CHAPTER 2

THE ROLE OF EDUCATION IN ADDRESSING ENVIRONMENTAL PROBLEMS

2.1. Environmental crises and concern

2.1.1. Introduction

We live in an epoch where an enormous amount of public interest is focused on the environment. It is fairly common to speak about “environmental crises” and there are many publications about what are not ephemeral issues. Government agencies are enforcing laws against violators of different kinds of environmental legislations. Organizations and concerned groups such as the Green Party have sprung up to deal with the problem at an international and national level, so that in South Africa, efforts to deal with the environmental crisis continue through the Department of Environmental Affairs and Tourism. The United Nations has an Environmental Secretariat, while globally, private organizations exist to protect, protest, conserve, publicise and agitate for the environment.

2.1.2. The nature and extent of environmental problems

Fundamental to this discussion is an understanding of what constitutes a problem. Broadly defined, a problem is perceived as “a discrepancy between reality and our expectations of what could be. In reality, man has always faced environmental problems. Traditionally, problems of living included finding adequate supplies of food, water, and shelter, the solution to which was to move to find new unexploited areas, and later to begin cultivation of plants and animals” (Jacoby, 1971: 35). According to this author, today, many people still try to escape from land degradation and pollution by ignoring the problems.

Greater insight into contemporary concern for the environment shows that in recent year’s concepts of reality and expectations have changed significantly. For instance,
some of the current efforts to cope with the “energy crisis” in Cape Town, South Africa, provide an illustration of the subtle, but serious consequences of changing expectations. The alleged sabotage surrounding the downfall of unit one at the Koeberg power station belies the problem. In an article entitled You Light up My Life, energy specialist, Jean Madzongwe (2006:15) posits that the time of reckoning will come in 2007/2008, driven by industrialization. South Africa will require more than double its generation of electrical power by 2010. The argument continues for more nuclear power stations, but this fails to deal with the basic issue of whether there is really a need for the extra energy. This kind of thinking also fails to take into account the perceptions from certain quarters that electrical-energy consuming machines might contribute to unemployment. Even assuming there is a need for more electrical energy, this researcher advocates the need to explore a range of alternatives for producing it, such as wind, tides, rivers and the sun. In addition, more research is needed on the subject of conservation.

Concepts of reality have changed considerably over the last decade, due to research, personal experiences and mass communication, which have impacted upon levels of understanding of the nature of environmental problems. Another factor that must be taken into account is the health of a society, highlighted by Maslow’s identification of a hierarchy, associated with their immediate importance for survival. Maslow’s hierarchy begins with the most basic and immediate needs, such as food and water, which must be satisfied for people to exist in harmony with themselves, with other people, as well as with their environment (Maslow, 1970). Once these basic needs have been satisfied, the human seek to satisfy psychological needs, which in order of immediacy are: safety, love and belongingness, self-esteem, and tendency to grumble about unfulfilled needs. By applying Maslow’s grumbles theory to a society, one can gauge levels of concern about the environment.

From Maslow’s hierarchy of needs, one can regard concerns for protection from threats to health by poisoned air, water, soil and food as basic, yet, paradoxically, a major component of environmental education is also the increasing population growth. Increasing population growth means increasing demands on natural resources from
the environment, such as food, fuel, space, building materials, and other resources. As the population increases, so do problems of urbanization. This leads to increasing demands for energy, water, waste disposal and sanitation, overcrowding, tension, crime and social problems. As Goliber (1989) points out, high population growth rates resulting in overpopulation have been singled out as one of the major factors that have greatly contributed to the declining economies and food problems in most African countries. A debate continues around the question: Just how far is the growing population to blame for the environmental problems that the world faces today? (Harris, 1990: 28-29). Glantz (1988: 203-213), in support of Goliber’s assertions, argues that population pressures have had both an ecological and socio-economic impact. Van Rooyen (2006:10) argues that while agriculture is a very important component of many of South Africa’s provinces’ economies, the pressure for greater food production for a growing population has led to agricultural practices that are unsustainable. Marginal lands that have been pressed into production are being quickly exhausted through soil erosion. An increased demand for wood for fuel and construction has encouraged deforestation, which in turn prompts further erosion and loss of soil fertility.

