-rural area of kwaMpande, which is in the upper Sweetwater area in Pietermaritzburg, were used for the focus group interviews. These teachers had had no previous exposure to the EES programme. Appendix B was used as the focus group discussion guide for these teachers.

3.4 Data interpretation and analysis

Data was analyzed using the thematic coding technique. This technique involves the process of categorizing segments of qualitative data into meaningful themes. Tere (2006) highlights the advantage of using the thematic coding technique as that of being highly inductive since the themes emerging from the data and are not imposed upon by the researcher. This technique analyzed data that was collected from semi-structured interviews and the focus group. The themes that were identified from the data were:

- Theory used by the teachers to prepare learners for the visit to Umgeni Water.

- Using Umgeni Water as a case.

- How learners reflected on the new information gained from Umgeni Water.

- The role of the natural experience.

- Activities conducted by learners after visiting Umgeni Water.

- How teachers administer feedback to the learners after visiting Umgeni Water.

Table 3.1 shows how the interview questions link to the research objectives. The table only shows objective 2 which was to: *Assess which components of the selected*

learning model are being practiced naturally by the teachers. The responses of the teachers for this particular objective are tabled in Chapter 4 (Table 4.3).

Table 3.1: Link between the interview questions and the research objectives:

Research objective	Interview questions
Which of the components of the selected model are being used naturally by the teachers?	What do you teach your learners before visiting Umgeni Water?
	What do you teach your learners after visiting Umgeni Water?

The researcher had to achieve these following 3 research objectives independently of the semi-structured interviews and the focus group:

- Review three learning models and select one best suited to the Umgeni Water Schools Environmental Education Programme ;
- Assess Umgeni Water Schools Environmental Education Programme against the selected learning model;
- Develop the outline of a plan for the future of the Umgeni Water Schools Environmental Education Programme based on this learning model.

3.5 Summary

This chapter discussed the basic qualitative method which was used as research paradigm framing the study. A description of the research methods used in the study was given, highlighting the literature review, pilot study, semi-structured interviews and the focus group as the sources of data collection. Having explored the research methodology applied to this study, details of the findings and interpretation of the results will be

explained in Chapter 4. Emphasis will be placed on the findings of the study in terms of what the teachers teach their learners to prepare them for the visit to Umgeni Water.

Chapter 4: Presentation of results and findings

4.1 Introduction.

Chapter 4 presents the findings from the data that were collected in establishing how the selected teachers were using the components of the selected learning model, without the knowledge that they were teaching according to a learning model. Data gathered from these teachers were used to assume that the other teachers in their schools were also naturally teaching according to the selected learning model. The study sought to achieve the following objectives:

- Review three learning models and select one best suited to the Umgeni Water Schools Environmental Education Programme;
- Assess which of the components of the selected learning model are being practiced naturally by the teachers;
- Assess Umgeni Water Schools Environmental Education Programme against the selected learning model;
- Develop the outline of a plan for the future of the Umgeni Water Schools Environmental Education Programme based on this learning model.

To achieve the objective of reviewing three learning models and selecting one best suited to the EEP, data were firstly generated through literature that was reviewed for the three learning models. The results of this review are discussed in Section 4.2. The second phase of data collection involved semi-structured interviews that were conducted with primary school educators who had made use of the EEP. The results of the discussion of the semi-structured interviews are supplied in Section 4.4.1. The views of the educators from primary schools who had no exposure on the EEP were collected using a focus group technique and these have been discussed in Section 4.4.2. Both Sections 4.4.1 and 4.4.2 sought to achieve the objective of assessing the components of the selected learning model that were being naturally practiced by the selected teachers.

The results of the objective of assessing Umgeni Water's EEP against the selected learning model are discussed in Section 4.5. Finally, Section 4.6 addresses how the objective of developing the outline of a plan for the future of the Umgeni Water's EEP based on this learning model was achieved.

4.2 Review and understanding of the three learning models

In Chapter 2, it was explained that the EES seeks to become an interdisciplinary learning programme by involving learners from as early as pre-schools and continue through to formal and non-formal stages (Le Grange and Reddy 2007). The expansion of learning paradigms which encourage the use of a variety of learning environments such as play, on the job and the media were also discussed earlier in this dissertation. The role of the traditional learning theories which had a strong influence on the 3 models under review was also discussed.

In the following section, the 3 learning models have been compared to show how Mintzberg's learning theory was chosen as the relevant model for this study. The following table summarizes the findings:

Table 4.1: Comparison between Nonaka (2004), Scharmer (2005) and Mintzberg's (2004) learning model:

THEORY	PRESENTATION	FOCUS	APPLICATION TO EEP	RELEVANCE TO EEP
NONAKA (2004)	* complex * multiple concepts * mostly suitable for organizations * not easy to follow	*to show that knowledge creation is a spiraling process between explicit & tacit knowledge leading to the creation of new knowledge	* not suitable for primary schools * will be difficult to adapt to lessons	* learning elements do not stand out for easy integration into schools * not appropriate for the selected school level * can work if applied to the whole of Umgeni Water as an organization
SCHARMER (2005)	* simple and easy to understand	* emphasis on thought and action * show interaction between humans and the world * focuses on awareness of the larger whole	* suitable for adults * level of awareness determines action to be taken	* learners not yet able to think at the level required by this theory
MINTZBERG (2004)	* easy to see the link between components * user-friendly for teachers and the EES	* integration of the elements into the process * easy for a teacher to link the practical application into the curriculum	* can be related easily to schools through "school talk" * teachers can identify where they fit within the model * can be used as a model for key schools	* each component contributes to the whole learning process * entails the elements of learning that already exist within the EEP * allows for pre- and post-assessment that can be used to improve learning

