

https://dspace.org/

Indigenous knowledge in the National Curriculum statement - from policy to practice for environmental education

Naidoo, Nirvashnee

2008-03-06T10:01:50Z
http://hdl.handle.net/10539/4559

Downloaded from a DSpace repository. https://dspace.org/

INDIGENOUS KNOWLEDGE IN THE NATIONAL CURRICULUM STATEMENT- FROM POLICY TO PRACTICE FOR ENVIRONMENTAL EDUCATION

Nirvashnee Naidoo

A dissertation submitted to the Faculty of Science, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Science.

Johannesburg, 2007

CONTENTS **PAGE**

DECLARATION vi

ACKNOWLEDGEMENTS vii

ABSTRACT viii

CHAPTER ONE – ORIENTATIVE INTRODUCTION

1.1 Introduction 1

1.2 Problem Statement 3

1.3 Aim 3

1.4 Research Questions 3

CHAPTER TWO – LITERATURE REVIEW

2.1 Introduction 5

2.2 Defining Indigenous Knowledge Systems 6

2.3 Indigenous Knowledge Systems and Environmental Management 9

2.4 Modern Western Science and Indigenous Knowledge 14

2.5 The Policy Environment 17

2.5.1 Education Reform 17

2.5.2 Environmental Education 22

2.5.3 Outcomes-Based Education and Environmental Education 29

2.6 Conclusion 30

CHAPTER THREE – RESEARCH METHODOLOGY

3.1	Introduction	32
3.2	Data Collection	32
	3.2.1 Secondary Data	32
	3.2.2 Primary Data: Semi-Structured Qualitative Interviews	33
	3.2.2.1 Strengths of Qualitative Interviews	34
	3.2.2.2 Criticisms of Qualitative Interviews	35
3.3	Purposive Sampling and Interviewee Selection	35
3.4	Recording Information	37
3.5	Data Analysis	38
3.6	Brief Respondent Profile	39
3.7	Conclusion	40

CHAPTER FOUR – RESULTS AND DISCUSSION:

4.1	Introduction	41
4.2	Definition of Indigenous Knowledge Systems	41
4.3	The Relationship between Indigenous Knowledge Systems and Environmental Matters	47
4.4	Impact of Apartheid and Colonialism on Indigenous Knowledge Systems	51
4.5	Curriculum Transformation	56
	4.5.1 Curriculum, Teaching and Learning in Post Apartheid South Africa	56
	4.5.2 Prior/Contextual/Experiential Learning and Culture	61
4.6	Conclusion	66

CHAPTER FIVE – RESULTS AND DISCUSSION: IMPLEMENTATION

5.1	Introduction		68
5.2	Challenges to the Effective Implementation of Principle 8		68
	5.2.1	Decontextualisation and Categorisation of Knowledge	68
	5.2.2	Teacher Challenges	69
	5.2.3	Attitudes, Mindsets and the Legacy of Apartheid and Colonialism	74
	5.2.4	Policy and Implementation Shortcomings	79
	5.2.5	Lack of Resources and Support	83
	5.2.6	Politics	84
	5.2.7	Monitoring and Evaluation	85
5.3	Opportunities		86
	5.3.1	Dignity, Self Reliance, Empowerment and Innovation	86
	5.3.2	Changing Attitudes and Perceptions	88
	5.3.3	Environmental Education	89
	5.3.4	Research and Opportunities for Resource Materials	91
5.4	Conclusion		92

CHAPTER SIX – CONCLUSION, RECOMMENDATIONS AND FURTHER WORK

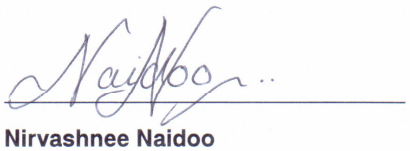
6.1	Conclusion	96
6.2	Recommendations	98
6.3	Further Work	103

7 **REFERENCES** 104

8 **APPENDICES** 114

DECLARATION

I declare that this thesis is my own, unaided work. It is being submitted in partial fulfilment of the Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.



Nirvashnee Naidoo

14 March 2007

ACKNOWLEDGEMENTS

I would like to extend my sincerest gratitude to the following individuals for their role in this research project:

- Mr Kerry Pile for his initial guidance in this project.
- Professor Ann Cameron for her insight, advice and encouragement.
- Professor Charles Mather for his very effective role as my replacement supervisor in the final stages of my project.
- Mr Lebs Mphahlele for his invaluable assistance and advice when sourcing interviewees for this study.
- To all the interviewees. Without your time and contributions this study would not have come to fruition.

To my mum and dad, thank you for paving the way for my accomplishments. All my accomplishments are truly yours.

Finally, to my lovely husband, Ash - as always, your patience, guidance, encouragement and unwavering belief has carried me through another major milestone. Thank you!

ABSTRACT

Within the National Curriculum Statement, Principle 8 refers to the value of indigenous knowledge systems. This represents the move towards a culturally appropriate curriculum as part of South Africa's post-Apartheid changes to the education system, in line with the Constitution. Neither environmental education nor indigenous knowledge exist as independent learning areas within the National Curriculum Statement. However, given that indigenous knowledge systems has been included as a principle underpinning the entire National Curriculum Statement, this study examined its potential in contributing to environmental education and the development of environmentally responsible citizens.

What has emerged is a plethora of challenges associated with policy translation, South Africa's colonial legacy, teacher training and the dearth of resource materials, among others, that are effectively coalescing to militate against the effective implementation of Principle 8. Consequently, not only is the country faced with the continued devaluing and loss of indigenous knowledge systems but also with missed opportunities for its enrichment of environmental education and environmental management.

CHAPTER ONE

ORIENTATIVE INTRODUCTION

1.1 INTRODUCTION

The mobilisation of environmental education in the school curriculum provides the ideal opportunity for encouraging environmentally responsible behaviour at a young age. Environmental education is, by its very nature, cross-curricular and imparts knowledge and understanding, skills, and certain values and behaviour. These factors can contribute to creating the necessary awareness of environmental matters as well as developing responsible citizens for the preservation and sound management of the natural environment (Degenaar, 1988).

Environmental education, by its cross-curricular nature, is open to the inputs of different forms of knowledge. Indigenous knowledge systems (IKS), for example, provide a rich source of information on our natural environment and how to use our natural resources sustainably. This claim is based primarily on experiences and observation at the local, community level. Principle 9 of the Treaty on Environmental Education for Sustainable Societies and Global Responsibility, adopted by the NGO Forum at the Earth Summit states that environmental education values different forms of knowledge and that knowledge is diverse, cumulative and socially produced and should not be patented or monopolised (ICAE, 1992). Appropriately, proponents of indigenous knowledge systems, who now also include some members of the western scientific system, argue and/or recognise that knowledge production is not the preserve of the dominant western scientific culture, but instead is the cumulative product of experiences and observations of different cultures.

There is now a growing body of research and policy that highlights the importance of integrating indigenous knowledge into the curriculum. The rationale is that it offers an additional way of processing information and making sense of the world (Shuter and Shooter, 2005). In the South African context, evidence of this can be found in the National Curriculum Statement, the Revised National Curriculum Statement, and the Indigenous Knowledge Systems Policy. In addition, the White Paper on Arts, Culture and Heritage views education as part of culture and acknowledges that culture itself is transmitted through education (Department of Science and Technology, 2005).

Indigenous knowledge interfaces with other forms of knowledge. This is evident where it is used together with modern biotechnology in the pharmaceutical industry and other sectors to increase the rate of innovation (Department of Science and Technology, 2005). In light of this, its integration into the curriculum may enable learners to recognise and learn from groups which lie outside dominant western scientific culture and who have made important contributions to fields such as agriculture, medicine and environmental management.

Based on the above, it is posited that mobilising indigenous knowledge for environmental learning may be an important means of developing environmentally responsible citizens who will be able to translate their awareness of environmental issues into actions that will contribute to the conservation of the natural environment.

1.2 PROBLEM STATEMENT

The National Curriculum Statement (NCS) represents a policy statement for learning and teaching within the Further Education and Training Band (FET) (Grades 10-12). The NCS will commence implementation in Grade 10 in 2006, Grade 11 in 2007 and Grade 12 in 2008. It is based on nine principles. Of these, Principle 8 refers to "valuing indigenous knowledge systems" (Department of Education, 2003:9). The absence of clear policy guidelines or appropriate systems and methodologies for the implementation of Principle 8 has the potential for missed opportunities in relation its contribution to environmental education.

1.3 AIM

This research project aims to contribute to an understanding of the issues surrounding the conceptualisation and implementation of Principle 8 of the National Curriculum Statement, with a specific focus on the link between indigenous knowledge systems and environmental education.

1.4 RESEARCH QUESTIONS

1.4.1 How do selected key role-players understand the rationale underpinning the integration of Principle 8 into the National Curriculum Statement?

1.4.2 How do they see indigenous knowledge systems contributing to environmental education?

1.4.3 Was an implementation plan envisaged/developed during the conceptualisation stage?

1.4.3.1 Who would decide/advise on what indigenous knowledge should be taught?

1.4.3.2 How would educators be assisted with the implementation of Principle 8?

1.4.3.3 How will monitoring and evaluation be done and by whom?

1.4.4 What are the challenges and opportunities related to the effective implementation of Principle 8?

1.5 REPORT STRUCTURE

This research report is structured into 6 chapters. The chapters are structured as follows:

- Chapter one – Orientative introduction; introduction to the study, background to the problem, the aim of the research and the core research questions.
- Chapter two – A discussion on indigenous knowledge, modern western science, environmental education and the policy environment, with specific emphasis on the South African school curriculum.
- Chapter three – The research methodology: qualitative research using semi-structured interviews.
- Chapter four – Main research findings and discussion thereof.
- Chapter five – Main findings of the research, related to implementation issues, and discussion thereof.
- Chapter six – Conclusion and recommendations emerging out of the study as well as options for further work.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Whilst several definitions of indigenous knowledge may exist, the majority emphasise that it uses the information, advice and wisdom of communities that have evolved over centuries of living in and interacting with the environment. It is a tacit type of knowledge that is mainly passed on from one generation to another via oral traditions. In recent years, indigenous knowledge has been receiving increasing attention, among other reasons, for its contribution to the products and processes of modern western science; and, because of the failure of many western science-based development efforts to achieve the objectives of sustainable development.

A limitation of most definitions of indigenous knowledge is that they tend to convey an over-romanticised notion of it. Not all indigenous ways of living have proven to be sustainable. It is therefore important to bear in mind that indigenous knowledge may not be a panacea to all our environmental problems as it too is characterised by certain limitations, much like many processes of modern western science. It does however have an important role to play as a way of knowing and understanding the world. Accordingly, a mix of IKS and modern western science may prove to be the answer.

Most formal education systems have been dominated by western scientific approaches to teaching and learning. Unlike modern western science that is characterised by written documents, rules, regulations and technological

infrastructure; indigenous knowledge has been relatively undocumented. It has thus largely been relegated to the status of informal knowledge, with the result that education systems have failed to acknowledge its contribution as a way of understanding the world and the human experience thereof.

This chapter discusses indigenous knowledge systems, modern western science, environmental education and the policy environment, with specific emphasis on the South African school curriculum.

2.2 DEFINING INDIGENOUS KNOWLEDGE SYSTEMS

There is a plethora of terms currently being used to describe the vast body of knowledge and expertise that is held by indigenous people. These include indigenous knowledge systems, traditional knowledge, ethnoscience, local science, traditional science, indigenous science, people's science, ecological wisdom and so forth.

Most definitions of indigenous knowledge emphasise its importance as a source of environmental information. For example, Mazur's (1996:151) definition refers to "community knowledge systems, communication methods, and associations that serve as a basis for agriculture (broadly defined to include knowledge of plants, trees, soils, insects, pests, diseases, etc.), irrigation, animal husbandry, aquaculture, food preparation and storage, engineering, ecology, environmental management (involving both conservation and improvement), education, communication, health care, social support and welfare networks, finance, marketing, labour mobilisation, and a wide range of other livelihood sustaining activities". This emphasis stems from the belief that indigenous knowledge usually emanates from communities who, through their long and close connection with their natural

environment, have cultivated an intimate understanding of it. Together with their close connection with the natural environment, their knowledge is derived from decades, even centuries, of time-proven observations and experimentation that are passed on from generation to generation through a variety of oral traditions. The description of indigenous knowledge by Snively and Corsiglia (1997) supports this by explaining that through time-authenticated experimentation and problem-solving many indigenous communities have used their knowledge to successfully sustain their lifestyles as well as conserve the natural resources upon which they depend.

Schnierer (2002) also highlights that through observation, assessment and experimentation, indigenous people have managed to successfully adapt their modes of production to the particular characteristics and limits of biological resources. This know-how includes information on breeding methods, agricultural systems, harvesting methods and routines, fishing and hunting techniques and the medicinal properties of various plants, among others.

The shortcoming with most of the definitions is that they do not factor in the effects of modernisation. For many local communities dealing with issues that are mainly underpinned by poverty, the possibility of escape from it (poverty) using modern methods may prove more compelling than using IKS. This would result in them placing more emphasis on competing for limited resources such as food, space and shelter in a manner other than their indigenous practices that in the past may have contributed to sustainable environmental management. It is also important to acknowledge that most of the modern world has been subjected to tremendous change that has resulted in circumstances starkly different to those which existed in times during which many of the indigenous practices were developed. This fact

stresses the importance of innovation within indigenous knowledge systems in order for them to respond to the changing needs of communities living in these rapidly changing environments.

Innovation has not been overlooked in the definitions of indigenous knowledge. For example, Fernandez (1994) explains that indigenous knowledge has been constantly generated and transformed through systematic processes of observation, experimentation, problem solving, and the re-adaptation of previously identified solutions to respond to changes in environmental, socio-economic and technological situations. Grenier's (1998) definition supports this by affirming that indigenous knowledge systems are complex and dynamic, allowing new knowledge to be continuously added to it via generations of experience, careful observations and trial and error experimentation.