Van Rooyen (2006:12) argues that South Africa has one of the highest rates of urbanization in the world. A major problem in many provinces in South Africa is migration of rural populations to urban areas, resulting in a need for infrastructure development to meet basic needs. (Van Rooyen, op cit). The proliferation of informal settlements without basic infrastructure, such as sanitation facilities and refuse removal, impacts negatively on the environment. Lack of refuse removal leads to the establishment of an informal solid waste stream, which includes litter pollution and informal dump sites. Solid waste that remain uncollected in open spaces accumulates and causes environmental and health hazards. With rains, such waste might be swept away, and ends up clogging drainage systems, and so contributes to water pollution. Van Rooyen (2006:5) argues that the human species is the only one that produces toxic waste that is harmful to a large proportion of the biological environment, and which can lead to long-term negative build-up in the bio-physical environment.
According to Stapp (1970:25), environmental problems stem from an inability to develop a system of social values, life styles, and institutions, which enable people to live in harmony with the environment. He posits that education can achieve this and the goal of Environmental Education, therefore, should be to develop a citizenry that is knowledgeable about the intricate web of environmental problems, is aware of how to become effectively involved in working towards the development of a more livable future and is motivated to do so. Implicit in this goal is the assumption that education has a positive role to play in securing a safer use of the earth by producing a society that:

- will come to understand man's dependence upon the environment,
- will understand the impacts of individual and collective human behaviour upon the environment; and
- will give considered thought before individual or collective action which affects the environmental system.

(Stapp, op cit).

More recently, Van Rooyen (2006:13) has argued that even the most successful Environmental Education is doomed to fail unless it has an out-of-school (in other words: a community) support system. He further argues that to establish a population committed to living their daily lives in accordance with the principle of sustainability, the requisite social support system must be in place at all levels of society. This includes supportive policy and/or laws, regulations for sustainable use of biophysical resources, and related support services (2006:13). It is in this context that South Africa is faced with the challenge to respond to the rapidly growing concerns about environmental degradation and the need to promote sustainable living amongst different communities and learners.
2.2. Education as the response to environmental problems in South Africa

In the past decade, South Africa has seen the most radical social, political, economical and educational changes in its history. Amongst other things, the institution of a non-racial Government of National Unity (GNU) on 10 May 1994 has necessitated the total reconstruction of the traditional education system.

The new South African school curriculum, curriculum 2005, followed by the Revised National Curriculum Statement, and finally the “National Curriculum Statement (NCS), is a complex far-reaching initiative to fundamentally transform the South African education system. The aim of the new system is to create conditions with regard to education and training which are conducive to the transformation of society. However, South Africa, as yet another recently democratized, developing country, still has to grapple and deal effectively with typical world-wide environmental problems as diverse as overpopulation, pollution, degradation and deforestation.

O'Donoghue (1993: 28-38) describes South Africa as having unique and complex environmental problems as a result of both modernism and its delinquent cousin apartheid. Ramphele, 1991 (in Le Grange, 1999: 35) has described some of South Africa’s environmental problems as follows:

“Overcrowded townships, the air heavy with smoke: barren soils, scarred by ravines and of vegetation; people and land under threat from toxic waste dumps, polluted rivers and pesticides. South Africa is suffering from decades of environmental mismanagement, aggravated and institutionalised by apartheid which forced people to live and settle in area unable to sustain themselves”.

Similarly, Le Roux (2001), Gough (1997), Van Rooyen and Viljoen (1996) also identify environmental problems to be emanating from population growth, urbanization, industrial and agricultural development.
A growing consciousness of the effects of environmental problems is not necessarily a new phenomenon, early responses having being those of scientists concerned with the effects of pesticides; issues related to resources, and human population growth. In recent decades, several responses to environmental problems have emerged, including extensive media and academic coverage, Van Rooyen & Viljoen, 1996; Neluvhalani, 2000; Mosidi (1999), and a number of conferences:


1975: - Belgrade, Yugoslavia- The publishing of the Belgrade charter-policy with environmental aims and objectives.