4.2.1 Choosing Mintzberg's model for this study

The above table shows some of the crucial elements of the Mintzberg's model that are core to the EEP. This learning model can be adapted to all grades hence the EES's grade-specific programme which is informed by the needs of the school. Mintzberg's model is

user-friendly and easy to follow thus allowing teachers the opportunity to use it independently. Although the components of this model are interdependent, learning can occur at any stage of the process. The model allows teachers to determine how they conduct their lessons and identify the gaps. Teachers that are naturally conducting learning according to this model are ideal for the study hence their identification as the key teachers to work with in the "model schools". In the following section, each component is discussed in details.

4. 3 Understanding of the components of the Mintzberg's model

In this section, the study focuses on the following objective: Develop and understand the components of the selected learning model in the context of the Umgeni Water Schools Environmental Education Programme. In order to understand the components of the Mintzberg's model, semi-structured interviews were conducted with 10 teachers who had made use of the EEP to determine how they prepared learners for the visit to Umgeni Water and how they reinforce learning from the visits. A focus group was used to get the views of 10 teachers who had had no exposure to the EEP to find out how they conduct teaching despite not having any exposure to the EEP. Visiting Umgeni Water to learn through the EEP must be part of the learning process for teachers to reinforce learning and this part of learning must not be used as an isolated excursion that is not integrated into the teaching programme.

This section looks at each component of Mintzberg's model and how it relates to the EEP in conducting water education to schools. The thematic analysis technique was used to identify the main themes, which resulted from conducting the semi-structured interviews and the focus group. The identified themes related to the following categories:

- Process used by the teachers to prepare learners for the visit to Umgeni Water

- Using Umgeni Water as a case

- How learners reflected on the new information gained from Umgeni Water

- The role of the natural experience

- Activities conducted by learners after visiting Umgeni Water

- How teachers administer feedback to the learners after visiting Umgeni Water

The categories were grouped and arranged resulting in the emergence of the specific topics of discussion which would have been taught by the teachers before and after the visit to Umgeni Water. Such questions are highlighted in table 4.3 under the specific criteria heading.

4.3.1 Lectures for conceptual input

The growth of the use of Mintzberg's model depends on the amount of preparation by the teachers and work that they engage learners in, after visiting Umgeni Water. For lectures, the teachers have to provide groundwork before learners get exposure to the EEP. If learners are well prepared, then the model will work successfully since learners will be familiar with concepts used at Umgeni Water. The less prepared the learners are, the more it will show the level of commitment that the teachers have towards using the EEP as part of their learning programme. If learners are ill-prepared, then using Umgeni Water's programme will have no significance for their learning process. Learners will thus have difficulty relating the new information to what they already know.

4.3.2 Cases to widen exposure

The education programme at Umgeni Water has changed its focus from the conservation of water, (Umgeni Water, 2008) to a rather inclusive approach viewed by Ferreira (2003) as a means to bringing about political and social change in South Africa. Ferreira (2003) emphasizes the main emphasis of Environmental Education during the early days as that of conservation education and ecology instruction. She further cites Shongwe (1997) who highlights that the idea of such initiatives was just simplistic notions of attitude change through awareness creation so as to change behaviour. Ferreira's (2003) conclusion is that Environmental Education has been viewed as a means to bring about political and social change.

The use of a relevant 'case' of Umgeni Water has a potential of drawing the teachers' interest to the EEP. Using a real life situation where learners can see and relate the new experience to their own world widens the scope of learning. All teachers who were engaged through the semi-structured interview technique felt that the EEP expands the

scope of the learners' knowledge, especially the plant tours. They stated that the tours expose learners to the different types of water treatment.

4.3.3 Reflection to make meaning of all experiences

In recognition of the application of the learning elements from constructivism, learners are given opportunities to make meaning of the water treatment process. Learners that are well prepared would not have difficulty comprehending and reflecting on the information received at Umgeni Water. During their reflection, the teachers indicated that the learners would find it easy to relate what they had learnt in class with what is presented at Umgeni Water.

4.3.4 Application of learning

Learners are expected to apply the knowledge they have acquired from the visit to Umgeni Water. The learning process is driven by the teacher through the design of worksheets, tests and projects for the learners to reinforce learning. How well or badly the learners execute tasks handed to them by the teacher, after tours, will indicate their understanding of the water treatment processes at Umgeni Water.

4.3.5 The role of the natural experience

In order for the learners to enhance their natural experience, they would have to assimilate the new experience and establish linkages with their daily lives. These will deepen their understanding of the new concepts and the processes. As the learners get familiar with the water treatment processes, so will their natural experience increase and their level of understanding will deepen.

4.3.6 Action learning for new experiences

Lave (1996) states that if teachers teach to affect learning, the only way to discover whether the kind of effects they have, is by exploring the changes in participation of learners in various communities of practices. It was in this light that Mintzberg (2004), in his theory challenged the way in which conventional teaching is conducted. He argued against the way in which learners were made to absorb information, while not allowing

reflective time. Mintzberg's views on the role of the learner were that of exploring while the teacher offered a guidance role as the mentor.