A common feature of the definitions highlighted above and several others like them is that they tend to convey an overly romanticised notion of indigenous communities living in a Utopian fashion, in complete harmony with their environment. As Dickson (2002) points out, this is something of a caricature, as not all traditional ways of life have proven sustainable. He cites the large tracts of forest in North Africa that have been grazed to destruction as testimony to the fact that, as with the processes of modern western science, not all processes of indigenous knowledge are necessarily sustainable.

This position is further supported by Langill (2004) who indicates that indigenous knowledge systems are sometimes accepted uncritically as a result of naïve notions that whatever indigenous people do is naturally in harmony with the environment. He states that there is historical and current-day evidence that indigenous communities have also committed

environmental injustices through over-grazing, over-hunting or over-cultivation of the land. Furthermore, issues surrounding large-scale urban migration and the consequent depopulation of rural areas raise questions regarding the practicality of perceptions that the application of indigenous knowledge necessarily confers better lifestyles to its practitioners/custodians.

In summary, whilst varying definitions of indigenous knowledge may exist, most, if not all, highlight that it uses the information, advice and wisdom of communities that have evolved over centuries of living in and interacting with the environment. It is commended as a valuable source of environmental knowledge that allows communities to realise and apply their knowledge to maintain and protect their way of life. It is a tacit type of knowledge that is mainly passed on from one generation to another via oral traditions. The knowledge is embedded in the experiences of the indigenous communities and relates to intangible factors, including their beliefs, values and perspectives (Rahman, 2000). Finally, it is important to bear in mind that IKS is not a panacea to all our environmental problems as it too has its limitations, much like the processes of modern western science. It does, however, have a place as a way of knowing that can contribute to environmental management.

2.3 INDIGENOUS KNOWLEDGE SYSTEMS AND ENVIRONMENTAL MANAGEMENT

Throughout the history of humankind, a good understanding of the natural environment has been essential for survival. Through their close interactions with the natural environment, local communities have gained an enormous amount of knowledge about it. This knowledge involved not only available environmental resources within the locality but also how to manage these resources sustainably in order to maintain their quality of life and ensure their

survival (Ulluwishewa *et al*, 1997). Samuels (2003) points out that since time immemorial, people have built stores of knowledge and have developed IKS to help solve problems they encountered in their many interactions with the natural environment. She explains that the evolution of systems to manage the environment sustainably and strategies to cope with fluctuating environments are common occurrences in communities whose livelihoods depended on the resources in their immediate locality.

According to du Toit (2005:56), indigenous knowledge is "directly related to the local communities' interaction with their environment, and the knowledge, stories, beliefs, rites and rituals developed in interaction with that environment over a long period of time and passed on from one generation to another". IMERCSA (2005:1) stipulates that indigenous knowledge systems include a "system of organisation, a set of empirical observations about the local environment, and a system of self-management that governs resource use". The interdependence and close interaction with the natural environment has not only created the diversity of cultures we see today but also the diversity within biological systems commonly referred to as biodiversity. It is no small coincidence that the majority of the world's remaining biodiversity hotspots are found within indigenous territories (Schnierer, 2002).

Even though many people believe that nature conservation is not an indigenous concept, many of its basic principles exist in indigenous knowledge systems. For example, plants required for medicinal purposes are often harvested in a manner that does not permanently damage the plant, thereby ensuring a continued supply (Toms, 2005). Toms' explanation is eloquently supported by Dr Keto Mshigeni from the University of Namibia who stated that "long before Herodotus concluded that Egypt's cultural origins lay in continental Africa; long before the historical Jesus took refuge in Egypt;

and long before Dr Livingstone penetrated into the heart of Africa, propagating the gospel of the three C's: Christianity, Commerce and Civilisation, the indigenous people of the continent had accumulated a large body of knowledge on the rich array of biological and other resources found in their various ecosystems. There is plenty of evidence that abundantly substantiates this view: thanks to the many ancient rock paintings we still have today, which, over the years, stood the acid test of time" (Department of Science and Technology, 2004:68).

In some instances, indigenous knowledge systems have tended to be associated with notions of being static, outdated, conservative or backward especially by western scientifically-based thinking. Terms such as objective, rigorous, control and testing have aided in entrenching perceptions that western science is value-free and is autonomous from the societies within which it is rooted (Fernandez, 1994). Notwithstanding these perceptions, indigenous knowledge has grown rapidly in popularity especially in fields such as medicine, environmental management and biotechnology: "considered for a long time as primitive and outdated, such expertise is in fact highly relevant for the ongoing national and international initiatives aimed at protecting biodiversity. Indigenous communities' way-of-life proved to be respectful of nature and their wisdom and knowledge offer interesting alternatives to the solutions proposed by modern science" (Schnierer, 2002:15).

Evidence of the elevated role of indigenous knowledge systems in environmental management and conservation is provided by the Convention on Biological Diversity wherein it is acknowledged in the preamble and various articles that indigenous knowledge has an important role to play in the conservation and sustainable use of biodiversity (Schnierer, 2002). With respect to medicine, the South African Minister of Science and Technology

(Mosibudi Mangena) highlighted in his speech at the June 2004 SADC Workshop on Indigenous Knowledge Systems that the signing of the Hoodia plant benefit sharing agreement between the Council of Scientific and Industrial Research and the San community in the Kalahari was a benchmark case depicting the potential of indigenous knowledge in providing valuable leads for the development of useful medicinal products and processes (Department of Science and Technology, 2004).

Over the last few decades, growing recognition of the significance of IKS has been attributed in certain instances to the failure of many development efforts to achieve the desired result of sustainable development. Development efforts that ignore local circumstances, knowledge and technologies have been criticised as being flawed and wasteful of significant time and resources. In addition, many industrial and agricultural processes that have emanated through modern science have been criticised by some proponents of indigenous knowledge for contributing to unsustainable patterns of growth. Unlike modern technologies, indigenous techniques are supported by researchers, among others, as tried and tested; effective, inexpensive, locally available, and culturally appropriate; and in many cases premised on preserving and building on the patterns and processes of nature (Grenier, 1998).

Therefore, although not as recognised as western scientific knowledge, it is now widely being acknowledged that indigenous knowledge systems have a role to play in contributing to the body of knowledge on natural resource management. For example, the Convention on Biological Diversity and some aspects of Agenda 21 recognise that local communities possess inner knowledge of their environments and consequently this knowledge is recognised for its value to environmental management. Agenda 21 also

addresses formal and non-formal education that aims at an understanding of environmental quality, sustainability and social equity (Rampedi, 2001). The World Conservation Union views indigenous knowledge as important for biological and ecological insights and environmental management (IMERCSA, 2005).

Du Toit (2005) explains that like other environments, the African environment is not static but changing and dynamic and as the environment changes, so do the beliefs, convictions, style of living and knowledge systems associated therewith: “the transition from one environment to another is, however, gradual, and the accumulated knowledge systems maintain much of their former worth and meaning in a new context” (du Toit, 2005:56). Given the dramatic changes that humankind has managed to inflict on the environment, the conservation challenges may be overtaking the ability of indigenous knowledge systems to cope with the increasing demands. This issue throws into stark reality the need for indigenous paradigms to be “foregrounded, local innovation encouraged and renewed pride in local answers to vexing problems promoted” (Payle, 2002:2). Grenier (1998) submits that although indigenous knowledge systems have a certain amount of flexibility in adapting to ecological change, when the change is particularly rapid or drastic, the knowledge associated with them may be rendered unsuitable and possibly damaging in the altered conditions. Furthermore, their site-specificity limits their transmission and possible applicability to other sites. Indigenous knowledge systems can thus become easily degraded and language specifications can increase the difficulties associated with understanding, particularly by outsiders (IMERCSA, 2005).

2.4 MODERN WESTERN SCIENCE AND INDIGENOUS KNOWLEDGE

Western science has developed a significant body of documented evidence from which new and refined ways of doing things are constantly developed. By contrast, indigenous knowledge is exchanged and transferred orally and the knowledge is local and context specific unlike the western scientific quest for universalism. Also, very little of the vast body of indigenous knowledge that exists worldwide has been subjected to testing using western scientific methods which has led to its questionable status within conventional western education (Rhea, 2002).

According to Snively and Corsiglia (1997), IKS interprets how the world works from a particular cultural perspective hence the knowledge systems of indigenous communities differs considerably from community to community depending on the locale. A fundamental principle underlying IKS is that the subject matter be examined and interpreted contextually. For example, the identification and examination of a particular plant and its fruits, is almost incidental to stories and demonstrations that relate to its use as a food source, ceremonial uses, the complex preparation process, the traditional accounts of its use in purification rituals and so forth. This principle is in distinct contrast to western science where environmental influences are considered confounding and where work that is 'more serious' is undertaken in the laboratory. Indigenous knowledge systems tend to be more holistic, acknowledging the interconnectedness of natural systems including human beings and is thus strongly values-based (Snively and Corsiglia, 1997). This '*in-vivo*' versus '*in-vitro*' approach is a fundamental difference between the two knowledge systems.

The '*in-vitro*' approach, which is simulated and more controlled, lends itself to greater mobility. By contrast, indigenous knowledge tends to be characterised by less mobility and a slower pace. The reason is that indigenous people spend many generations learning about life in one place under 'real', natural conditions ('*in vivo*'). Therefore, experimentation and innovation may occur at a more measured pace than in western science (Snively and Corsiglia, 1997).

Stephens (2000:11) indicates that there are commonalities between indigenous knowledge systems and western scientific systems. These include factors such as "honesty, inquisitiveness, perseverance, open-mindedness, empirical observations in natural settings, pattern recognition, verification through repetition, inference and prediction". Although implicit, complex scientific principles have been applied within indigenous knowledge systems (Rahman, 2000). For example, some researchers such as Dickson (2002) point out that indigenous knowledge has even played a role in the development of modern science, citing Linneaus' use of folk taxonomies in the development of biological classification systems. In addition, many scientists are beginning to work more closely with indigenous communities for purposes of medical, agricultural and environmental benefits to nations worldwide. This all highlights the growing recognition of the value of indigenous knowledge systems as a means of understanding the world and the human experience in it.

Rahman (2000:5) states that, "both knowledge systems are in a constant state of evolution, and both systems have also been developed for their own 'universe' and are thus characterised by areas of greater or lesser expertise". Indigenous knowledge systems originated relatively independently of (and not in competition with) western science. Despite their differences, or maybe because of their differences, indigenous knowledge and western science

should be seen as two systems of knowledge that can complement, rather than compete with each other (Science and Development Network, 2004).

As mentioned earlier, awareness of the importance of indigenous knowledge has grown because development planning over the last few decades has failed to meet the requirements of sustainable development. Unsustainable patterns of growth related to human habitation, industrial processes and agricultural techniques have led to environmental degradation. By contrast, the less acclaimed indigenous knowledge systems are associated with some lifestyles that have survived successfully and relatively unchanged for decades, if not centuries, and have thus proved themselves sustainable (Dickson, 2002). However, whilst it is true that not all products of western science have proven unsustainable the same applies to some of the products of IKS. Nevertheless, there is a growing reality that IKS is an existing form of valuable knowledge that can complement scientific knowledge. This combination can provide decision-makers with more complete information on natural systems (Schnierer, 2002).

With respect to the schooling system, science teaching in Africa has generally been conducted with little or no reference to IKS. Toms (2005) explains that this would produce learners who do not have a frame of reference to apply to concepts they learn, nor relate these to their own experiences and circumstances. For example, when teaching complex life cycles in biology, indigenous insects such as the iconic *Mashonza* (Tshivenda) commonly known as the Mopane Worm (*Imbrasia belina*), are not used despite this insect forming the basis of a multi-million Rand industry. The problem, he explains, is that many of the science and biology teachers, in the area where it is endemic, do not themselves understand its lifecycle. Without an understanding of the lifecycle of the Mopane Worm, it is impossible to

develop a scientifically based system of sustainable utilisation of this resource which is of cultural and economic value. He emphasises that knowledge of the lifecycle of the Mopane Worm *does* exist in the form of indigenous knowledge. It is possible and important to utilise IKS to contribute to among other things, a better understanding of concepts of complex lifecycles and sustainable utilisation of natural resources.

In conclusion, Minister Mangena of the South African Department of Science and Technology holds the view that the knowledge of individuals and the collective knowledge of communities are the only real competitive advantages that any country can rely upon (Department of Science and Technology, 2004). He explains that the challenge is to bring about synergy in our actions in terms of indigenous and western knowledge and other knowledge systems, so that knowledge generation and its utilisation benefits all segments of society, without causing disparities or lopsided development.

2.5 THE POLICY ENVIRONMENT

2.5.1 Education Reform

Globally, policy makers are starting to acknowledge the importance of using national education systems to serve as the building blocks in fostering positive attitudes about human rights, equitable resource management and development, and the preservation of the Earth's biodiversity (Rhea, 2002). In addition, since the 1960s educationists have used Howard Gardner's theory of multi-intelligence to recognise that we all learn in different ways and there are thus many ways of processing information so that one may make sense of the world. Western methodologies that emphasised logic and objectivity were no longer hailed as the only means of knowing and other knowledge

systems rapidly started to gain more recognition (Department of Education, 2003).

During apartheid, South African education policies were characterised by an exclusivist approach which not only saw education policies being skewed along racial lines, but also in terms of which knowledge systems were deemed superior and thus worthy of consumption. Indigenous knowledge systems, which in the South African educational context refer to a body of knowledge embedded in African philosophical thinking and social practices that have evolved over many centuries, were not included as part of the curriculum (Department of Education, 2003). Instead, colonial educational systems replaced the practical everyday life aspects of indigenous knowledge and ways of learning with Western notions of abstract knowledge and academic ways of learning (Stephens, 2000).