1977: - Tblisi, USSR- eleven principles of Environmental Education programmes were drawn up and introduced as the Tblisi Declaration


1982: - Environmental Education in South Africa- Mooi river- Environmental Education Association of Southern Africa (EEASA) and promotion of Environmental Education.

1996:- Istanbul- Conference on Human settlements

2002:- South Africa- Johannesburg- The world summit on Sustainable Development.


But education has an important role to play in creating greater environmental awareness and, more importantly, “how education may contribute to improving the
condition of the environment” (Le Grange, 1999: 31). Fien, as cited in Le Roux (2001: 56) concurs with this view when he argues that education is “the world’s greatest resource in bringing about preparedness for changes in social systems toward sustainable living”.

2.2.1. Environmental Education: Process or product?

Until fairly recently, Environmental Education had been undermined by a narrow perspective of the key concept “environment”. According to Le Grange (1999:32), in many of the early education responses, the concept of “environment” was perceived to signify “nature”, or as in the discipline of ecology, its focus was on the biophysical surroundings. Although this narrow view is still dominant in some quarters, it has been challenged, (Van Rooyen, 20002; Janse van Rensburg, 1995; Erkins, 1992; O’Donoghue, 1995). O’Donoghue’s 1995 model indicates interactions between social, economic, political and biophysical environment. (See Figure 2.1 below):

![Figure 2.1: The “Environment”: (Developed by O’Donoghue, 1995).](Image)

The figure illustrates the complex interaction between the various environmental dimensions. It is therefore significant that Environmental Education as one of the
responses to environmental problems be planned around the socio-economic, socio-political and the biophysical aspects, as they dynamically interrelate with each other.

In an attempt to expound the social, economic and political issues in environmental problems, Van Rensburg and Lotz (1998:9) provide a broader view of environmental processes, as illustrated in figure 2.2 below:

![Figure 2.2: The socio–historical context of the environmental crisis, (Van Rensburg & Lotz, 1998:9)](image)

Figure 2.2: The socio–historical context of the environmental crisis, (Van Rensburg & Lotz, 1998:9)

While acknowledging the validity and usefulness of both O'Donoghue's (1995), Van Rensburg, and Lotz's (1998) models for the environment, this researcher finds the
Van Rooyen’s (2006) models for the environment to be more holistic and comprehensive in their representation of the interrelationships of the different dimensions of the concept ‘Environment’. While all the three models put the biophysical dimension of the environment at the center of all the other aspects, Van Rooyen’s model, as compared to the other two, becomes clearer by including a few more dimensions which are considered by Van Rooyen to be essential components of the environment (see Figure 2.3 below): Van Rooyen’s model of the ‘Environment’
The concept of “environment” as illustrated in Figure 3 above accords with the underlying principles of the Revised National Curriculum Statement (RNCS), which are social justice, a healthy environment, human rights and inclusivity (DOE, 2000). The principle of social justice serves to remind all humanity (government and civil society) that the needs of all individuals and societies should be met, within the constraints imposed by the biosphere, and that all should have equal opportunities for improving their living conditions. Van Rooyen (2006:15) further argues that there is need for governments where individuals, institutions and communities have certain rights and obligations to have regulatory measures to try to guarantee these rights, hence the need for a political-juridical dimension on the human-environmental relationship. People across the world, including the learners, should be empowered to exercise responsibility for their own lives and for life on earth.

Van Rooyen’s model stands alone and further accords that a better understanding of environmental problems must have reference to the social-, scientific-technological-, economic-and political values of the societies in which they occur, without having the anthropocentric view of the environment as this may totally lead to something that cannot be education for a sustainable environment (Van Rooyen, 2006:6). He argues that this understanding is key to changing human values for the better management of current environmental crisis (Van Rooyen, 2006:4).

Neluvhalani and Beeton (ibid) argue that, in the South African context, one can identify a number of social justice issues which can be attributed to the apartheid era and to socio-ecological injustice issues inherent within communities. The history of mining, for example, has led to many socio-ecological problems that the country is still dealing with. In the past, neighbouring communities had been relocated to make space for game parks and were denied involvement in the management of the game parks. This created resentment and poaching amongst communities. On the other hand, human rights and their infringement are grounded in the daily experiences of people within their local environments. Issues of this kind are inextricable parts of society. The right to life, for example, cannot be realized without basic rights to safe
water, air and land. (RNCS Training Manual: DOE, 2003). According to the Van Rooyen model, sustainable living therefore requires a political system that secures effective citizen participation in decision-making and in the maintenance of a social system that provides for solutions to the tensions arising from disharmonious social patterns (Van Rooyen, 2006:16).