The EEP believes in action learning projects that will expose learners to the real environmental issues and allow them to make their own discovery about the environment. It is also important for Umgeni Water to work with schools that are naturally applying the components of the Mintzberg's model. These schools are likely to continue working on the information gained from the EEP long after visiting Umgeni Water. The success of their action programmes is dependent on the key teachers that are willing to continuously engage learners in water-related activities. There was not much evidence of action learning for new experiences.

4. 4 Findings from the semi – structured interviews and the focus group

The diagram below was used to elicit responses to reflect how the teachers conducted their teaching prior to the visits to Umgeni Water and how they used the acquired information after the visits.
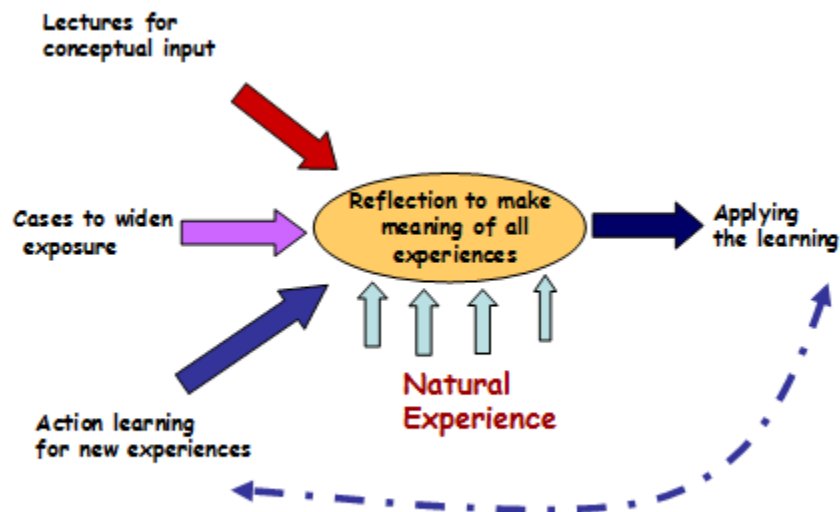
Figure 4.1: *Mintzberg's theoretical framework* (Mintzberg, 2004:267)

4.4.1 Semi-structured interviews:

Each teacher's responses are discussed in table form according to each component of the Mintzberg model. The master template presents a picture of an ideal school that would have engaged all the components of learning in line with what the EEP seeks to achieve through this study by using the Mintzberg model as a guide. The table shows the facts that were distilled from the long discussions in the semi-structured interviews. Each school is scored according to whether or not it achieved the learning outcomes as outlined in the master table.

The results from the semi-structured interviews indicated that the Midmar water classroom was the most visited water classroom as compared to the Darvill water classroom. Of the teachers interviewed, 8 out of 10 teachers indicated that they visited the Midmar water classroom because they found it more relevant to primary schools' curriculum.

Table 4.2: Master template for schools used in the semi-structured interviews

Theory	Learner preparedness:
	* Water issues discussed at school as part of the curriculum theme on water (forms and sources of water)
	* The natural water cycle is taught at school as part of the curriculum. Posters, diagrams and pictures are used for clarity
	*The differences between the treatment of drinking water and waste water are clarified
	*The impacts of water pollution are taught at school as part of the curriculum
	*Health and good hygiene practices are taught at school to illustrate and emphasize the effects of poor hygiene
	*Abstraction/purification/water supply/sanitation/return to stream taught at school

	Water conservation taught at school (recycling of used water, repairing leaking pipes, toilet cisterns and taps as well as reducing the quantity of water used for various purposes)
Case	*Learners visit Umgeni Water treatment sites to experience a. The water purification process - the plant infrastructure (chemical house, settlement tanks, sand filters, pipes, pumps, valves, process control room) - stages of the water purification process - unclean water coming in and clean water leaving the plant b. The waste water treatment process - the plant infrastructure (screens, settlement tanks, balancing tank, digesters, splitter box, chlorine room, lime silos, aerobic/anaerobic zones, maturation river) - stages of the waste water treatment process - dirty water coming in and clean water leaving the plant
Reflection	* Learners reflect on the new information in class. The reflection takes place in light of the theory they have learned before the visit * Learners make connection between what they were taught at school and what they have experienced at Umgeni Water
Natural experience	* Learners make connections between their own natural experience acquired from their school & home environments and new information learnt at Umgeni Water
Action	After visiting Umgeni Water, learners: * Complete worksheets * Write tests * Answer quizzes * Design and draw posters

	* Designing and make models of the water works	
Result of action	* Teachers' feedback on the tasks administered to the learners after visiting Umgeni Water * Teachers' feedback used as part of action learning CASE * Teachers weave the theory into the feedback to teach learners as THEORY to teach learners more about Umgeni Water treatment processes after the visit * Learners use feedback to learn from their action tasks they conducted at school	

Table 4.3: Responses from the 10 teachers (semi-structured interviews)

MINTZBERG'S ELEMENTS OF LEARNING	ASSESSMENT CRITERIA	SCHOOLS									
		A	B	C	D	E	F	G	H	I	J
THEORY (Learner preparedness)	Water issues discussed at school as part of curriculum theme on water (forms and sources)	√	√	√	√	√	√	√	√	√	√
	The natural water cycle is taught at school as part of the curriculum. Posters, diagrams and pictures are used for clarity	√	√	√	√	√	√	√	√	√	√
	The differences between the treatment of drinking water and waste water are clarified	√	○	○	○	○	○	○	○	√	○
	The impacts of water pollution are taught at school as part of the curriculum	√	√	√	√	√	√	√	○	√	√
	Health and good hygiene practices are taught at school to illustrate and emphasize the effects of poor hygiene	√	√	√	√	√	√	√	√	√	√
	Abstraction/purification/water supply/sanitation/return to stream taught at school	○	○	○	○	○	○	○	○	○	○