Christian National Education (CNE) was the ideology responsible for the transmission of Eurocentric values and culture to all in the schooling system and its assimilation was given great importance (Venter, 2006). This ideology was entrenched by the Afrikaans-speaking White South Africans who dominated the country politically. The values and cultural norms which were Christian National in nature were enforced through State policy. The perception underpinning the CNE ideology was that objective knowledge and education could only be found in a Eurocentric context. Therefore, “western culture and values dominated without acknowledging and considering the African origin of the vast majority of people. The western, capitalistic, individualistic view of life is often in direct opposition to the more group orientated outlook of the African cultures” (Venter, 2006:3). As Venter explains, the type of knowledge dictated by the CNE ideology resided outside the immediate context of especially the Black learner.

Samuels (2003) states that the result of the de-legitimisation of indigenous knowledge was that learners were detached from their daily lives. Those having different perspectives to the Western one, had to find ways of accommodating and making sense of both worldviews (the traditional and the Western one) to provide the skills to function in traditional societies and to master the abstract body of Western knowledge. She summarises her argument by stating that “a political and not an educational choice decided what was knowledge and what was not knowledge” (2003:96).

Changes to South Africa’s education system began immediately after its first democratic elections in 1994. The Constitution of the Republic of South Africa provided the basis for the curriculum reform in the country. The development of a new curriculum for South Africa to address the dual purpose of education i.e. to overcome the past inequalities and to prepare for competitiveness in the global market, required a major paradigm shift from the mere provision of education for all (Samuels, 2003). As Samuels writes, “memorising facts becomes secondary to the ability to locate, synthesise and analyse emerging and new sources of information. Rote memorisation becomes secondary to the application of skills of literacy and numeracy, creativity, conceptual and lateral thinking and critical engagement” (2003:44). She explains that life skills became the central aspect in the new curriculum framework with the purpose of seeking to change the pedagogy of the apartheid era education and training system.

Curriculum 2005 was released in 1997 after an extensive process of public participation that involved both national and international role players. Incremental implementation of the policy began in 1998 in Grade 1, followed by Grade 2 in 1999, Grades 3 and 7 in 2000, Grades 4 and 8 in 2001, and Grades 5 and 9 in 2002. It was envisaged that by 2005, the policy would be

fully implemented in all Grades from R to 12 (Department of Education, 2001a). An intensive programme of teacher education and classroom support accompanied the release of C2005, involving national and provincial education departments, non-governmental organisations (NGOs), television and newspapers, higher education institutions and private publishers. Unfortunately, there were many problems experienced during the implementation of C2005, such as the lack of educator experience regarding the envisaged curriculum, as well as the manner in which the policy was interpreted by educators, trainers, education department officials, trainers and writers of learning materials. Consequently, in February 2000, the Minister of Education, Dr Kader Asmal, called for a review of C2005. After a thorough review of existing research papers and reports, interviews with teachers, principals, managers, trainers, publishers and departmental officials as well as public submissions made by a number of individuals, organisations and institutions, the Review Committee recommended that C2005 needed streamlining and strengthening before it could be implemented in the Further Education and Training (FET) band i.e. Grades 10-12. C2005 was refined, and the streamlined and strengthened version was released in 2001 under the title of Revised National Curriculum Statement. This revised document responded to the learning and teaching requirements of the General Education and Training (GET) band only, as C2005 had already commenced implementation in this band. In 2003, the National Curriculum Statement, which represented the policy statement for what was to be taught and learnt in Grades 10-12, was released. This policy was also to be incrementally implemented, commencing in 2006 for Grade 10, 2007 for Grade 11 and 2008 for Grade 12 learners.

In terms of indigenous knowledge, the transition from C2005 to the National Curriculum Statement witnessed a distinct growth in acknowledgement of its importance within the education system. Within C2005, indigenous

knowledge systems were provided a very subtle and nuanced acknowledgement, primarily because of the major political changes that were taking place during the inception of the policy. However, the RNCS made clear references to indigenous knowledge systems, but not as a blanket principle. For example, within the Natural Sciences Learning Area, indigenous knowledge systems are encapsulated within Learning Outcome 3 namely, Science, Society and the Environment. A Learning Outcome is "derived from the critical and developmental outcomes. It is a description of what (knowledge, skills and values) learners should know, demonstrate and be able to do at the end of the General Education and Training Band" (Department of Education, 2004:7).

Within the National Curriculum Statement, indigenous knowledge systems are given the greatest acknowledgement, as it comprises one of the nine principles upon which the policy is based, namely, "Valuing Indigenous Knowledge Systems" (Department of Education, 2003:09). This infusion of indigenous knowledge into the 29 Subject Statements of the NCS is recognition of the rich history and heritage of South Africa as important contributors to nurturing the values articulated in the Constitution. The Learning Programme Guidelines developed by the Department of Education aim to assist teachers and schools in planning for the introduction of the National Curriculum Statement. These guidelines help teachers to plan for sequenced learning, teaching and assessment in the FET band so that all the Learning Outcomes may be achieved in a progressive manner (Department of Education, 2005).

2.5.2 Environmental Education

Environmental education has a key role to play in enabling people to improve environmental practices in all walks of life and to make sustainable life-style choices. This is especially true for a country such as South Africa that is still recovering from a legacy of socially unjust environmental laws. When the Constitution of the Republic of South Africa was adopted in 1994, it recognised the importance of linking environmental issues to those underpinned by human rights and social responsibilities. This recognition committed the entire South African nation to an environment that is not detrimental to the health and well-being of its citizens and thus signalled the importance of environmental education (Lotz-Sistka and Raven, 2001).

South Africa now has a number of policy documents and programmes that are important for environmental education, not only because they focus attention on environmental education, but also because they underline the importance of the work of environmentalists and educationists in ensuring that environmental education is put onto the agenda of the South African curriculum (Maila, 2003). The policies give weight to the environmentally related knowledge, skills and values that both educators and learners should be imbued with. However, Bornman (1997) explains that the integration of environmental education into the curriculum has not been quick to happen. She attributes this to factors related to misconceptions about environmental education, a lack of knowledge and understanding of the field of study, an inherent resistance to change, and an unwillingness of teachers to commit themselves to the teaching of environmental education in the midst of overcrowded curricular and courses.

Table 1: A selection of important policy documents and programmes

The Constitution of the Republic of South Africa	The Bill of Rights enshrines the right to an environment that is not detrimental to the health and well-being of citizens. "Everyone has the right to – (a) to an environment that is not harmful to their health or wellbeing; and (b) to have the environment protected, for the benefit of 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" (South Africa, 1996:11)
Reconstruction and Development Programme (RDP)	Rekindle our people's love of the land, to increase environmental education policy at all levels, and to empower communities to act on environmental issues and to promote an environmental ethic (South Africa, 1994).
The White Paper on Education and Training (1995)	The White Paper on Education and Training presents the framework for the transformation of the education and training system in South Africa. "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" (Department of Education, 1995:13).

The White Paper on Environmental Management Policy (1997)	The White Paper on Environmental Management Policy sets out the vision, principles, strategic goals and objectives and regulatory approaches that government will use for environmental management in South Africa. One of its strategic goals is, "Environmental Education and Empowerment - Promote the education and empowerment of South Africa's people. Increase their awareness of, and concern for environmental issues, and assist in developing the knowledge, skills, values and commitment necessary to achieve sustainable development" (Department of Environmental Affairs and Tourism, 1997:20).
The National Environmental Management Act of 1998 (NEMA)	"Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means" (South Africa, 1998:12).
Norms and Standards for Educators Policy (2000)	This policy requires educators to promote the values and principles of the Constitution particularly those related to human rights and the environment (Department of Education, 2000).
Curriculum 2005 (C2005)	Designed to set out an implementing framework for the outcomes-based education system advocated in the White Paper on Education and Training, This policy was reviewed and refined in 2000, which resulted in the development of the Revised National Curriculum Statement for Grades R-9. Environment was applicable across all learning programmes for Grades R to 9 (Maila, 2003).
Revised National Curriculum Statement (RNCS)	The RNCS builds on the visions and values of the Constitution and C2005. These principles include among others social justice, a healthy environment, human rights and inclusivity (Department of Education, 2001b).
National Curriculum Statement (NCS)	The NCS Grades 10-12 (General) represents a policy statement for learning and teaching in schools located in

	the Further Education and Training band. It is underpinned by nine principles which include social transformation; outcomes based education; high knowledge and high skills; integration and applied competence; progression; articulation and portability; human rights, inclusivity, environmental and social justice; valuing indigenous knowledge systems; and credibility, quality and efficiency (Department of Education, 2003).
National Environmental Education Programme (NEEP)	This programme was launched in 2001 by the Department of Education and aimed to provide an integrated educational framework for environmental enhancement and sustainable development through co-operative governance (James, 2001).

The first known definition of environmental education within the school curriculum was developed at the Conference of the International Union for the Conservation of Nature (IUCN) in 1970. It stated that, "environmental education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biological surroundings. Environmental education also entails practice in decision-making and self formulation of a code of behaviour about issues concerning environmental quality" (Bornman, 1997:58).

The IUCN conference stressed the holistic and interdisciplinary nature of environmental education and that it is a lifelong learning process that is geared toward knowledge, understanding, skills and the fostering of values and attitudes towards the natural and man-made environments. Bornman (1997) supports this inter-disciplinary idea as she asserts that environmental education is not a discrete subject, but should be regarded as an approach to education which permeates all subjects in some way. Panday (2002) confirms

both the IUCN's and Bornman's position by stating that environmental education goes beyond the usual limits of conventional school subjects in the sense that it involves more than just the development of the learner's knowledge and understanding of facts and concepts. Instead, it is geared more towards developing the attitudes and values within which learners cultivate their knowledge and understanding that ultimately informs and guides their actions.

During the Tbilisi Inter-Governmental Conference on Environmental Education in 1977, the objectives for environmental education were defined. These objectives are still widely subscribed to across the world (Bornman, 1997). The objectives are listed below (De Jager, 2003:27):

- **Awareness -** to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.
- **Knowledge** - to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.
- **Attitudes** - to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.
- **Skills** - to help social groups and individuals acquire the skills for identifying and solving environmental problems.
- **Participation** - to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

Degenaar (1988:45) defines environmental education as being "that part of the general educational programme (curriculum) which provides those special learning experiences which will enable pupils to acquire appropriate

knowledge, understanding and learning skills so that they will become aware of and understand the complex nature of the natural biophysical environment. Knowledge and understanding will help them to be environmentally literate and become responsible citizens".

The preceding explanations of environmental education demonstrated some common elements. These include knowledge and understanding, skills, attitudes and behaviour. In addition, the definitions highlighted the cross-curricular and holistic nature of environmental education. Given its holistic and discipline-pervasive nature, proponents of environmental education generally argue for its integration into the formal curriculum. For example, Bornman (1997) maintains that through the curriculum of other disciplines, the aims, goals and objectives of environmental education can also be achieved.

With respect to the role of indigenous knowledge systems in environmental education, Mokuku and Mokuku (2004:47) through their study of the role of indigenous knowledge in biodiversity conservation in the Lesotho Highlands, recommend that "educational approaches that foster real and complex integrated spiritual and physical relationships between people and other living things could be explored for effectiveness in biodiversity conservation. This approach would constitute a shift from detached and rather mechanical ways of learning about the relationship between humans and other living things, an orientation informed by the dominant Western epistemology".

The White Paper on Education and Training (1995:18) 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 though the sustainable use of resources". Samuels (2003:3) builds on this using work done by the Environment Education Curriculum Initiative which states that "inherent in such a vision is the translation of local needs and peoples' knowledge including indigenous knowledge (IK) into learning programmes for all phases and across all learning area".

Indigenous knowledge can play a significant role in environmental education, especially with respect to the local environment (Ulluwishewa *et al*, 1997). Ulluwishewa *et al* cite the enormous volumes of knowledge that local communities have developed over time about their local environments through direct interaction. They assert that ready-made knowledge systems could be easily used in environmental education if appropriate measures are taken to tap the indigenous knowledge housed in the memories of local elderly people.

Active learning in and about the environment through outcomes-based education (OBE) can help to deepen the relevance of classroom learning and strengthen school-community links. In addition, environmental education at school level can contribute significantly to an environmentally literate citizenship that is able to consider the impacts of their decisions and those of others on environmental sustainability. Citizens will thus be better disposed to make informed decisions on appropriate development options and sustainable living patterns. Futhermore, with increased awareness, it is more likely that people will strive to reverse, reduce and prevent environmental degradation (Department of Environmental Affairs and Tourism, 2003).

2.5.3 Outcomes Based Education and Environmental Education

Outcomes based education (OBE) is a learner-centered, result-focused education framework founded on the belief that all individuals can learn and achieve certain results. Therefore, in outcomes based education, curriculum developers work back from the end, or design down from where they want to end up (Samuels, 2003).

The focus for South Africa's new curriculum has changed from one directed at the completion of the syllabus to outcomes based education which is directed towards achieving measurable outcomes i.e. what a learner is expected to be able to do, understand or demonstrate at the end of his/her learning process (Shuter and Shooter, 2005). Outcomes which are subject-related are termed learning outcomes. According to the NCS, learning outcomes should address knowledge, skills, values and attitudes. Knowledge relates to information, facts, theories and explanations. Skills relate to the practical application of knowledge. Values relate to the acceptable norms and standards of society and the things that a society holds important. Attitudes relate to characteristics of thinking, and are usually demonstrated through behaviour (Shuter and Shooter, 2005).

Outcomes based education places great emphasis on learning through group work and downplays rote learning. It is constructivist by nature in that it recognises not only formal school knowledge but also the knowledge that learners bring with them to school, based on their experiences and circumstances (Fiske and Ladd, 2004).

The preceding section on Environmental Education highlighted some of the elements which it can appropriate to the learner. These include knowledge

and understanding, skills, and attitudes and behaviour. From the brief discussion on OBE, it is apparent that these core elements of environmental education are in line with South Africa's National Curriculum Statement as it also seeks to develop knowledge, understanding, values, skills and commitment to enable citizens to be pro-active in ensuring a healthy and well functioning environment (Bornman, 1997).