In the RNCS documents, it is stated that the kind of learner envisaged is one who will be imbued with values and act in the interests of a society based on respect for democracy, equality, human dignity, life and social justice (DOE 2001). The fundamental curriculum principles of the NCS, which represent critical aspects of a young democracy, also remind one that the environment and environmental learning cannot just be limited to nature studies (Van Rooyen, 2006).

The arrows in Figure 3 above point in various directions, further indicating that the environment is interactive and interdependent. In the White Paper on Environmental Management Policy, the South African government defines the word environment as referring to conditions and influences in terms of which any individual or thing exists, lives and develops. These conditions include:

- The natural environment including renewable and non-renewable natural resources such as air, water, land and all forms of life;
- The social, political, cultural, economic, scientific-technological, personal and contextual factors that influence the natural environment;
- Natural and constructed spatial surroundings, including urban and rural landscapes.

In the light of the above, it becomes clear that culture, economic considerations, social systems, politics, scientific-technological, personal and contextual factors and the natural environment are not mutually exclusive, but rather interactive.
In order to unleash the full potential of Environmental Education in addressing environmental problems, therefore, it is important not to circumscribe environment within limited definitions, which tend to close it (Environmental Education) as a product, a thing, but to view it as process. Le Roux (2001: 57), drawing on O’Donoghue, is perhaps aware of the fluidity of the concept "environment" when he avers that:

“It is more appropriate to talk of environmental education process, rather than environmental education as a “thing”. The process’ addition draws attention to the multiple forms of environmental education, the evolving fluidity of the concept, and the open endedness of environmental education, aims and methods. Environmental education processes differ in different contexts, thus it is appropriate to talk of processes, which arise to take appropriate shape in differing situations”.

Indeed, education itself is a process not a product. It is within these contexts that Environmental Education in South Africa runs across the curriculum rather than as a special subject on its own. Van Rooyen’s model suggests this type of an education, an education with a theme to “demonstrate how a concern for environment can be articulated through an education that promotes sustainable living”, the one articulating improvement that can “lead to a rational and realistic utilization of the earth’s resources and a long-term approach to their restoration and protection” (Van Rooyen, 2006:33).

According to Le Roux (2001: 57), to attain education for sustainable living, teachers in all learning areas must be able to draw on “environment” (both the local and broader environmental issues) as a basis for their teaching. This accords with one of the stated aims of the Tbilisi conference: “to make environmental education interdisciplinary in an approach…encompassing all levels of education”. Indeed, a broader understanding of environmental problems can lead to a broader understanding of Environmental Education as a process.
2.3. Leveling the playing field: Imperatives for Environmental Education

The governance of the Environmental Management Policy in South Africa is manifested in legislation, which is based on schedule 4 and 5 of the 1996 Bill of Rights of the Constitution of the Republic of South Africa. On the basis of the Constitution, an effective institutional and legislative framework for the management of environmental policy in South Africa has evolved. This has facilitated the creation of an effective, adequately resourced and harmonized institutional framework and integrated legislative system. Article 24 of the constitution states that every South African has the right to:

- an environment that is not harmful to their health or well-being, and
- have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures
- prevent pollution and ecological degradation
- promote conservation
- secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.

This has clear implications for planning and effective Environmental Education in the education system. Thus, the White Paper on Education and Training (1995) states that Environmental Education should become a key element at all levels of education and training systems in South Africa. Chapter 24(20) of this document clearly states that:

“Environmental education, involving an interdisciplinary, integrated and active approach to learning, must be a vital element of all levels and programmes of the education and training system, in order to create environmentally literate and active citizens and ensure that all South Africans, present and future, enjoy a decent quality of life through the sustainable use of resources”.