	Water conservation taught at school (recycling of used water, repairing leaking pipes, toilet cisterns and taps; reducing the quantity of water used for various purposes)	√	√	√	√	√	√	√	√	√	√
CASE (Learners visit Umgeni Water Treatment sites for experience)	The water purification process The plant infrastructure (chemical house, clarifiers, sand filters, pipes, pumps, valves, process control room) Stages of the water purification process Unclean water coming in and clean water leaving the plant	√	√	√	○	√	√	√	√	√	○
	The waste water treatment process The plant infrastructure (screens, settlement tanks, balancing tank, digestors, splitter box, chlorine room, lime silos, aerobic/anaerobic zones, maturation river) Stages of the waste water treatment process Dirty water coming in and clean water leaving the plant	○	○	○	√	○	○	○	○	○	√
REFLECTION (Learners reflect on the new information)	Reflection takes place in light of the theory that learners have learnt before the visit	√	√	√	√	√	√	√	√	√	√
	Learners make connection between what they were taught at school and what they have experienced at Umgeni Water	√	√	√	√	√	√	√	√	√	√
NATURAL EXPERIENCE	Learners make connections between their own natural experience acquired from their school and home environments and the new information learnt at Umgeni Water	√	√	○	√	√	√	√	√	√	√
ACTION (Activities done by learners after visiting Umgeni	Complete worksheets	√	√	√	√	○	○	○	√	√	○
	Write tests	√	√	○	○	○	√	○	○	○	○

Water)	Answer quizzes	√	○	√	√	○	○	○	○	○	○
	Design and draw posters	√	√	○	○	√	○	○	○	○	○
	Design and make models of the water works	√	○	○	○	○	○	○	○	○	○
RESULT OF ACTION (Teachers' administer feedback on the tasks to the learners after visiting Umgeni Water)	Teachers' feedback used as part of an action learning CASE	√	√	√	√	○	○	○	√	○	○
	Teachers weave the theory into the feedback to teach learners more about Umgeni Water treatment processes after the visit	√	√	√	√	√	○	○	√	○	○
	Learners use feedback to learn from their action tasks they conducted at school	√	√	√	√	√	√	○	√	√	○

Key: √ has been done   ○ has not been done

School A appears to have developed the integrated learning programme proposed by Le Roux (2000) and incorporated most of the elements of the Mintzberg's model into its teaching programme. Except for the explanation of the abstraction and purification process, the school managed to prepare learners well by giving them theory that was of relevance to the water treatment processes. Responding to how the school incorporates the elements of learning under the theme of water, an educator from school A had this to say:

"the theme on water encompasses everything about water and this is where we get to cover as much as possible ... we talk about the water cycle, water pollution, what they use water for and that they should save water by closing taps. By the time they visit you, they already know a little bit about water".

In this school, learners were prepared for the visit to Umgeni Water to learn about the purification of drinking water. After the visit, the teachers prepared activities (worksheets, tests and poster-drawing) that were related to what the learners had experienced at Umgeni Water. The teachers used feedback from the activities to teach the learners more about water treatment thus broadening the scope of their theory and using the feedback as part of an action learning case. This is a school that the EEP can work

with since they are readily applying the elements of the Mintzberg's theory without any persuasion from Umgeni Water.

Like school A, school B had prepared their learners for the visit to Umgeni Water. There was post learning at school where learners were given activities after visiting Umgeni Water. The teachers at this school used the feedback from the activities that were given to the learners to teach them more on water treatment. At school C, the teachers are aware of the learning expectations hence the preparation of the learners before the visit to Umgeni Water. The teachers also prepared worksheets and quizzes for learners to do after their visit to Umgeni Water. School D understands the link between learning at school and the elements of Mintzberg's theory. The teachers need guidance to get the most out of the EEP.

Enough information was given to learners in school E to prepare them for a visit at Umgeni Water and learners drew posters of the water treatment process after the visit. The teachers used the information as additional theory to teach their learners about the water treatment processes. Teachers in school F gave learners written tests to check for their understanding. Learners were given feedback on their tests and they used it as part of learning. School G did not conduct any follow up activities to ensure that the information acquired from Umgeni Water is understood and remembered by the learners. Teachers at this school need encouragement to apply all the elements of Mintzberg's theory. Learners from school H were prepared for the visit to Umgeni Water and also given activities after the visit. This is a good sign showing the willingness to learn from the teachers. The learners from school I completed worksheets after visiting Umgeni Water.

School J needs to be encouraged to utilize the information that they received from Umgeni Water. It is desirable that learners recognize the link between what is learnt at Umgeni Water and their classroom learning programmes.

4.4.2 Focus group

Reference is made to the Mintzberg's model (2004) in (Fig 2.3) for discussions held with the focus group.