In summation, the commonalities between environmental education and OBE may be described as follows (De Jager, 2003):

- a shared emphasis on the relevance to societal needs as well as relevance to learners' present and future needs;
- both adopt a holistic approach to the curricula and emphasise the importance of cross-curricular approaches;
- both advocate a learner-centred approach and encourage active learning; and
- both emphasise the importance of critical thinking and lifelong learning.

2.6 CONCLUSION

This chapter highlighted that indigenous knowledge has been growing in popularity over the past few years for reasons such as its contribution to environmental management and medicine, but also because of the failure of many western science-based initiatives to achieve the objectives of sustainable development.

Indigenous knowledge is defined using a plethora of concepts testifying to its multifaceted and multi-disciplinary nature. However, a fundamental point is

that most definitions of indigenous knowledge systems tend to convey a romanticised notion of it as being beyond destructive and non-sustainable practices.

With respect to education, the research has highlighted that most formal education systems have been dominated by western scientific approaches to teaching and learning. South Africa's education system has not been the exception, especially when one takes into account the legacy of colonialism and apartheid. However, since 1994, South Africa's education system has been undergoing changes and part of that change has been the inclusion of indigenous knowledge systems as a principle underpinning the National Curriculum Statement. What has emerged as a critical point is that indigenous knowledge and western science should be seen as two epistemologies that can complement, rather than compete with each other

In the area of environmental education, South Africa has a host of policy documents and programmes that are important because they bring attention to environmental education and foreground the work of environmentalists and educationists in highlighting the importance of environmental education within the South African curriculum. Furthermore, environmental education is characterised by several elements which are shared by outcomes based education which is the new pedagogical style of education in South Africa. These elements include the development of knowledge and understanding, values, skills, attitudes and behaviours that contribute to enabled, proactive citizens concerned with a healthy and well functioning environment. With respect to the role of indigenous knowledge systems in environmental education, it has much to contribute because a significant concept underpinning it is natural resource use and management.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter serves to clarify the research methodology that was adopted for the purpose of this study. Semi-structured qualitative interviews were used, as this method of data collection provided some structure whilst also allowing flexibility in terms of the questioning. Furthermore, this study is not premised on the collection of hard, statistical data, as it is policy related and delves into qualitative issues such as stakeholders' ideas and reasoning underpinning the conceptualisation of Principle 8 of the NCS. Qualitative interviews serve as a means of developing ideas or suppositions rather than as a means of generating facts or statistics. What follows is a description of the rationale supporting the utilisation of semi-structured qualitative interviews, its strengths and criticisms, the method of data analysis and a brief profile of the respondents.

3.2 DATA COLLECTION

3.2.1 Secondary Data

Secondary data collection involved a review and analysis of policies and other relevant literature. Work that had been developed by others was utilised by the author to inform, understand and analyse the primary data collection component of this study.

3.2.2 Primary Data: Semi-Structured Qualitative Interviews

To provide respondents with the opportunity to relate their opinions, insights, attitudes and experiences in relation to the impetus of the study, qualitative, semi-structured, face-to-face interviews were selected as the most appropriate research approach for primary data collection. Five core, open-ended questions were initially developed to guide the interview process (Appendix A). Open-ended questions were selected to allow the respondents the freedom to address the questions being posed and present the data in a manner that was most comfortable for them (Samuels, 2003). The author asked additional probing questions in response to the answers provided by the respondents in order to obtain clarity or delve deeper into the information that was being provided. Each interview lasted between 30 and 45 minutes, except for the first interview which took one and half hours and was spread over two interview sessions. This was expected, as the first respondent provided the author with deep background information on the development of the NCS. This interview provided a sound base for the remaining four interviews.

A qualitative interviewing approach is preferred where complex or elusive information is sought as compared to the collection of straight-forward, factual information which will require a structured interview (Gordon, 1999). This approach requires the interviewer to develop a core set of questions that will be used to guide the conversation. Additional questions are asked to gain greater insight into the responses obtained from the core questions. The qualitative interview is thus amenable to constant modification allowing the interviewer to raise new issues and questions as they arise as well as eliminate unproductive questions. This method, unlike methods such as survey questionnaires, provides the interviewer with a greater degree of

meaningful insight about the thoughts, feelings and formative experiences of the respondents (Robinson, 1998).

The interactive nature of the qualitative interviews was in itself a learning process for the author. The author endeavoured to ensure that a flexible approach was employed so that the process could be used to her full advantage. Lindsay (1997) explains that flexibility is essential because as the actual interview progresses, new ideas and issues may emerge that will require the interviewer to go back to the literature and read more widely on the issues before resuming the interview programme or research project. Flexibility will allow this process to unfold and the information provided by the respondents will not be lost but make for a richer research project.

3.2.2.1 **Strengths of Qualitative Interviews** (Lang and Heiss, 1994)

- Interviews provide the interviewer with the flexibility to deviate from the set pattern of questions and the ability to probe areas of interest or vagueness instead of encouraging a reliance on routine responses (Lang and Heiss, 1994).
- The free flowing conversation-style facilitated by interviews will allow the interviewer to conduct information checks during the interview thereby eliminating problems associated with attempting to analyse unclear/vague data later.
- The interviewer will be able to observe and record non-verbal responses during the interview. The interviewer will thus be able to determine some of the nuances that may be associated with certain questions.
- The interviewer will be in a position to probe the respondent for greater details as well as determine whether the respondents are correctly interpreting the questions posed.

3.2.2.2 **Criticisms of Qualitative Interviews** (Doyle, 2004)

- Qualitative interviews are time consuming and consequently dictate that only a few key actors should be interviewed. This can result in samples being non-representative. Respondents must therefore be carefully selected for their special knowledge or experience. Respondents must be chosen because of the value they will add to the research rather than because they are the easiest to access. Obtaining recommendations from interviewed individuals on further candidates to interview is a good way of obtaining an appropriate pool of respondents. It is most likely that the criteria for the selection of respondents will change as the interview programme progresses. The researcher should commence the interviews by interviewing respondents who will be able to present the overall picture so that important sub-themes may be extracted from the interviews. Later interviews may necessitate interviewing individuals with specialist knowledge.
- Researcher bias and subjectivity or the lack of rapport between the interviewer and the respondent can contribute to data distortions.

3.3 PURPOSIVE SAMPLING AND INTERVIEWEE SELECTION

Unlike other methods of research such as surveying by questionnaire, qualitative interviews are less concerned with sampling issues such as number and representivity. Purposive sampling is applied and the main sampling criteria is often quality and positioning (Lindsay, 1997). The primary concern in qualitative interviewing is ensuring that respondents are individuals with distinct and important perspectives on the topic. This matter highlights another key reason for the author's selection of a qualitative approach for this study. Rather than focussing on a sample that is of a

specific number, the author purposively selected respondents that were able to provide meaningful insights into the decisions influencing the development, implementation, and monitoring and evaluation of the National Curriculum Statement, with specific emphasis on Principle 8. Consequently, the sample comprised of government officials and non-government role-players that have been or are closely involved with specific aspects of the National Curriculum Statement as well as other key role-players closely associated with indigenous knowledge systems.

The first respondent was selected based on the author's knowledge of that individuals experience with the development of the NCS. Thereafter, respondents 3, 4 and 5 were approached based on the recommendations made by Respondent 1. Respondent 2 was approached by the author based on a research paper that he had written in relation to IKS, environmental education and the NCS.

It is important to select respondents so as to obtain the widest variety of perspectives. This is done in order for the researcher to be able to discern whether a particular perspective is simply unique to a respondent or whether it is a pattern that resonates with the whole group. Champion (2003) states that when a researcher interviews mostly people with a shared perspective, he/she may find that the saturation point is reached early and the same themes are emerging repeatedly. For this study, the author was alert for when she had explored as many responses within the research question as possible. It was not deemed necessary to interview any of the respondents more than once as the initial interviews provided a relatively in-depth understanding of issues.

3.4 RECORDING INFORMATION

An essential component of the qualitative interview process is tape recording the conversation so that it may be transcribed and analysed later. This is an important step because it ensures that the researcher is able to engage the respondent more freely without the distraction of having to divide his/her concentration between listening, conversing and writing. Consequently, all five interviews that were conducted by the author were tape recorded. Prior to the commencement of the interviews, all respondents provided the author with written permission to interview them as well as to use an audio tape recorder (Appendix A).

Notes taken during the interview are also important as they allow the researcher to make note of certain essential nuances that the tape recorder may not be able to capture but would assist during the analysis of the interview. However, note taking without tape recording the interview is insufficient. As Robinson (1998) points out, it is rare for the interview to be recalled with sufficient accuracy afterwards for note taking alone to be relied upon as an accurate record of the interview. In order to reduce the margin of error that may be associated with tape recording e.g. inaudible segments of tape, the author also took notes during the interview.

Tapes, notes and memories must be transcribed so that the material can be analysed at a later stage. On culmination of each interview, the author transcribed the interview.

3.5 DATA ANALYSIS

Once all the interviews had been transcribed, comparisons were made across each of them. This required the author to return to the interview transcripts and review them, looking for similarities and differences and patterns and thematic connections in the data. Each interview segment was then allocated a code to indicate the concept, category, theme, or argument it related to (Doyle 2004). Appendix C contains the categories and their inclusion rules. Thereafter, each segment corresponding to the same code was separated from their original transcripts and put together to serve as the raw material for an analysis of the general findings of the study. Data reduction was achieved by noting redundancies in the data and discarding all but the most interesting and compelling statements concerning a particular issue or theme. In some cases, the author noted quantitative aspects of the interview data, for example, the number of participants who expressed a particular concern or who shared a similar experience (Doyle, 2004). The data from the interviews was compared with information collected by the author during the secondary data collection phase.

A limitation that may arise during data analysis is associated with the researcher's subjectivity. For example, the researcher's specific interests may affect how the data is interpreted. It is thus essential for the researcher to constantly reflect on his/her subjectivity and bias. The position of the researcher can also affect the study, either positively or negatively. For this study, the author's work background placed her in a better position to access certain respondents as well as ask certain questions based on insights her position afforded.

3.6 BRIEF RESPONDENT PROFILE

Respondent 1: Senior National government official (not the Department of Education) who formed part of the Department of Education's core team involved in the development and early administration of the National Curriculum Statement. Respondent 1 was also part of the secretariat of the Review Committee on Curriculum 2005. Respondent 1 was selected based on his experience with both the Apartheid and post-Apartheid curriculum.

Respondent 2: Scientific researcher working on indigenous knowledge systems, with a superficial understanding of the development of the National Curriculum Statement but who currently tracks the curriculum to determine how his work is relevant to it. Respondent 2 was selected primarily because of his experience with integrating modern western science with indigenous knowledge.

Respondent 3: Middle manager in National Government (not the Department of Education) working with indigenous knowledge policy. He is also an indigenous knowledge scholar holding a PHD degree. Respondent 3 was selected based on his extensive research into indigenous knowledge systems, his understanding of IKS policy imperatives and his experience with respect to IKS mainstreaming.

Respondent 4: A historian of repute and highly knowledgeable about IKS, especially from an African Renaissance point of view. Respondent 4 is a senior National government official (not the Department of Education) responsible for indigenous knowledge policy issues, within the science and technology sector, and who formed part of the Department of Education's National Curriculum Statement Ministerial Project Committee.

Respondent 5: Senior Provincial Department of Education official currently involved with the implementation of the National Curriculum Statement and who formed part of the Department of Education's core team involved in its

development. Given, his current role in the administration of the National Curriculum Statement, this respondent was selected to provide a current perspective on issues associated with the implementation of indigenous knowledge systems in the National Curriculum Statement.

3.7 CONCLUSION

This chapter contextualised the research methodology used for this study. In an attempt to delve into the rationale underpinning the integration of IKS into the NCS, the factors impacting on implementation of Principle 8 and the implications of the implementation of Principle 8 for environmental education, the researcher purposively sampled five individuals and interviewed them using semi-structured interviews. The five individuals were selected based on their experience with indigenous knowledge systems and the National Curriculum Statement, either on a policy development and/or implementation level. Consequently, the five respondents primarily included government officials either currently involved with the implementation of the National Curriculum Statement or those that were actively involved in its development. The strategic selection of respondents compensated for the small sample size, as their knowledge and experience contributed to the collection of rich primary data. At the culmination of the interviews, all tape recordings and notes were transcribed and analysed by a process of coding which involved looking for similarities, differences, patterns and thematic connections in the data across all the interviews. Thereafter, corresponding segments from each interview were put together for an analysis of the general findings of the study.

CHAPTER FOUR

RESULTS AND DISCUSSION:

4.1 INTRODUCTION

In this chapter primary data gathered for this study is analysed and discussed within the context of the respondents' collective experiences and the established literature discussed in Chapter 2. Specific issues, challenges and opportunities relating to indigenous knowledge systems within the National Curriculum Statement will be elucidated.

4.2 DEFINITION OF INDIGENOUS KNOWLEDGE SYSTEMS

The evaluation of responses on what indigenous knowledge is illustrated its multi-dimensional nature. Expressions such as complex, experiential, contextual, dynamic, applied, holistic, local, spiritual, unstructured, uncodified, integrated and environment are among the many that were used to define indigenous knowledge systems. These findings match closely the findings of the various researchers described in Chapter 2. The following analysis provides support for the preceding statements and discusses the findings of the interviews in relation to published literature.

IKS is often the kind of knowledge that resides in local communities and because of this, it is not hierarchically codified or structured using a certain universal way of doing things.

Respondent 1

It is a knowledge that resides amongst individuals or shared by groups of people in a particular location. It is the knowledge that they carry to engage with the environment in terms of producing food, harvesting, animal husbandry or any other social production they may want to engage themselves with within a particular locality.

…IKS is dynamic, it evolves, it actually responds to a particular time.

The environment is called 'she' like the oceans and earth and in the 'she' you get the spirituality that harnesses people's relationship with the 'other', either animal, plant or water.

When we did that we forgot that it is a spiritual connection with the self. So the spirituality of IKS even in teaching is absent.