To accomplish this, the then Minister of Education, Kader Asmal, established a National Environmental Education Programme (NEEP). NEEP was an interdepartmental project involving three partners, being the Department of Education, as the lead agent, the Department of Water Affairs and Forestry and the Department of Environmental Affairs and Tourism. This partnership was important for co-operative governance, and for highlighting multifaceted, integrated nature of environmental issues in communities. The aim of this project was to implement Environmental Education as formulated in the White Paper.

The Reconstruction and Development (RDP) document of 1994 (in Van Rensburg & Lotz, 1998: 7 and Van Rooyen, 1998: 101) also advocates a bias towards programmes that “rekindle our peoples’ love of the land, to increase environmental consciousness amongst our youth, to co-ordinate environmental education policy at all levels, and to empower communities to act on environmental issues, and to promote an environmental ethic”.

Analogously, Mosidi (1999: 23) argues that the goal of Environmental Education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitude, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones. This should be done by integrating Environmental Education processes into all facets of the curriculum. My argument here concurs with one presented at the Tbilisi conference (1977), which maintains that Environmental Education should be “interdisciplinary in its approach, drawing on specific content of each discipline in making possible a holistic and balanced perspective,” (cited in Mosidi, 1999: 22). Environmental Education should therefore not be implemented as separate subject or even Learning Area, but should form an integral part of all Learning Areas.

Concern for Environmental Education is also reflected in the National Environmental Management Act (1998), Article 2 of which propagates the idea that “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”.

The purpose of the South African government’s environmental policy is two fold:

- To inform the public of government’s objectives;
- To inform government’s agencies and state organs about their environmental objectives and what they must do to achieve these objectives.

(Republic of South Africa, Environmental Management Act (Act No. 107 of 1998)

From the 1995 White Paper on Education and Training emerged policies with broader implications on the restructuring of Education and Training systems. Le Grange (1999: 37) notes that “foremost among these were the establishment of a National Qualification Framework (NQF) and OBE curriculum”. The Education Ministry officially launched the new curriculum in March 1997 under the title Curriculum 2005. This curriculum replaces content-based education with outcomes-based education, and teacher-centred approaches with learner-centred approaches. It also replaces the 42 school subjects offered to learners in South African schools by 8 Learning Areas.

The combination of the old subjects points to a holistic approach. Le Grange (1999:37-38) points out that each Learning Area has curriculum-linked outcomes (specific outcomes) which learners should attain through activities. These learning activities should have a local and contextual focus, and teachers will have to play a much more prominent role in developing learning programmes. In addition, all programmes of learning are to be organised by cross-curricular themes, such as environment, entrepreneurship and personal development. Notwithstanding the recent streamlining of curriculum 2005, key policy documents emphasise an enabling environment, which aims, among other variables, at giving Environmental Education practical expression in and outside the classrooms.
In recognising the importance of Environmental Education in laying the basis for policy in education, the former Director General of Education, Thami Mseleku indicated that the National Curriculum Statement (NCS) would help develop citizens who are “sensitive to environmental issues and able to respond to the many challenges that confront South Africa in the 21st century” (Grey, 2004:2). The final revision of the Revised National Curriculum Statement into the National Curriculum Statement (RNC) process has meant that environment within the curriculum changed from being a phase organizer to being one of the underlying principles of the curriculum. Clearly, the South African government’s policies indicate a concern and support for Environmental Education.

2.3.1. A cross-curricular approach to Environmental Education

Elements and aspects of Environmental Education have for many years been included in the school programmes, especially in such subjects as Geography, Biology, Agriculture, Social Studies and History (Van Rooyen, 1996:17). However, environmental issues, risks and problems escalated, and this led to the demand for significant curricular attention. Curriculum 2005 softened the boundaries between subjects (Le Grange, 1999:37), and the integration of subjects into 8 Learning Areas may enable greater possibilities for addressing environmental issues. Le Roux (2001:285) notes that with environment as a phase organiser in the OBE system, environment can be incorporated into all Learning Areas (Curriculum 2005). Similarly, Van Rooyen (1996: 17) argues that the present school-based curriculum allows the infusion of Environmental Education into the learning programmes of various Learning Areas. In addition, environment as a phase organiser will not only direct educational activities and programmes towards addressing environmental concerns, but also may enable integration across Learning Areas, allowing much broader environmental perspectives (Le Grange, 1999: 39).