The focus group comprised 10 teachers from schools in a semi-rural area of kwaMpande in the upper part of Sweetwater near Pietermaritzburg. Under normal circumstances, these schools would not form part of the schools that make use of the EEP programme since they are on the outskirts of the city and their teachers are not aware of the existence of the education programme at Umgeni Water. These schools had not brought their learners to Umgeni Water to learn about water treatment before. The researcher chose these schools since they form part of the 2015 that the EEP seeks to reach out to. The researcher assumes that these schools form about 50% of the schools to whom Umgeni Water needs to reach out. Having these schools as part of the research would give an indication of the wide spectrum of schools that the EEP seeks to engage Working with a few of these schools would post an indicator of the work that is being done by the EEP and enable these schools to become examples to be followed by other schools.

The discussions that emerged from the focus group revolved around learners in grades 5, 6 and 7. Eight out of ten teachers spoke freely thus allowing the discussion to be interactive between themselves and the researcher and also among themselves. The researcher did not raise the diagram at all but used it as a personal mental framework to guide the discussion and mentally map the comments onto the diagram. Almost all aspects of Mintzberg's model were discussed without the teachers knowing that they were addressing the learning model's components. The teachers' responses have been grouped according to Mintzberg's components of learning and they are discussed below.

4.4.2.1 Lectures for conceptual input

The teachers indicated that their learning programme addresses water issues during the theme on water which lasts for about a month. One of the teachers from the focus group commented:

" ...well, water forms part of our curriculum...in fact we talk about it in all learning areas. Most of our learners can say a lot about water because the water stuff gets covered during the theme on water".

The theme referred to by the teacher covers the following aspects:
- sources and uses of water
- water pollution
- the water cycle

There was general consensus on most issues discussed such as:
- environmental issues are addressed in most learning areas by each school
- teachers need more information and teaching resources on water
- visiting Umgeni Water treatment sites would allow the learners to see how water is treated

4.4.2.2 Cases to widen exposure

It is common for teachers in schools in kwaMpande area to encourage learners to keep buckets next to the classroom door for hand washing on the way into the classroom. Probing by the researcher showed the connection between sanitation and hand washing. This common practice of hand washing practice reveals the natural experience that the learners bring from home. Weinstein (1999) asserts that in order to learn, people need to question, to understand and to reflect not simply on their actions but also on their thoughts and feelings. These feelings have an influence on people's natural experience since they are responsible for how individuals react to situations.

4.4.2.3 Reflection to make meaning of all experiences

The combination of the EEP theory and the teachers' theory contributes to the reflection process which should make sense to the learner. The learner needs to make linkages between what s/he learns at school and what s/he knows from the home environment and

surroundings. The exposure received from the teacher allows the learner to reflect on the learning process and use the experience to take action.

4.4.2.4 Application of learning

The teachers from the focus group indicated that learners are given activities that are related to water. They draw posters, do worksheets, and write tests that are linked to what they have learnt about water. Unfortunately the teachers did not engage in follow ups within the EEP regarding feedback they received from pupils about the activities. The EEP seeks to bridge this gap between administering activities and using the feedback as part of the learning process. The Mintzberg model shows the linkage between the two.

4.4.2.5 Action learning for new experiences

Involvement in projects and more school-based activities would indicate that teachers and learners have assimilated water-related information and used it for new experiences. The EEP still needs to develop these schools to bring them up to a level where they can comfortably use the acquired knowledge to build up more cases and start action orientated projects.

4.5 EEP assessment against the Mintzberg model

Assessment of the education programme at Umgeni Water against Mintzberg's model was done through focusing on the objectives of the EEP. The aim of the study objective was to determine how the EEP compares to Mintzberg in terms of application of the components of learning. The following table gives a summary of the findings:

Table 4.4 : Checklist comparison between Mintzberg and the EEP

COMPONENTS OF THE MINTZBERG MODEL	CONDUCT LEARNING USING MINTZBERG	CONDUCT LEARNING USING THE EES PROGRAMME	IDENTIFIED GAPS WITHIN THE EEP
LECTURES	Lectures used for conceptual input.	Lectures conducted according to the learners' expectations. It is information given to learners for the purpose of understanding water treatment. 80% teacher. 20% Umgeni education officer.	The EES assumes that learners have been prepared by the school.
CASES	Cases used to widen exposure.	Umgeni Water used as an example to illustrate a real life situation 100% Umgeni education officer.	Umgeni Water treatment process is a good example to show relevance between school and real-life.
REFLECTION	Reflection to make meaning of all experiences.	Asking questions, group tasks. 5% Umgeni education officer. 95% learner.	Reflection is controlled by the learner.
NATURAL EXPERIENCE	The role of natural experience as a contributory factor to the learning process.	Learners bring their prior learning to the classroom which contributes to the learning process. 5% Umgeni education officer. 10% educator. 75% learner.	Natural experience enhances the learning process.
APPLICATION OF LEARNING	Application of learning to show understanding.	Learners are exposed to tours. 10% Umgeni education officer. 45% educator 45% learner	No evidence application of learning.
ACTION LEARNING (NEW EXPERIENCE)	Action learning used for new experiences.	No evidence of learner-engagement in projects.	No evidence to show how learning is used for new projects.