Respondent 3

IKS is a complex body of knowledge that is holistic and has been generated from the local environment. It is experiential, it's applied…

Basically, there is supposed to be harmony and balance in terms of the lived experience between humans and the environment and to that extent there is a broad template for knowledge production which relates the environment and human beings.

The classification of knowledge is based on trying to create this relationship between environment and humans but often there is a spiritual dimension.

IKS must not be seen as a static body of knowledge but as one that is dynamic and ever-changing. There are people who seem to think that they can lock it up in the 19th century but it continues to evolve, even today.

Respondent 4

…you start to see that indigenous means, what is local.

There is a lot of IK in terms of the environment, in terms of the cultural belief systems, in terms of social systems, history, scientific understanding and development, economic development.

Respondent 5

According to this study, indigenous knowledge pertains to the knowledge of local people, living in a specific area, in close interaction with their natural environment. It is contextual knowledge as it is based on the experiences of its custodians and is transmitted from generation to generation through oral traditions such as stories, proverbs and metaphors as well as through mechanisms such as totems which are all embedded in the culture of the indigenous people.

Proverbs are an important means used by indigenous peoples to pass down information through the generations. They often contain references to a variety of natural factors such as animals, plants and celestial bodies.

Different indigenous communities have proverbs peculiar to their environmental settings which serve to uphold their values, morals and overall way of life (Mail and Guardian, 2005). As a consequence of its means of transmission, indigenous knowledge is uncodified and undocumented. The result of this lack of formal records and codification is that the transmission of indigenous knowledge systems to other societies and bodies of knowledge is limited rendering the body of knowledge vulnerable to erosion, exploitation and misuse.

The local, experiential or contextual nature of indigenous knowledge as put forward by the respondents is supported by Samuels (2003). She explains that indigenous knowledge is local and is not separated from practical life. In addition the IMERCSA (2005) understanding is that indigenous knowledge systems are far more than a simple compilation of facts. They are also the basis for local-level decision-making in areas of present life, including agriculture, health, food preparation, natural resource management, education, community and social organisation. du Toit (2005:57) also aptly illustrates this by explaining that "the hunter-gatherers' knowledge (IKS) of their environment is neither formal, nor authorised, nor transmissible in contexts extraneous to the act of hunting. It is based on feeling, comprises skill, sensitivities and orientations that have developed through long experience of conducting life in a particular environment". Catherine Odora-Hoppers (2005:5) put forward that the context in which indigenous knowledge is "generated and preserved is extremely important to its meaning, and reflects the internal cultural cognitive categories of the particular community".

The findings of this study show that indigenous knowledge is dynamic and evolves constantly and is not time-bound. This is reinforced by the IMERCSA (2005:1) position which states that "the body of knowledge is inherently

dynamic, constantly evolving and changing through indigenous experimentation and innovation, fresh insight and external stimuli. Communities are therefore able to adapt to changing circumstances through identifying new problems and seeking solutions to them". Samuels (2003) espouses that indigenous knowledge is a cumulative and collective experience that is constantly revised both daily and seasonally by the creativeness and inventiveness of the community as well as by external factors. In addition she points out that it is dynamic as it builds upon the experience of earlier generations and adapts to new technological and socio-economic changes of the present. Grenier (1998) also agrees with the dynamic nature of indigenous knowledge putting forward that new knowledge is continuously added and that such systems do innovate from within and also will internalise, use and adapt external knowledge to suit the local situation.

Respondents were also of the view that indigenous knowledge is holistic. This means that it cannot be compartmentalised or separated from the people who hold the knowledge as it is rooted in the various dimensions of the people such as their language, culture, spirituality, mythology, customs and even their social organisation of the local communities (Cochran, 2004). Morgan in Mokuku and Mokuku (2004:39) defines indigenous knowledge as "systems which make no distinction between fields of understanding of the physical and spiritual, and despite its dynamic and diverse nature, indigenous thinking is mostly holistic and contextual". Unlike in Western epistemology, the boundaries between subject disciplines such as botany, chemistry and physics do not exist in indigenous knowledge systems and these disciplines along with others are produced and reproduced in relationship to the entire practical life experience of the indigenous community (Samuels, 2003). Indigenous knowledge is thus holistic in the sense that it cumulatively and

collectively takes into consideration all aspects of its people's lived experience.

Given their perception of its holistic nature, indigenous knowledge was also described by respondents as having a strong spiritual dimension. Researchers such as Odora Hoppers and Mokuku and Mokuku confirm this. Indigenous cosmology, according to Odora-Hoppers (2005), centres on the co-evolution of the spiritual, natural and human worlds. Mokuku and Mokuku (2005) expound that the association of some organisms with either fearsome consequences if destroyed or providence if seen or encountered shrouds them with spiritual powers, sacredness and awe, creating a basis for their respect. Therefore, indigenous knowledge practice does not subscribe to human domination of nature, but rather emphasises the interrelatedness and interdependence of all aspects of human existence i.e. biological, physical, spiritual, cultural, social, and so on.

The human-environment connection can also be seen in elements of social organisation and networks. For example, Respondent 4's explanation below, of the meaning behind surnames such as Ntuli demonstrates evidence of environmental ideology and ethic among indigenous communities. The specific set of rules and regulations pertaining to these social organisations and networks include a respect for nature, restraint in resource exploitation, agreed exclusions, intergenerational communication and socio-cultural continuity (IMERCSA, 2005).

> *For example, if you take the name Ntuli. Ntuli would also be seen to relate to the environment, specifically to Hyenas. Now, in that relation the Ntuli people become the custodians of the Hyenas. Of course there are other relations that will be based on this. For instance in terms of*

food, Ntuli's should never eat Hyenas. The Hyenas thus become a totem and it then begins to regulate the way of life for the people i.e. who they marry, who they relate to.

Respondent 4

From the analysis of how indigenous knowledge is understood and thus defined, it is clear that it is multifaceted, encompassing a number of broad areas that have emerged out of the local experiences of people, living in a particular environment. It is an integrated body of knowledge taking cognisance of its people's spirituality, social networks, culture and other factors that are all interwoven. It is knowledge that changes in response to changing local internal and external factors, is embedded in culture and is passed on through oral traditions. As a result of its manner of transmission it is not codified or structured according to traditional universal means. This makes it vulnerable to loss or decay. Finally, within indigenous knowledge systems the human-environment connection is one of interdependence rather than one of human domination of nature.

4.3 THE RELATIONSHIP BETWEEN INDIGENOUS KNOWLEDGE SYSTEMS AND ENVIRONMENTAL MATTERS

This study also explored the link between indigenous knowledge systems and environmental matters. Respondents were asked the following question, *What, in your opinion, is the relation between indigenous knowledge systems and environmental matters?* Once again the variation in responses was minimal.

In addition to the various components of IKS raised by the respondents, the natural environment featured as a fundamental component. The overall

impression created was that there is a very close, possibly inextricable, link between indigenous knowledge systems and the natural environment. Respondents explained that this link is a result of the close interaction of indigenous communities with their natural environments. Indigenous communities can thus provide valuable input about the local environment and how to effectively manage its natural resources (Langill, 2004).

> *…they live in certain environmental domains and therefore often find that traditionally, communities have lived inextricably with the environment. They interacted and integrated their lives with the environment...*
>
> *IKS and the environment are very inextricably intertwined*.
>
> *A lot of IKS promotes ecosystem balance but is not taught as a concept out of context. It is integrated into people's lives on a daily basis.*
>
> Respondent 1
>
> *Well, I think that there are enormous overlaps between IKS and environmental matters because most communities, especially in Africa, have a very close relationship with the environment and there is an enormous amount of IKS about environmental issues.*
>
> Respondent 2
>
> *Environmental matters and IKS are actually mother and daughter.*
>
> *So, the relationship between human beings and the environment is the essence of IKS because it is only when people recognize the*

significance of nature that they must not subdue and dominate it but harness it and benefit from it we will then become more human.

Respondent 3

To me, it a very close relationship. There cannot be an IKS without environment. IKS evolves in the interaction with the environment…

…if you look at most African proverbs you will find that the metaphors used relate to the relationship with the environment and to me it appears that the body of knowledge is deeply rooted in that interaction.

Propagation and maintenance of IKS requires that interaction with the natural environment because that it is how it is created.

Respondent 4

There's a very strong link. To a large extent if we don't look at indigenous knowledge and understanding we could find ourselves not managing the environment appropriately.

Respondent 5

Respondent 2 pointed out that "there cannot be continued reproduction of IKS without land. So if you forced people out of their land it means that you have diminished IKS". For indigenous people the land is essential as a source of nourishment, source and education. Although indigenous peoples vary widely in their customs, culture, and impact on the land, all consider the Earth like a parent and revere it accordingly (Burger, 1990).

Respondent 1 stated that …*they did not destroy the environment but took care of it because their needs depended on it.* This response puts forward the perception that indigenous communities see themselves more as stewards or custodians of the environment rather than masters of the environment. This is in contrast with Western models of science and rationality that are based upon the objectification and scientific domestication of the natural environment. As a result, Western societies have come to occupy, dominate, domesticate and control their environment thus alienating people from nature and preventing them from participating symbiotically in the environment (du Toit, 2005).

The management of resources coupled with the use of totems and taboos, such as the Ntuli example used by Respondent 4, can be illustrated by the practices of the ethnic groups living in the Zambezi River Basin (IMERCSA, 2005). Their process of developing shared traditional beliefs helped mould a sense of group solidarity, although the communities view their immediate environments differently. Group beliefs such as totems, taboos and the creation of sacred areas for worshipping ancestral spirits have an impact on the manner the river was and is managed. For example, totems and taboos are associated with restrictions on the use of certain animals, plants and habitats.

A strong impression created from the interviews is that IKS is fundamentally beneficial to the environmental management agenda. None of the respondents articulated any negative perceptions related to the application of IKS. It is essential to reiterate that although IKS has proven itself in many instances with respect to its environmental management value, it is important to remain vigilant about viewing it as always being the right or sustainable choice. As mentioned in chapter 2, it is not a panacea to all our environmental

problems as it has not been immune to the various forces that have acted on it, in certain cases effectively eroding it away. Pressure on IKS exerted by national and international markets, the imposition of educational and religious systems and the impact of various development processes are leading more and more to the commingling of the cultures of the world. As a result, indigenous values, beliefs, customs, practices and know-how may be altered and the resulting knowledge base incomplete (Payle, 2002).

In summary, it is apparent from the analysis of the primary and secondary data that the natural environment has a dominant role to play in indigenous knowledge systems. Indigenous people have had a long and close association with their natural environment, developed and maintained over thousands of years. As a result of this close interaction, indigenous knowledge has strong elements of environmental resource management. Unlike Western epistemologies, IKS adopts a stewardship approach to the environment rather than one of dominance and subjugation. However, it is important to remember that whilst being fundamentally underpinned by natural resource use, not all indigenous practices have proven to be environmentally sustainable and indigenous knowledge by its very nature can count against itself in certain instances. One must thus be wary of adopting Utopian notions of IKS.

4.4 IMPACT OF APARTHEID AND COLONIALISM ON INDIGENOUS KNOWLEDGE SYSTEMS

Respondent 1 provided an overview of the pre- and post-apartheid education system. He explained that during the apartheid era South Africa's education system was underpinned by the ideology of the Christian National Education. Consequently, western systems were used to legitimise the ideologies of the

politically dominant group, i.e. Afrikaans-speaking White South Africans. This resulted in specific exclusions from the curriculum such as indigenous knowledge systems and the associated consequence of learners being "impoverished from a knowledge point of view" (Respondent 1).

The literature review (chapter 2) found that within the post-apartheid curriculum the prior learning of children was not given cognisance which resulted in a major disconnection between what they learned in the classroom (formal knowledge) and what they learnt outside the classroom. This was supported by Respondent 5 who explained that the Eurocentric nature of the apartheid curriculum did not provide "opportunities to bring in contextual relevance unless the teacher decided to do so". In a similar vein, Respondent 3 stated that apartheid education focussed on the learner "being a sponge to absorb the education and to memorise and never to question". He also explained that even the intelligence of a learner was determined through mechanisms such as the Intelligence Quotient (IQ) test that was rooted in western epistemologies.

Apartheid education forced learners and educators from indigenous communities in South Africa to marginalise what they had learnt from their elders and communities. This resulted in IKS being devalued in favour of Western knowledge and has created a sense that the various issues including the environment can only be understood in terms of Western or English scientific concepts(Mail and Guardian, 2005). "Colonialism and the monopoly of western science have made many colonised people suspicious and even dismissive of their own knowledge in favour of western knowledge paradigms" (Payle, 2002:1). Respondent 4 aptly referred to this phenomenon as the "colonised mind" stating that "we have been brainwashed to think less of ourselves and our knowledge".

Ntsoane (2002:25) asserts that “not only did the colonial education system eventually create a sense of disaffection or desire to disassociate oneself with the native heritage, but it affected the individual and the sense of self confidence. On top of this the new colonial education undermined people’s belief in their names, in their languages, in their environment, in their heritage of struggle, in their unity and in their own abilities. It makes them see their past, their rural richness, their living heritage and their cultural and natural heritage as a wasteland of non-achievement and it causes them to want to distance themselves from that wasteland”. Respondent 1 agrees, as he explained that where there are people there is indigenous knowledge systems but “in areas where there are so-called sophisticated people, they have turned their backs on their own IKS”. Respondent 2 submitted that “in South Africa what has happened is that there are people who are ashamed of their own culture and are reluctant to admit that they eat caterpillars or stink bugs”. When probed as to whether this has any link to the legacy of apartheid, he responded in the affirmative.

The result of this epistemicide is that western science and western paradigms have established themselves as both politically and epistemologically correct (Payle, 2002). By epistemicide, Payle is referring to the negation and dismissal of the indigenous experience as a basis for understanding indigenous reality. He explains that this has led to a profound reluctance to reclaim and manipulate indigenous knowledge systems as a source of sustainable development.

Respondent 1 emphasised that Curriculum 2005 (C2005) signified transformation in the curriculum, but that the essence of it was still largely linked to apartheid issues. According to him, these apartheid ideals were

maintained primarily by beauracrats who favoured the apartheid system. Also, indigenous knowledge systems were not mentioned in C2005.