Because learner activities will be developed towards achieving outcomes rather than being developed from a rigid, prescriptive content, there is a flexible educational
space for introducing environmental concerns in the classroom. Since OBE is more learner-centred and activity based, it is important to design educational activities that have issues that are relevant to learners’ lives. Local environmental issues can be used as entry points for developing Environmental Education programmes. The school environment can thus be used to enable learners “to find their own local solutions”, Parry & Scott, 1997 (in Le Roux, 1999:289).

Neluvhalani (2000:25) argues that, in theory, both outcomes-based education and Environmental Education focus on relevance to the needs of society as well as relevance to learners’ current and future needs; both focus on holistic approach to curriculum development and emphasise the importance of integration and cross-curricular approach; both approaches are learner-centred and encourage active learning on the part of learners, by involving them in real and simulated actions. The importance of life-long learning is also emphasised. The implication for the above argument is that in order for the learning process to take full advantage of opportunities created by the inclusion of environment as a cross-curricular concern within all Learning Areas, learners will have to develop certain action” competencies, which have been identified by Van Rensburg and Lotz (1998:13) as follows:

- An understanding of social, economic, political and biophysical systems and their interactions;
- The nature and effects of environmental issues
- The nature of, and the need for sustainable resource use; as well as
- The capacity to address environmental problems and develop ways to move the society towards sustainability, thus ensuring the well being of its citizens and its place as a contributor to, and not recipient of the international economy.

(Cited in Neluvhalani, 2000:26)

Figure 2.4 (below) illustrates how an environmental orientation to learning may influence learning programme development and the attainment of specific outcomes across Learning Areas: (Adapted from the Discussion Document of the EECI, 1998:15)
An environmental orientation to education and training

Incorporation of environmental concerns in the specific outcomes of all eight areas of learning

Through learning programmes which make maximum use of the Environmental context of learning

Through approaches which may be:

- **Theme Based**
  - Highlighting
    - Possible Studies
    - Possible Methods
    - Possible Assessment Strategies

- **Issue Based**
  - Possible Studies
  - Possible Methods
  - Possible Assessment Strategies

- **Topic Based**
  - Possible Studies
  - Possible Methods
  - Possible Assessment Strategies

**ENVIRONMENTAL UNDERSTANDING AND ACTION COMPETENCIES**
(through attainment of the specific outcomes across learning areas)
The above figure indicates environmental orientation in all the eight Learning Areas. It is, however, for the purpose of this study important to indicate how this can be broken down into individual Learning Areas, where an outcome and thematic approach to learning programme development is used.

2.3.2 An Outcome and Thematic approach to Learning Programme development

In this approach, specific outcomes of an individual learning area are clustered through themes or contexts within the learning area (EECI Discussion Document, 1998:35). Natural Sciences, for example, has four prescribed themes, (Earth and Beyond, Life and living, Energy and change, and Matter and Materials) and these themes can be used in different ways, depending on the Learning Area perspective. The clustering of specific outcomes is done based on their weighting. The specific outcomes of the Natural Sciences, 1, 3 and 5, for an example, have more weight. They can be incorporated with segments of other learning areas outcomes, while the remaining specific outcomes 2, 4, 6, 7, 8 and 9, can be used to cut across, as they have just a generic focus, (EECI Discussion Document, 1998:36).[ See the list below]

SO1: Use process skills to investigate phenomena related to the Natural Sciences.
SO2: Demonstrate an understanding of concepts and principles, and acquired knowledge in the Natural Sciences.
SO3: Apply scientific knowledge and skills to problems in innovative ways.
SO4: Use knowledge and skills acquired in the Natural Sciences for the management and utilization of natural resources.
SO5: Use scientific knowledge and skills to support responsible decision making.
SO6: Demonstrating knowledge and understanding of the relationship between science and culture.
SO7: Demonstrate knowledge and understanding of the changing and contested nature of knowledge in the Natural Science.
SO8: Demonstrate knowledge and understanding of ethical issues, bias and inequalities related to the Natural Sciences.
SO9: Demonstrate an understanding of the interaction between the Natural Science
and socio-economic development.