The purpose of this exercise was to check if there are common elements between the two and identify gaps that exist within the EEP and to see how the latter can seek to achieve the outcomes of Mintzberg. The objectives of the EEP as outlined in Chapter 1 are to:

a. raise public awareness on water related issues;

b. expose schools to water treatment processes through the water classroom;

c. develop education materials to be supplemented into the schools' curriculum.

a. Raise public awareness on water related issues

The aim of raising public awareness is for people to see the relationship between cause and effect. People need to see how their actions impact the environment. By raising public awareness, the goal of the EEP is to impact people's behaviour. The assumption is that once people are aware of the consequences of their actions they will modify their behaviour such that it does not cause harm to the environment. For example, cleaning up a stream lessens the effects of water pollution caused by illegal dumping. In Chapter 2, Harrison (2002), argued that communities will start living when potential for non-localized learning is evident through integration of life, work, education and play. This is what the EEP seeks to achieve through conducting education programmes that are relevant to people's lives. Again in Chapter 2, the behaviourists argued that the accumulation of skills and attitude was evidence that learning has taken place. Through the water classroom programme, the EEP seeks to instil learning that will be easily connected by learners to their daily lives and influence their attitudes on environmental issues.

The Mintzberg model seeks to impact learning through the application of learning. By continuously practicing and applying learning, it is hoped that learning will be reinforced through the daily routine practice. If learners are involved in projects or tasks, they are likely to remember since in Chapter 2, Confucius, circa 450 BC was quoted "involve me and I will understand". By allowing learners to be hands-on, the EEP is giving them an opportunity to remember and instil what will ultimately impact positively on their behaviour. Brock (2004), emphasizes that people learn best when they practice what they have done.

The Mintzberg model uses lectures for conceptual input where the focus is on giving information relevant to the issue. The EEP is similar to Mintzberg in that during lectures, information on water related issues is provided to the learners. This is provided in line with the needs of the group. The study has already discussed the impact of learner-preparedness in Section 4.3.1.

b. To expose schools to water treatment through the water classroom

This objective sought to use the water classroom as a living example of a treatment process to show the various stages of water treatment. At Umgeni Water, teachers bring their learners to the water treatment sites (Darvill and Midmar) to learn about water. The EEP had previously been monitoring the number of learners visiting the sites without looking at how the acquired learning is utilised after the visits. Ultimately, the EEP wants to work with schools that will apply learning and become key schools in conducting environmental education. The EEP proposes criteria as presented in Section 4.6 that will be used to identify these key teachers.

The checklist (Table 4.4) revealed that the EEP encompasses Mintzberg components of learning. Mintzberg proposes that cases be used to widen the scope of exposure. The EEP uses Umgeni Water as a case to expose learners to water treatment processes. This case is relevant and encompasses various stages of water treatment that are explained to the learners. Through reflection, Mintzberg believes that the learner makes his own meaning of learning that has been acquired. The EEP makes reflection a process that is controlled by the learner through allowing interpretation of the information in their own way. Of importance, is the role of the natural experience which the learner brings into the learning process. Section 4.3.1 revealed that well-prepared learners enhance the learning experience. They relate their acquired knowledge and natural experience to learning for which they deduce their own meaning.

The use of lectures, cases and reflection, as outlined in Mintzberg's model, is key since it forms the foundation for the application of learning to new experiences in which the

learners engage. The role of the teacher was crucial in the learning process since her own interpretation and understanding influences the type of activities to be prepared for learners. The findings revealed that the EEP does not have set requirements for schools to apply the learning. This is where the role of key teachers comes in, since they will be naturally doing these follow ups.

c. To develop education materials to be supplemented to the schools' curriculum

The EEP develops education materials on a continuous basis to address and respond to environmental challenges. These materials are aligned with the schools' curriculum. Mintzberg's (2004) model encompasses the use of education materials throughout the learning process. The following material is an example of education materials developed by the EEP :
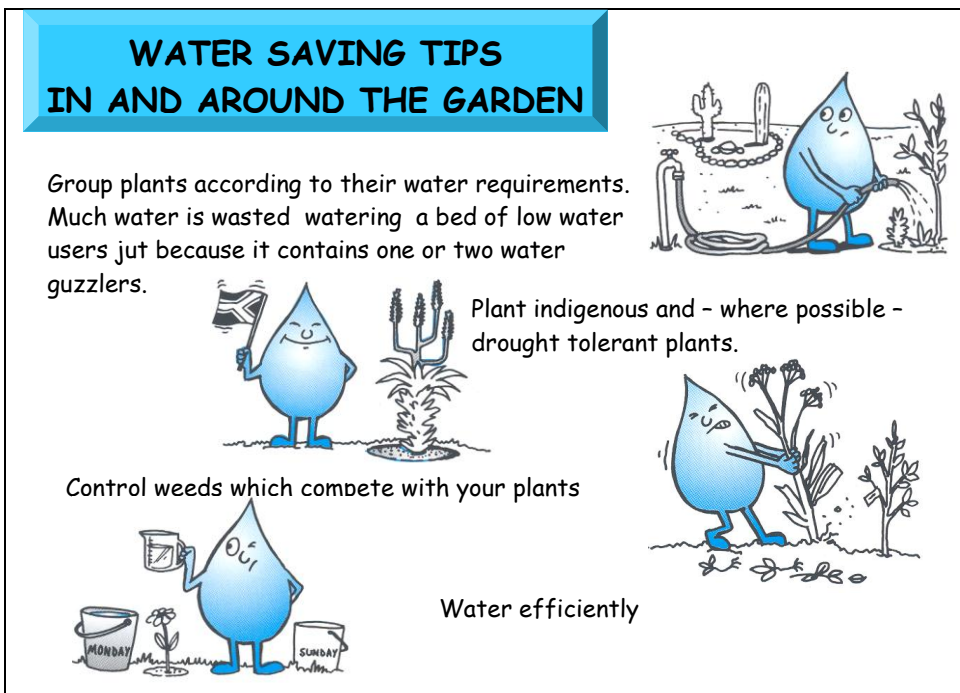

Fig 5.1 EEP resource materials used at Umgeni Water

4.6 Framework development for the EEP

The development of the EEP framework is in response to the last objective for this study which is to develop an outline of the plan for the future of the EEP.