> *C2005 was actually a combination of Apartheid and post-apartheid ideals as related to both the ANC policy document on Education and Training (1993) and the Education Renewal Strategy (1992), the latter being entrenched in CNE ideals.*
>
> *Therefore, the new syllabus is built on the remnants of the old syllabus. The vestiges of the old are found in the new. So, the actual elements of the old syllabus were implanted in the new syllabus by Apartheid beauracrats.*
>
> *In the documents that spoke of C2005, you will find that IKS was not mentioned i.e. IKS was conspicuous by its absence. The time was not right for IKS during this period. The period in history allows certain things to take root. By the second time i.e. when C2005 was reviewed, certain issues such as IKS had already become part of the public discourse and was thus easier to introduce into the curriculum.*
>
> Respondent 1

Respondent 1 cited the inclusion of IKS, as a principle in the National Curriculum Statement, as a major milestone given its total absence in C2005. Respondent 4 was also optimistic about its integration into the National Curriculum Statement even though it has limitations based on the manner in which it was integrated.

However, whilst the National Curriculum Statement appears to respond to the democratic values enshrined in the Constitution through, among other things, its recognition and integration of IKS, what emerged from the interviews is that the integration was made by concession. On being probed on whether its integration was a compromise Respondent 4 said, “Yes, it was almost a compromise. It was contested. It was not as though everyone bought in. We had to have open sessions and open debates and we had monitoring groups to look at the subject statements and say ‘there isn’t enough of IKS in here’. I was one of those ‘police’. However, that was influenced by the fact that we are not challenging the fundamentals but are including aspects of IKS in the curriculum. It was a managed integration of IKS into the curriculum”.

The manner in which Principle 8 is couched shows that it was a negotiated settlement”

Respondent 1

The curriculum change that we undertook did not challenge the fundamental basis on which knowledge is built. So, we merely included within that western epistemology aspects of IKS. Off course it is a minimalist approach and therefore the achievements that we expect from it, necessarily, will be limited. However, that limitation is still much better than what it was before...

To me, this was a problem in that it was not really integration but cooption. It was taking little bits of IKS and inserting them. It was not a fundamental change.

Respondent 4

From the statements above, one can deduce that despite the integration of IKS into the National Curriculum Statement, the vestiges of the apartheid and colonialist curriculum, such as the prominence of Western ideologies, were still carried forward into the new curriculum.

4.5 CURRICULUM TRANSFORMATION

4.5.1 Curriculum, Teaching and Learning in Post-Apartheid South Africa

The South African Constitution, the highest law of the land, obliges education authorities to ensure that democratic structures, education models and curricular are put in place to conform to the democratic values of the country. This implies that the expectation is for democratic values and attitudes to be instilled at schools. Unlike with the pre-apartheid Government the focus now is not on Government imposing biased learning requirements but rather facilitating the development of an education system that will contribute "towards improving the quality of life and building a peaceful, prosperous and democratic society" (Department of Education, 2006a). The example provided by Respondent 5 aptly clarifies this "let's take for example the current policies about religion education. It clearly gives you an idea of the intent of government to be able to say 'look it's not our role as government to promote religion in our schools; it is our role to promote religious tolerance'. So therefore, we talk about religion education saying that every learner that goes into the schooling system should have an understanding of the different religions. That will help you in terms of being the type of citizen that we want as an output of the education system".

The answers from the five respondents were relatively congruent when asked ***"What in your view was the rationale underpinning the integration of IKS into the curriculum?*** The common elements of their responses included prior learning and the recognition of informal/African knowledge systems and how they contribute to an understanding of the world. The extracts below substantiate these statements.

> *The National Curriculum Statement says that we need to establish the link between in-class and out-of-class learning. This means that we need to recognise the knowledge systems outside the classroom. These are indigenous knowledge systems. This is the reason that it was integrated into the curriculum.*
>
> Respondent 1

> *It was very important to include it because it is important to pay respect to the traditions and knowledge which actually has been developed internally and to recognise the fact that there is actually indigenous knowledge and that it is crucial in actually understanding how certain things work.*
>
> Respondent 2

> *Now, one of the central purposes of having IKS in education is actually to deal with the whole notion of epistemology - the ways of knowing that matters most are the ones of the self. So people begin to deal with the knowledge of the self as the beginning of wisdom thereby our education system will from now onward be anchored in the cultures of the people and that for me is a very important step and it is why IKS was recognized and integrated into the curriculum.*
>
> Respondent 3

It was argued that in terms of the emancipation of the African voice there was a need to include African bodies of knowledge.

If you look at the history curriculum it started with Europeans coming into South Africa. Where was the history before then? So, it was maintained that African people will have no identity if this issue is not addressed.

The major thrust was that the focus of the examples that were used in geography texts was all foreign. Now how do people relate to their own environment if the geography they are being taught has nothing to do with their own environment? So, it was also argued that we must begin to introduce young people to their own societies; they must begin to understand their own geographical and environmental conditions in which they live.

It introduces the African environment within the curriculum. It also begins to introduce to African people that knowledge production was not the precepts of the Whites but also happened within their own communities. It also begins to introduce new values that are based on beginning to appreciate their own and therefore from that perspective there are outcomes from the inclusion of IKS, limited as they are, but they can still be celebrated.

Respondent 4

It became increasingly evident that in any country IK plays a vitally important role in conceptual development and understanding. It's important to understand and realise why the South African policy makers for our curriculum actually infused it as a principle. Because, we

really want to acknowledge IK and what contributions it made to modern knowledge.

IK has very sound educational benefits. If you take the kind of learner envisaged as outlined in the curriculum, the learner needs to understand his or her country and context, we want a learner that must value democracy, human rights and the environment. If we don't have this understanding of IK, how are we going to be able to achieve that?

Respondent 5

Respondent 4, a key player in the curriculum development process, explained that in the construction of the curriculum the focus was on bringing it "much closer to home". For example, within Mathematics it was argued that in the past only western mathematical and scientific knowledge was valued. The task team argued that within African societies there were also sciences and mathematics but we failed to understand them. Respondent 4 cited the example of Ndebele paintings and the fact that their geometric shapes can actually be used to teach abstract aspects of mathematics.

With respect to History, Respondent 4 explained that the template that was traditionally used was a western one in that the manner of proof or validation is a materialistic one based on proof of material remains of the past. He indicated that the worldview of Africans, and thus their historical consciousness, is a combination of the material and the spiritual. But that had not been taken seriously in beginning to reconstruct the past. In Geography, the major thrust was that the focus of the examples that were used was foreign making it difficult for people to relate to their own environment. Hence, the task team also argued for the introduction of young people to their own

societies so that they may begin to understand their local geographical and environmental conditions.

Venter (2006) plays up the clear distinction between pre- and post-apartheid South Africa. This distinction not only reflects a change in political and constitutional conditions but also a shift in the value and philosophical frameworks which underpin the basis of South African society. In order for learners to function in a democratic society, cultural differences and value plurality needed to be acknowledged. The focus of the post-apartheid curriculum on indigenous knowledge systems, demonstrates this attempt to inculcate a renewed appreciation of our country's cultural differences and value plurality by affirming indigenous knowledge systems and how it can assist in addressing some of the challenges we face. Venter explains that as a result, all learners in South Africa will have to develop the skills, knowledge competence and attitudes to function effectively in a diverse society. This type of learner is a fundamental matter underpinning the National Curriculum Statement.

Respondents 1, 4 and 5 all referred to the type of learner envisaged as an outcome of the curriculum. Respondent 4 stated that in the development of the curriculum "the major concern was the learner that we needed to produce. So we started with the definition of the learner that we wanted to produce". Respondent 1 explained that the implementation plan for the rollout of the National Curriculum Statement "said a lot about the content demand, i.e. the knowledge, skills, values and attributes that the learner has to have". Respondent 5 highlighted that "the learner needs to understand his or her country and context; we want a learner that must value democracy, human rights and the environment. If we don't have this understanding of IK, how are we going to be able to achieve that? So you are going to create a void". He

elaborated on this by stating that “The principle of infusing IK into the curriculum leads towards the achievement of that kind of a learner. I believe that the kind of learner envisaged as an outcome of the FET curriculum will respect human rights, respect the environment, will be a democratic citizen, will actively participate in the promotion of cultural diversity and respect for others”.

Venter (2006) explains that the type of learner required by the new curriculum will require a major paradigm shift for teachers, education managers, teacher trainers and education philosophers. This last statement has been borne out by the findings of the study wherein Respondent 1 highlighted that the new curriculum has implications for pedagogy wherein the teacher now has to go beyond subject matter and help learners relate the material they are studying to their lives. He elaborated that the teacher “is also going to learn from children about what they bring into the classroom. So, the teacher is not the custodian but the facilitator of the integration of different experiences and knowledge”. Respondent 4 stated that the new pedagogical approach of outcomes based education “requires a new kind of teacher”. Respondent 5 pointed out that with outcomes based education the contextual knowledge of the learner becomes very relevant. This position was supported by the sentiments of Respondent 1 who indicated that “the way the new curriculum has been designed is that it must be relevant to the learners. What is relevant to the learners is what is taking place in their neighbourhood”.

4.5.2 Prior/Contextual/Experiential Learning and Culture

The National Curriculum Statement recognises the link between in-class and out-of-class learning. Respondents 1, 3 and 5 all spoke specifically of experiential, prior or contextual learning as being of primary importance to the

new curriculum. According to Respondent 1, this means that “we need to recognise the knowledge systems outside the classroom”. He went on to explain that these knowledge systems include indigenous knowledge; hence the new curriculum has been designed to take cognisance of indigenous knowledge systems so that formal education becomes relevant to the learners. Respondent 1 believes that during the apartheid era, education policies dictated against children connecting what they learnt in the classroom with their daily lives. To him, “people learn when they build on what they know”. According to Respondent 3, the National Curriculum Statement attempts to answer questions such as “has South Africa managed to have that education system that is responsive”? He says that as a consequence of this approach “the policy of education was to begin to infuse into the children that which we call prior learning”. Respondent 5 explained that most “modern curricular, and with OBE, it is important to start learners conceptual understanding linked to their context. Learners may develop greater links and understanding when you look at their context”.

There are various findings of previous research that corroborate the statements of Respondents 1, 3 and 5 with respect to prior, experiential or contextual learning. As mentioned in Chapter 2, Fiske and Ladd (2004) highlighted that outcomes based education is constructivist by nature in that it recognises not only formal school knowledge but also the knowledge that learners bring with them to school, based on their experiences and circumstances. In addition, Kreisler and Semali (1996) cite the work done by Hawkins and Pea which says that knowledge develops as a result of the interaction between an individual and his/her environment. The objects and events that make up a child’s rich cultural setting play a crucial role in the construction of knowledge that the child then brings into the classroom. These objects and events are unique to each individual culture and locality and may include the interaction of the media, people, plants, animals,

buildings, informal learning situations, and the practices of institutions such as churches or schools.

Kroma (1995) laments that enrolment and retention in science and mathematics courses are unacceptably low in many developing countries. He attributes this in part to a disjunction between the course content encountered in schools and the local knowledge of the learners and argues that science and mathematics would be more popular if the course content reflected the indigenous knowledge of the local communities. He also asserted that formal education can undermine indigenous knowledge in three ways. Firstly, it fails to foreground indigenous knowledge as a valid epistemology. Secondly, it limits learners' exposure to their local knowledge and finally it creates attitudes in learners that act against their acquisition of indigenous knowledge.

Based on the research of Kreisler and Semali (1996), many learning and teaching opportunities are lost when teachers ignore their learners' prior knowledge of indigenous ways of knowing. Opportunities to teach language skills by describing native plants in the learners' garden, or recounting local history by discussing local heroes and heroines can reinforce the link between what is learned in the classroom and what the learner already knows. "When students bring to the classroom what they already know, and are acknowledged as knowers, the classroom becomes an interactive environment for knowledge production which engages both the student and the teacher" (Kreisler and Semali, 1996:2). The environment serves as a rich teaching resource primarily because learners are already familiar with their local environments. Consequently, investigations conducted within the local environment can help to bridge the gap between the familiar and novel (Panday, 2002).

By bringing in the learners' out of classroom experiences, the teacher contextualises the knowledge and in so doing learners would realise that knowledge is largely relative and that each person should decide his/her preferred way of constructing it by appropriately addressing problems from a variety of contexts (Venter, 2006). This parallels the statement made by Respondent 3 that "teaching for progress must involve prior learning, cultural intuition i.e. where the learner does not go only by the book".

When students bring into the classroom their discoveries and knowledge based on their out-of-classroom experiences, they are demonstrating the production of alternative ways of knowing and keeping alive alternative forms of knowledge production. According to Kreisler and Semali (1996), this alternative form of indigenous knowledge production is known as indigenous literacy i.e. it's a competency with respect to its own environment that a community has acquired and developed over time. By allowing this integration of the learners' out-of-classroom learning with the classroom learning, indigenous literacy is given value, becomes relevant and assists learners to develop an interest in and take ownership of what they learn. This ownership is an important step in helping to overcome the 'colonised mind' and changing perceptions related to the superiority of western epistemologies. Shiva (1993) explains that this negates the dominant culture which if not challenged could eliminate the use and appreciation of other forms of knowledge such as that associated with the culture of the locality. Appleton *et al* (1995:80) explain that "at all levels of education, efforts should be made in culturally appropriate and respectful ways to include local knowledge in syllabi to ensure that it continues to be reproduced by communities".

Respondent 3 argued that “education is cultural” and that by recognising different cultures and knowledge systems we can develop people “who are multi-polar in education i.e. people must be taught the western systems, African systems and Asiatic systems and over and above, the whole notion of tribal heritage comes into being”. He postulated that education which does not take cognisance of the cultures of the people it aims to educate is tantamount to mis-education. The feelings of Respondent 2 on the issue of culture in education support the statements made by Respondent 3 i.e. “it is actually important for people to have a positive feeling about their own culture”.