Once the specific outcomes have been clustered, themes, with their common links, can be distributed into the matrix of outcomes, taking into account the perspectives within which they might be used. The clustering of outcomes will provide a good foundation for learning programmes skeleton in which learning activities, methods and performance criteria are determined for the specific outcomes (EECI Discussion Document, 1998: 41).

This study however develops a matrix, based on the above understanding, on which specific outcomes, their weighting, and themes are clustered. Natural Sciences specific outcomes have been used to summarise the matrix contained in the EECI Discussion Document (1998:37).
Table 2.1: The Matrix on the clustering of Natural Sciences Outcomes and Themes.

<table>
<thead>
<tr>
<th>SO2</th>
<th>SO2 + SO1 (Theme depending on the perspective)</th>
<th>SO2 + SO3 Theme, depending on the perspective</th>
<th>SO2 + SO3 Theme, depending on the perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO4</td>
<td>SO4 + SO1 (Theme for activities)</td>
<td>SO4 + SO3 (Theme for activities)</td>
<td>SO4 + SO5 (Theme for activities)</td>
</tr>
<tr>
<td>SO6</td>
<td>SO6 + SO1 (Theme for activities)</td>
<td>SO6 + SO3 (Theme for activities)</td>
<td>SO6 + SO5 (Theme for activities)</td>
</tr>
<tr>
<td>SO7</td>
<td>SO7 + SO1 (Theme for activities)</td>
<td>SO7 + SO3 (Theme for activities)</td>
<td>SO7 + SO5 (Theme for activities)</td>
</tr>
<tr>
<td>SO8</td>
<td>SO8 + SO1 (Theme for activities)</td>
<td>SO8 + SO3 (Theme for activities)</td>
<td>SO8 + SO5 (Theme for activities)</td>
</tr>
<tr>
<td>SO9</td>
<td>SO9 + SO1 (Theme for activities)</td>
<td>SO9 + SO3 (Theme for activities)</td>
<td>SO9 + SO5 (Theme for activities)</td>
</tr>
</tbody>
</table>

2.4. Approaches to Environmental Education

Multiple orientations and perspectives have over time shaped curriculum theory for Environmental Education. Fien (1993) identifies three approaches that helped shape Environmental Education as, Neoclassical/vocational approach, Liberal progressive approach, and socially critical theory, (cited in Le Grange, 1999: 38). These approaches will be summarised in a table form indicating how they have impacted on the formulation of Environmental Education curriculum:
### Table 2.2: Approaches to environmental education (Cited by Fien, 1993 in Le Grange, 1999: 38)

<table>
<thead>
<tr>
<th></th>
<th>Education about</th>
<th>Education in</th>
<th>Education for</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aims</strong></td>
<td>Vocational</td>
<td>Liberal/progressive</td>
<td>Socially critical</td>
</tr>
<tr>
<td><strong>View of knowledge</strong></td>
<td>Pre existing, commodity developed by experts</td>
<td>Sensory awareness through contact with surroundings</td>
<td>Emergent from enquiry into issues, contextual</td>
</tr>
<tr>
<td><strong>Role of teachers</strong></td>
<td>Dispenser of knowledge, authority figure</td>
<td>Providers of experiences</td>
<td>Co-investigator and knowing adult</td>
</tr>
<tr>
<td><strong>Role of learners</strong></td>
<td>Passive receivers</td>
<td>Active learners</td>
<td>Active learners/investigators</td>
</tr>
<tr>
<td><strong>Role/nature of text</strong></td>
<td>Source of authority</td>
<td>Provides guidelines and often related to fieldwork</td>
<td>Text emerges from the enquiry research</td>
</tr>
</tbody>
</table>

### 2.5. Conclusion

The foregoing Chapter has attempted to facilitate insight into the nature of environmental problems as well as trying to give meaning to the complex and dynamic concept environment while also providing valuable information on how the various dimensions of the environment interact. This study shall then investigate whether outcomes-based education does provide opportunities for teachers to develop learning programmes with activities addressing environmental concerns. Le Grange (1999:45) argues that it is up to academics and educators to see the opportunities and support Environmental Education in the OBE learning programmes at all levels of the education system.