O'Donoghue (2001) in Loubser, Schude and Le Roux (2008) proposes that learning frameworks must encourage action learning which support activities that engage risk and concern. The development of the EEP framework seeks to encourage teachers to take action on issues affecting their schools and the surrounding communities. The success of the EEP would be determined by the section's ability to identify key teachers to work with.

Proposed criteria for the identification of key teachers are as follows:
a) Teachers that are naturally involved in management of their school's environments. The findings revealed that in both semi-structured and focus group interviews; teachers do address environmental issues as part of the curriculum requirements. Such issues are water pollution, water conservation, invasive alien species, and health and hygiene.
b) Schools that are 'fertile ground' for planting the EEP seed. These are schools that have teachers that are willing to incorporate the EEP into their activities. Teachers in such schools would voluntarily request for a presentation by the EEP, a guest speaker for their environmental days or a guide to assist them in a water study or clean-up campaign.
c) Schools that are model schools which would be approached by other schools for information sharing. Once the teachers in these schools have been exposed to the EEP and integrated the programme to their schools' programme, they must be willing to assist others so as to spread the processes.

Chapter 2 revealed that programme evaluation is undertaken to improve effectiveness (Patton 1986) and to judge the value or merit of a programme (Clarke 1999). Programme evaluation in the EEP is used to improve the effectiveness of the schools' programmes by firstly determining how EEP is adding value and secondly, develop ways that will improve its effectiveness. For this purpose, the EEP seeks to develop a framework that will be used in future to assess its education programme. In this section, the role of the EEP in framework development is discussed.

4.7 Summary

In this chapter, the three learning theories that frame this study were examined. Data that were gathered from literature review, semi-structured interviews and focus group were analyzed and discussed. The views of teachers from schools that had made use of the EES programme were obtained through the semi-structured interviews and interpreted using tables A – J. Discussion of the views of teachers from schools that had no previous exposure to the EEP were obtained through the focus group and summarized in Section 4.4.2. Though the teachers were not aware of their use of the components of the Mintzberg's model, the findings revealed that almost half of them were applying those components in their learning process. A gap also existed between exposure to the EEP and the follow up with schools. Schools were found to be less engaged in projects that showed how the acquired information had been used. The following chapter discussed the recommendations which will pave the way forward for the EEP.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The main objective of this study was to develop an assessment framework for Umgeni Water's education programme. To achieve this main objective, four sub-objectives were identified and used to provide a broad overview of what the study entailed. In this chapter, the key findings based on the following study objectives, are used to draw conclusions on the EEP:

i)   Review three learning models and select one best suited for the EEP;

ii)   Assess which of the components of the selected learning model are being practiced naturally by the teachers;

iii) Assess Umgeni Water's Environmental Education Programme against the selected learning model;

iv)   Develop the outline of a plan for the future of Umgeni Water's Environmental Education Programme.

5.2 Review three learning models and select one best suited for the EEP

In reviewing the three learning models Nonaka (2004), Scharmer (2005) and Mintzberg (2004), the researcher sought to find an appropriate model to be used for the EEP in conducting their environmental education programme. The findings from the review revealed that while Scharmer's theory of learning placed emphasis on thought and action which the researcher was looking for, it did not encompass other learning aspects that the researcher had hoped to achieve. For example, the model did not indicate how using theory could influence the learning process. The researcher therefore felt that Scharmer's learning model was fairly complex to understand at the level of the teachers that the researcher is working with.

Nonaka's learning model on the other hand was also found to appear complex and presented multiple concepts which were mostly suitable for organizations. This learning model, (Figure 2.1) shows the cycle of knowledge creation from the level of an individual through to inter-organizational level. For the purpose of this study, the researcher was interested in seeing how individual learners apply knowledge by doing, reflecting and re-doing tasks that would indicate that learning has taken place. Nonaka's learning model was therefore not recommended for learners at the level at which the research was conducted.

To conclude this study the Mintzberg's model was chosen as the working learning model merely for its practicality and ease of application into the EEP. It was found to promote learning by doing, reflecting, re-doing and applying the lessons for further learning. In this model, feedback was seen to play a crucial part for the learner as it reinforced learning which the learner in turn used for further learning. By engaging in learning and doing, the learning cycle in Mintzberg's model seemed practical to repeat and allowed the learner to assess his progression within this framework. Therefore, this model appeared relevant for application at all learning levels, especially everyday matters such as water. The simplicity and the clear links to the teaching process that also involved case studies was another reason for selecting this model.

5.3 Develop an understanding of the components of the selected model in the context of Umgeni Water's Environmental Education Programme

Understanding the components of the Mintzberg model in the context of Umgeni Water means that the EEP is able to align their programme with these components. The findings under this sub-objective were concluded by using Figure 2.3 to clarify the components of the Mintzberg model as per the EEP. According to Mintzberg's model, the EEP fits into the *cases to widen exposure* component. Schools visit Umgeni Water treatment sites to learn about the water treatment processes. The learners must have been prepared prior to the visit to ensure that they understand the processes and make connection with their prior knowledge to make meaning from the visit.