Stephens’ (2000:7) explanation of a culturally responsive curriculum is that it “assumes that students come to school with a whole set of beliefs, skills and understandings formed from their experiences in the world, and that the role of school is not to ignore or replace prior understanding, but to recognise and make connections to that understanding. It assumes that there are multiple ways of viewing, structuring and transmitting knowledge about the world-each with its own insights and limitations”.

Respondent 5 raised the following, **“**I wouldn’t want to find a learner walking out of the SA schooling system that has a very sound understanding of American culture and so on but doesn’t know what’s happening in SA” and “If you don’t understand the local how can you make decisions for another context”. Venter’s (2006:6) argument parallels the views of Respondent 5 because she asserts that “people should be enabled to accommodate the cultural diversity of their own society, before being exposed to cultures in the global community. In a world where borders are becoming more and more diffuse, South Africans will have to work hard on accepting each other in order to enter the global world”.

The *Handbook for Culturally Responsive Science Curriculum* by Sidney Stephens (2000:7) sets out the following strengths of a culturally responsive curriculum:

- "It recognises and validates what children currently know and builds upon that knowledge toward more disciplined and sophisticated understanding from both indigenous and Western perspectives.
- It taps the often unrecognised expertise of local people and links their contemporary observations to a vast historical database gained from living on the land.
- It provides for rich enquiry into different knowledge systems and fosters collaboration, mutual understanding and respect.
- It creates a strong connection between what students experience in school and their lives out of school.
- It can address content standards for multiple disciplines".

4.6 CONCLUSION

The findings of this study link closely to the findings of other research. In addition, the consistent trend in the responses to the interview questions highlighted a general concurrence on the various matters concerning indigenous knowledge systems.

At the outset, this study has confirmed that indigenous knowledge systems are in fact deemed to be multi-faceted and inter-disciplinary. This body of knowledge has a wide range of descriptions because of its highly integrative and immersive nature. It has been described as holistic, dynamic, evolving, having a strong spiritual dimension and based on strong human-environment

inter-connectedness. The natural environment plays a fundamental role within indigenous knowledge systems and as a result of the close interaction of indigenous communities with their local environment, indigenous knowledge has strong elements of environmental resource management.

Respondents heralded the inclusion of indigenous knowledge systems in the National Curriculum Statement as a major milestone for the South African education system, given that apartheid education excluded and devalued indigenous knowledge in favour of Eurocentric ways of teaching and learning. The focus of the post-apartheid curriculum on indigenous knowledge systems, demonstrates an attempt to inculcate a renewed appreciation of the country's cultural differences and value plurality by affirming indigenous knowledge systems and how it can assist in addressing some of the challenges we face. The improved quality and type of learner coming out of South Africa's education system is a fundamental matter underpinning the National Curriculum Statement. So too, is the recognition of experiential or prior learning of children. This is all in keeping with the new pedagogical model for South Africa's education system, i.e. outcomes based education.

The impact of apartheid and its education system has, nevertheless, had enduring effects. This is illustrated through the persistent belief that matters such as the environment can only be understood in terms of Western or English scientific concepts or the profound reluctance, even on the part of indigenous people, to reclaim and manipulate indigenous knowledge systems as a source of sustainable development.

CHAPTER 5

RESULTS AND DISCUSSION: IMPLEMENTATION

5.1 INTRODUCTION

In this chapter primary data gathered for this study is analysed and discussed within the context of the respondents' collective experiences and the established literature discussed in Chapter 2. Specific issues, challenges and opportunities relating to the effective implementation of indigenous knowledge systems within the National Curriculum Statement will be elucidated.

5.2 CHALLENGES TO THE EFFECTIVE IMPLEMENTATION OF PRINCIPLE 8

5.2.1 Decontextualisation and Categorisation of Knowledge

Respondent 1 raised the decontextualisation and categorisation of knowledge as a challenge to the effective inclusion of IKS into the curriculum. He explained that unlike traditional Western approaches to environmental education which teach it as a separate concept, indigenous knowledge systems do not differentiate. Instead, environmental education is taught within the context of the people's lives.

> *The way environmental education is taught within IKS is to inculcate, absorb and make it practice. Traditionally environmental education is taught as a separate concept and not integrated as a way of life i.e. in*

modern knowledge systems the packaging of environmental education is de-contextualised. In indigenous settings this is difficult to do - with any knowledge for that matter - it is very difficult to separate it within IKS, it is all highly integrated.

Respondent 1

According to Samuels (2003), Western science creates temporal conflicts through the fragmentation of scientific knowledge into different disciplines and courses. As explained by Respondent 1, this is in conflict with IKS which does not differentiate in such a manner as it integrates all aspects of knowing and understanding. Unlike the reductionist method of Western science wherein information is broken down into smaller units to understand, indigenous knowledge is comprehensive and holistic in its view of ideas and practices.

5.2.2 Teacher Challenges

The National Curriculum Statement (Department of Education, 2003:5) explains that "all teachers and other educators are key contributors to the transformation of education in South Africa". It envisages teachers that "will be able to fulfil the various roles outlined in the Norms and Standards for Educators. These include being mediators of learning, interpreters and designers of learning programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists". Clearly, this is a complex matrix of expectations. Consequently, if teachers are to live up to such expectations, responsive training programmes must form a fundamental component of the education landscape.

Teacher training has been cited by several researchers as being a critical success factor for any school curriculum. For example, Ogunniyi (2005) accents that the success of a school curriculum ultimately depends on the calibre of teachers responsible for its implementation. “It is no exaggeration that teachers can make or mar any curriculum no matter the quality of its design or content” (Ogunniyi, 2004:2). Panday (2002) submits that teacher training is of paramount importance, as it builds their capacity enabling them to embrace change and to bring about change in their classrooms.

The findings of this study agree with Ogunniyi’s and Panday’s statements as it emerged strongly that teacher training is critical for the effective implementation of IKS within the curriculum. Teacher training is rendered more pressing by the chronic shortage of resource materials on indigenous knowledge systems from which teachers can draw for use in the classroom, and the fact that Principle 8 represents a major change within the education system.

According to Venter (2006), South Africa needs to restructure its teacher training programmes if our teachers are to be trained and equipped with the necessary skills, attitudes and behaviour that will allow learners to integrate their out-of-classroom learning with their structured curriculum. Teachers must thus be better prepared to accommodate and build on the prior learning experiences of their learners. This was supported by some of the findings of this study.

Respondent 1 explained that the new curriculum requires that the different ways of thinking, doing and explaining be encouraged. He emphasised that these ways are varied and thus provide a big challenge. Also, problem solving is a key element of indigenous knowledge systems and most teachers

have not been trained to deal with problem solving as an approach to learning. Respondent 2 conjectured that even with a lot of support material on indigenous knowledge systems, it would still not be easy to implement unless there is ample teacher training. Respondent 5 also stressed the importance of teacher training to prevent indigenous knowledge falling through the cracks.

Respondent 1 highlighted that the National Curriculum Statement asserts that a link must be established between in-class and out-of-class learning. He explained that "this has implications for pedagogy. The teacher must understand where the learner comes from. This puts pressure on teachers to go beyond subject matter. The learners must be assisted to relate the subject matter to their lives". Furthermore, Respondent 1 felt that this new pedagogy would remove the "comfort zones" of the teachers who would now have to depart from the mindset of being the custodian of knowledge to one of being the facilitator and co-constructor of knowledge. He/she would have to facilitate the "integration of different experiences and knowledge" as well as learn from the learners.

For learners to be allowed the flexibility of bringing in their own experiences, beliefs, understanding and ideas, the teacher needs to acknowledge his/her role as the facilitator of learning and not as the custodian of knowledge that needs to be transmitted to the learner. The educator therefore has to create an environment that promotes learners' exploration of new ideas and allow them to find their own solutions through the manipulation of objects and materials in their local environments (Panday, 2002). This is in line with the constructivist theory which holds that learners are active constructors of meaning, and bring their existing understanding into the classroom (Bornman, 1997).

Teachers are required not only to deal with the range of backgrounds and experiences of the learners but also with their own background and experiences (Panday, 2002). This multicultural, multi-experiential setting could complicate the manner in which indigenous knowledge systems are integrated into teaching and learning. One example is that the personal preferences of the teacher may introduce biases. According to Respondent 5, these biases may manifest in the type of indigenous knowledge that the teacher may chose to emphasise. It is thus essential for teachers to employ a creative range of teaching strategies encompassing the integration of learners' experiences in order to negate the excessive influence of their personal preferences. Proper teacher training is thus essential to militate against the challenges posed by regional differences in culture and language.

According to Respondent 5, current teacher development programmes focus on curriculum orientation and are not subject specific. He commented that if subject specificity is incorporated into the teacher development programmes then there is a greater likelihood that this barrier can be managed appropriately. This lack of a subject specific focus during training is exacerbated by and probably symptomatic of the agreements reached during the curriculum development process. For instance, although the expectation for Principle 8 was that it should be expressed within every subject, it was not couched as something measurable. In addition, it was agreed that IKS be integrated into the various subjects rather than it being a self standing subject. According to Respondent 1, the agreement was that there should not be a separate training programme or policy guidelines for indigenous knowledge systems. Further, Respondent 5 explained that there was no focus on the individual subjects with respect to what indigenous knowledge should be incorporated and at what level.

Kroma (1995) is in agreement with the stance that IKS should not be a stand-alone subject. He explains that it should be included within existing subjects so that it cuts across the curriculum, which will also require a reorientation of subjects, teachers and all school experiences. Following from this, teachers must be trained to present the subjects in such a manner that the factual elements and their corresponding indigenous knowledge are logically connected and relevant to the experience of the learner. The task of the teacher must be to present indigenous knowledge systems together with Western knowledge systems in a manner that is clear and concise so that learners will be able to know when to apply either or both of the systems when dealing with a particular context (Ogunniyi, 2005).

As mentioned earlier, teacher training can make or break a curriculum and "in the same vein, the quality of teachers depends to a large degree on their training in higher educational institutions" (Ogunniyi, 2005:2). In South Africa, a further complication is that the professional teacher qualification has to be internationally comparable. "It's a professional qualification and therefore when a teacher comes out with this qualification it means the teacher should be able to teach any curriculum anywhere" (Respondent 5). As a result of this and the continued focus on Western modalities of teaching and learning there is a lack of focus within higher education institutions on certain particularities of the South African curriculum, such as IKS. Consequently it is only in practice that teachers get exposed to matters such as indigenous knowledge.

Respondent 5 explained that unless components on IKS are built into the pre-service training programme for teachers, the potential exists for the development of teachers without the indigenous knowledge competence. If teachers are not trained to recognise indigenous knowledge they will continue to neglect it, deny it or even denigrate it when it appears as part of their

learners' response in classrooms (Kroma, 1995). In addition, the failure to adequately prepare teachers through the provision of appropriate training, can result in under-qualified and unmotivated teachers who become suspicious of initiatives that they do not regard as transparent and participative (Panday, 2002).

On being probed as to whether teachers will find the challenges easy to overcome, Respondent 1 postulated that some teachers will be in a better position to address indigenous knowledge issues than others as they may be more gifted. However, all teachers will be required to put in more effort in order for them to move away from being knowledge custodians to being knowledge facilitators. For this to happen, teachers must be confident. This change in pedagogical paradigm will also, according to Respondent 1, reveal the inadequacies of some teachers by exposing their incompetence. It is thus likely that some, if not many, teachers will overtly or covertly resist implementing aspects of the new curriculum that further challenge their abilities, such as the teaching of IKS.

5.2.3 Attitudes, Mindsets and the Legacy of Apartheid and Colonialism

Despite the proven usefulness of indigenous knowledge, it continues to be threatened in the Third World by inadequate, inappropriate and inaccurate conceptions of knowledge, and the propagation of these perceptions within educational practices (Kroma, 1995). Negative attitudes and mindsets about indigenous knowledge systems have been fostered by a tradition of Western science. The perception that Western modern science is capable of providing humankind's solution to underdevelopment is to a large extent responsible for the degenerative view of indigenous knowledge systems (Appleton et al, 1995). This was borne out by the findings of this study as negative attitudes

and mindsets emerged among the challenges that could undermine the effective implementation of IKS in the curriculum and consequently its applicability to environmental education.

For example, Respondent 2 stated that “there is a great deal of intolerance of IKS and what is referred to as African science”. Respondent 3 spoke of the need to “elevate the awareness or consciousness of those who are involved in the current environmental education which is misdirecting the significance of IKS”. His explanation in this regard, which paralleled the sentiments of Respondent 2, focussed on the exclusion of indigenous people from areas designated as protected, based on the notion that this would ensure environmental protection and conservation. Such initiatives have to a large extent “actually pushed further outside the reserve those people who have embraced animals and plants and are constantly using them but also conserving them” (Respondent 3). In the past, many communities were forcibly removed from areas now declared as protected areas or national parks. In certain instances this was done unlawfully and without the consent of the local communities (Mail and Guardian, 2005). Under apartheid, these protected areas were also for the benefit of the exclusive few and the majority of the population was denied access to it, until fairly recently.

According to Tauli-Corpuz (2006) such approaches do not recognise the environmental management systems of indigenous people as viable ways of natural resource management. Secondly, the western model of environmental conservation places precedence on the importance of plants and wildlife rather than on the indigenous people of the area. Instead indigenous people are seen as part of the problem i.e. agents of environmental destruction. This mindset aided in separating indigenous communities from their land and the wealth of indigenous knowledge they had developed within these areas. It

further contributed to the demise of their identities and cultures and perpetuated the development of negative attitudes amongst the affected communities about the need for environmental conservation and protection.

In addition to the lack of acknowledgement of indigenous principles of environmental management, other barriers associated with attitudes and mindsets include those related to people's domination over nature and the pre-eminent focus on industrialisation and technology. Such a focus steers people away from an environmental consciousness and associated bodies of knowledge that are based on human-environment interconnectedness.