Learning that takes place at school level, in preparation for the visit to Umgeni Water, fits into the *lectures for conceptual input* component as shown in Figure 2.3. Weinstein (1999) asserts that in order to learn, people need to question, to understand and to reflect not simply on their actions but also on their thoughts and feelings. He *(ibid)* suggests that the feelings have an influence on people's natural experience since they are responsible for how individuals react to situations. On the same note, Mintzberg (2004) challenged the way in which conventional teaching was conducted arguing against the way in which learners were made to absorb information while not being allowed reflective time. It is on this light that the *reflection* process in Mintzberg's model is independent of the EEP official. At this level learners are expected to derive meaning from the experiences gained at Umgeni Water. They must be able to do tasks (*applying the learning*) that are related to the new information that has been acquired from Umgeni Water.

Learners use their *natural experience* which they have gained from their school and home environment to reflect on the learning and influence the learning process. Feedback on the learners' activities that are performed after visiting Umgeni Water is used for further learning. Mintzberg's model emphasizes the learning process that individuals go through by doing, reflecting and re-doing. In a way, the learners' experiences that are gained during the various stages of the Mintzberg's model become new cases for use in the learning process.

5.4 Assess Umgeni Water's Environmental Education Programme against the selected learning model

In conducting its environmental education programme, Umgeni Water does not have a theoretical framework that informs their interventions with schools. For this reason, the EEP has been conducting its programmes in the absence of a strategy that would maximize learning by increasing the number of schools with which the organization works. The findings revealed that linkages between the EEP and the Mintzberg's model can be drawn by indicating the elements of learning that the EEP contributes to the model. At *CASE* level, the EEP provides the schools with relevant information which is

aimed at bringing their attention to water issues. Umgeni Water is used as a case for schools to learn about water treatment as has been explained in Section 5.3.

The findings also showed that there were schools that were naturally conducting their learning according to Mintzberg's model. These are the schools that the EEP needs to work with and 'sow the seed' since they are readily receptive of the proposed learning programme.

5.5 Develop the outline of a plan for the future of Umgeni Water's Environmental Education Programme

Having looked at the study sub-objectives and seen what has worked and not, the study proposes the following plan to be used by the EEP at Umgeni Water in the future:

i)   Umgeni Water's EEP   needs to identify schools to work with (the selection criteria for these has already been discussed according to Mintzberg's model)

ii)   Umgeni Water's EEP needs to work closely with these schools by offering them guidance and support (teacher training workshops, educational materials)

iii)   Selected schools to act as 'model schools' for other schools to learn from

iv)   Model schools to invite other schools and mentor them

v)   Once the new schools have been mentored, they need to invite their own schools and roll-out the process

vi)   More schools will be reached through this method of school identification.

The following example is used to show how the programme could potentially grow:

Table 5.1: Proposed plan for the organic exponential growth in the EEP

LEVEL	GROWTH IN NO. OF SCHOOLS	EXPLANATORY NOTES
I	5	the number of schools that have been identified by the EEP
II	25	each identified school invites 5 other

		schools
III	125	the invited schools invite their own 5 schools
IV	626	the new 5 schools invite their 5 schools

As can be seen in Table 5.1, each time the invitation level changes, the number of schools also grows. Through this example, the EEP might be able to reach its targeted number of 2 000 schools earlier than anticipated and the programme will thus grow from strength to strength.

5.6 Recommendations for practice

The following recommendations are made, based on the findings of the study and the conclusions drawn:

- The EEP needs to develop assessment standards for its programme. Currently schools that visit Umgeni Water leave without any requirements to show how they would apply learning.
- The EEP needs to adopt the proposed plan so as to see how it can grow the number of schools reached, whilst still utilizing the existing human resources.
- The EEP needs to work closely with teachers and contribute towards the component of *lectures for input* thus contributing to the theory with practical examples in which the organization has experience.
- Once the EEP has adopted and established the proposed plan, the level of engagement with teachers can be deepened and other theories such as Scharmer's learning theory can be incorporated into the programme to maximize the level of intervention.

5.7 Conclusion

The findings of this study have contributed towards the identification of the components of the EEP assessment framework. Soto (2004) views the incorporation of a framework into planning and management as raising the profile of monitoring progress and feedback and making management more responsive. The development of an assessment framework

for Umgeni Water would address challenges that have been faced by the EEP regarding the application by schools and contributes towards programme development.

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Appendix A: Interview Question Guide

1. How do you incorporate water issues into your teaching?

2. How do you teach the water natural water cycle?

3. Do you teach your learners on the differences between the purification of drinking water and the treatment of waste water?

4. What do you teach your learners on water pollution?

5. How do you address the issues of good and poor hygiene?

6. Do you teach your learners how water is abstracted/purified/returned to the stream?

7. How do you teach your learners about the stages of the water purification or waste water treatment processes?

8. What sort of activities do your learners engage in after visiting Umgeni Water?

9. How do you incorporate feedback into your teaching programme?

Appendix B: Focus group discussion guide

    a.   In which learning areas are you currently addressing water issues?

    b.   What do you feel is missing in your environmental lessons?

    c.   What issues do you address during you theme on water?

    d.   Do you do any practical activities with your learners during the above theme?

    e.   How do you address environmental issues at your school?

    f.   Which environmental projects has your school participated in, during the last 3 years?