"We seem to have gone to Genesis which says that mankind is here on earth to dominate the environment. Such an orientation makes us less environmentally conscious. One barrier is the extent to which religion plays a subtle role in placing us as playing a dominant role over nature".

"The second is the whole notion of modernization and westernization. I think these two terms are being abused at the expense of the environment. When westernization takes place, technology is the first thing to destroy the environment. Technology does not reproduce the environment".

Respondent 3

"The ignorance of principles of environmental management from indigenous societies is a major barrier. Because people don't know the methods that were used, they tend to diminish and devalue the IKS aspect of environmental management".

"Probably one of the major problems of the 20th and 21st century is that the value of the environment has also been overridden by the value of industrialisation. People tend to look at development as a higher priority than the management of their own environmental resources. This is a major challenge for environmental education".

Respondent 4

The legacy of South Africa's colonial past also emerged as a challenge. This legacy is not only reflected in the lasting impacts of unjust practices but also in prevailing mindsets. Respondent 4 articulated that the major barrier is "the colonised mind". To him, indigenous South Africans have been brainwashed to think less of themselves and their knowledge. In order for these mindsets to change there has to be a change in the vision of the future that takes indigenous knowledge in different areas seriously, whether it is in environmental management or biochemistry. He explained that as result of the disassociation linked to colonisation, people do not recognise the value of the ancient bodies of knowledge that have been tested over time and can be used as a viable basis for us to interact with the rest of the world. The effect of the colonised mind is that in many instances "there are still many people who cannot drink African medicine because they think it is evil and demonic. They fail to see that a lot of it was developed through practical experimentation to see what is suitable" (Respondent 4).

Furthermore, colonialism remains entrenched in certain institutions such as the institutions of higher learning which perpetuate western epistemologies and continue to use western measures of success. This then poses the question, what chance does indigenous knowledge stand in such an environment? Respondent 4 described this as an uphill battle in terms of having indigenous knowledge systems accepted as equal to other bodies of knowledge. This also has implications for teacher training because a

University tied into Western ways of teaching and learning will not address IKS as a training priority.

Ignorance and misunderstanding, closely linked to attitudes and mindsets, also have a role to play in how IKS is integrated into the curriculum. Respondent 2 highlighted that ignorance associated with the origin of knowledge systems could easily lead people to believe that "there is no knowledge that actually originated from Africa and that all our knowledge comes in American or European textbooks and without that we actually wouldn't know anything". He also pointed out that misinformation can be detrimental as it can perpetuate negative mindsets about indigenous knowledge. He quoted the example of a Kenyan woman who was adamant that Venda people only ate insects because they were forced to during apartheid. However, insect-eating is an integral part of the Venda culture.

To borrow from Enkiwe-Abayao (2003), who states that despite the general negative mindset or perceptions of many of today's younger generation, it is still possible to challenge learners' and students' mindsets by providing them with equal training in Western and local knowledge and capacities so that they can excel in both. What is essential though is that Western and indigenous knowledge systems should be taught as complementary subjects and not at the expense of each other.

Odora-Hoppers (2004) aptly captures the importance of the preceding standpoint. She explains that Western knowledge has been and still is invaluable to all, but on its own, it has it has been incapable of responding adequately in the face of massive and intensifying disparities, untrammelled exploitation of pharmacological and other genetic resources and rapid depletion our natural resources. Indigenous knowledge which is both a

national heritage and national resource should be protected, promoted, developed and where possible conserved. However, it is also a valuable resource that should be put at the service of present and future generations.

5.2.4 Policy and Implementation Shortcomings

During the development of the National Curriculum Statement, a separate implementation plan for IKS was not developed. Respondent 4 and 5 reported that emphasis was placed on the writers and publishers of textbooks i.e. that they would take indigenous knowledge seriously and include it in texts.

Furthermore, Respondent 4 reported that whatever implementation plans were developed tended to look much more at the physical requirements for the implementation of the curriculum, such as access to computers and so on. They thus focussed on the methodology rather than the content. He substantiated that it was likely that the focus on methodology rather than content was related to the new pedagogy of outcomes based education which is less content-focussed.

At the commencement of implementation of the National Curriculum Statement various systemic issues had emerged which impacted on the implementation of Principle 8. For example, the tight implementation timelines meant that publishers, textbook writers and education managers were under-prepared to plan adequately and intensely on to enable the system to support implementation. Respondent 5 explained that if they had been allowed sufficient space and scope, the chances are that they could have had a special programme or module in each of the teacher development

programmes to ensure that the principle of indigenous knowledge could be included.

Respondent 5 elucidated that “there is no education manager that has managed education in this context before. We have to enhance learner performance and bring in other programmes such as the culture of teaching and learning. Then we had to look at the promotion of maths, science and technology outputs of the system. Then we had to prepare for the implementation of the new curriculum. In the process of preparing for implementation of the new, there were changes in timelines. Then we had other systemic challenges and had to bring in phasing in of OBE into the FET band. That was another major challenge”. He expressed the hope that by the time the National Curriculum Statement is implemented in Grade 11 and Grade 12 which is in 2007 and 2008 respectively, the system would have stabilised in terms of the capability of Provincial and National Departments to hone in on quality issues.

Currently, according to all the respondents, there are no guidelines, frameworks or methodologies regarding how IKS should be implemented within the curriculum. Furthermore the implementation of Principle 8 to date has been quoted as being inconsistent and limited (Respondent 2) and, according to Respondent 4 the instances of implementation have been fragmented. This can be attributed to a lack of planning and coordination on the part of the relevant authorities, especially during the curriculum development phase.

Respondent 3 expressed the view that the implementation of IKS in the curriculum has not been coherent as “we are starting in the middle”. He explained that it is incorrect to depart from the premise that everyone

understands indigenous knowledge systems and is well conversant with its nuances. To him, a fundamental aspect that is missing is the involvement of experts in the field as well as the inputs of elders who are the actual holders of indigenous knowledge. It is insufficient to rely only on academics wishing to cement their reputations in the field.

However, there are pockets of interventions, mostly run by certain Universities such as the University of the North West, University of Limpopo, University of the Free State and the University of Kwazulu-Natal. Government Departments such as the Department of Science and Technology were also listed as implementers. Respondent 5 commented that currently South Africa's institutions of higher learning are not very responsive and that the faculties of education at the Universities should be playing a very important role in the interpretation of policy and compliance. Respondent 3 however felt that good work is being done by some Universities, more than what is being done at school level, and that this must be acknowledged.

With respect to preparing teachers to implement IKS, Respondent 5 explained that currently the focus and effort made by the Provincial and National Department of Education is to orientate educators on the National Curriculum Statement. The orientation programmes are largely generic, i.e. they are not subject specific and the competency of the educator in infusing IKS into the curriculum is not emphasised. This is clearly not in keeping with the requirements of The National Policy Framework for Teacher Education and Development in South Africa which says that "both conceptual and content knowledge and pedagogical knowledge are necessary for effective teaching, together with the teacher's willingness and ability to reflect on practice and learn from leaners' own experience of being taught. These

attributes need to be integrated, so that teachers can confidently apply conceptual knowledge in practice" (Department of Education, 2006b:6).

In addition, curriculum-related documents, including the National Curriculum Statement, do not clearly define indigenous knowledge systems. "If you look at most of the curriculum policies, they make reference to indigenous knowledge in terms of the assessment standards and learning outcomes but what has happened from my engagement and interaction with the implementation of the curriculum, I found that there is a varied understanding of what indigenous knowledge means" (Respondent 5). He also expressed the view that it is the responsibility of curriculum developers, learning support material developers and teacher development programmes to elucidate it within the different disciplines. Therefore the success of the implementation of IKS will depend on the definition as well as how it is made relevant to the different subjects. An explicit definition outlining the parameters of indigenous knowledge not only informs what is expected of teachers, but it also inscribes the way teachers articulate understanding and meaning in their learning programmes (Samuels, 2003).

The myopia of the developers of the National Curriculum Statement is perplexing and gives further substance to the commonly held understanding in South Africa, that policy development is not coordinated, both within and between sectors. For example, The National Policy Framework for Teacher Education and Development in South Africa (Department of Education, 2006b:6) clearly states that teachers work in "extremely complex conditions, largely due to the pervasive legacies of Apartheid, but also as a result of the new policies needed to bring about change in education". Yet, policy implementation programmes such as teacher training do not demonstrate acknowledgement of this.

4.2.5 Lack of Resources and Support

Dr Rob Adam, a past Director-General of the Department of Science and Technology aptly articulated in his opening address at the SADC Workshop on Indigenous Knowledge Systems Policy Development and Regional Cooperation in June 2004 that "societies throughout the world try to shift away from the dominant paradigm that holds that Western knowledge should be the sole system of knowledge in the world. In the midst of all this, we should find the African voice and means of expression, and develop models of access to information, literacy and reading that plays to the strength and intelligence of the African Peoples. African cultural orientation in research will be key in the development of an epistemology in the face of globalisation" (Department of Science and Technology, 2004:15).

Universities were quoted by some respondents as being non-responsive to the research and teacher training needs related to IKS. This is partly due to their immersion in Western modes of teaching and learning as well as their drive to ensure that teacher qualifications are universally adaptable. In order for IKS to proliferate within the education system, institutions of higher learning must play a key role in contributing to a broader understanding of the body of knowledge. However it is imperative that Universities be clear about whether they aim to legitimise local knowledge solely in the eyes of the scientific community by picking out bits of practical information or whether they are striving to strengthen and maintain its cultural integrity (Appleton *et al*, 1995).

The lack of active research in the field of indigenous knowledge awareness, understanding, application and best practice can also probably be attributed to the lack of a critical mass of indigenous knowledge specialists that would

be able to ensure that indigenous knowledge is properly understood and implemented. Respondent 1 articulated a need for a greater number of high calibre individuals that would be able to make a systemic impact.

Both Respondents 1 and 2 played up the scarcity of knowledge and resources such as baseline information, guidelines and guidance on IKS. These guidelines are required to assist with teacher training, material development and to conduct effective learner assessments. Respondent 1 proposed that high quality resource materials would be able to mitigate the negative effects of the lack of a critical mass of indigenous knowledge specialists. This can be supported by the input of the Panel on History/Archaeology that asserted that "it is little more than a truism to assert that successful implementation of the curriculum rests upon effective support materials of high quality (Department of Education, 2001a:16).

5.2.6 Politics

Indigenous knowledge is a phenomenon where rhetoric and practice tend to diverge a bit, there is often a political payoff to endorsing it but a real political cost to doing something concrete about it (World Bank, 2002). Respondent 2 stressed that those who design the curriculum must not do so purely out of political intentions without having planned with respect to what is relevant. He explained that "the planning and strategy must not be about over reacting or responding to political issues. The politics of the day must not necessarily dictate the intellectual format or the development of the mind that must emerge". Furthermore, the intention of wanting to do things quickly in order to respond to particular political needs and demands without giving cognisance to international and regional best practices is ill-considered. Respondent 2 emphasised that as a new democracy, South Africa cannot pretend to

understand all issues and should thus learn from other countries such as those that have considered environmental justice in their education system.

5.2.7 Monitoring and Evaluation

In terms of the responsibility for monitoring and evaluation of the implementation of the curriculum, Respondent 1 maintained that all structures from the National Department of Education to school level should maintain an oversight role to determine whether the curriculum is implemented the way it was intended. The monitoring and evaluation of qualitative aspects of the curriculum will assist in determining whether the curriculum is being implemented as per the policy. Currently, according to Respondent 5, there is an evaluation instrument but it focuses primarily on key outputs or quantitative matters such as whether there has been teacher development and orientation. The instrument does not consider quality issues, increasing the possibility for IKS to be lost within the curriculum. He argued that this could easily happen as indigenous knowledge is a new element and teachers, because of their training and past experiences, may not be sufficiently motivated or compelled to ensure its integration into the subjects they teach.

Respondent 5 explained that policy compliance to a large extent has been lacking with respect to Provincial Departments' capability as a result of the current system's demands. The current context of having to be able to look at maintaining an old curriculum while phasing it out, and preparing for implementation of a new curriculum has been a major challenge to education managers. He predicts that as soon as the Department of Education moves into a maintenance function, the likelihood is that they will be able to begin to hone in more on the qualitative issues.

As part of monitoring and evaluation, another important area to consider is the quality of learner support material to determine how indigenous knowledge is being included. A review of the Guiding Criteria for Selecting Textbooks for Grade 12 screening process has demonstrated the absence of specific mention of IKS, except within the Life Sciences subject that requires the content to cover various indigenous knowledge systems of life sciences that occur in the different geographical areas of South Africa. Other subject areas such as tourism speak broadly of an appreciation of heritage and culture. From this it is clear that there is a shortcoming in the Guiding Criteria for Selecting Textbooks for Grade 12. The instrument does not adequately and explicitly consider the inclusion of IKS in the different subjects.

This gives weight to Respondent 5's position that it is essential to highlight the fact that although indigenous knowledge systems are embedded as a principle within the National Curriculum Statement, there is no correlation with evaluation instruments such as those intended to screen learner support material. This is important because such instruments are drivers for ensuring that Principle 8 is in fact being infused into the different subjects.

5.3 OPPORTUNITIES

5.3.1 Dignity, Self-Reliance, Empowerment and Innovation

The use of indigenous knowledge systems encourages local community participation and a bottom-up approach to development that makes available resources over which local people have control (IMERCSA, 2005). Furthermore, the inclusion of indigenous knowledge systems into environmental management projects can contribute to local empowerment

and development, raising self-sufficiency and self-determination, local innovation and greater buy-in from the indigenous communities (Langill, 2004). In the same vein, Respondent 1 enunciated that the opportunities linked to the effective implementation of indigenous knowledge within the National Curriculum Statement would be immense and limitless and the dignity afforded to indigenous people would result in a force and energy that would allow them to become active participants in their own education and training. Respondent 1 also spoke of innovation and that if people could mix indigenous knowledge with entrepreneurial spirit, they would be unstoppable. This would contribute to building the economy and improved qualities of life as people would be able to create their own businesses, be self sufficient, self reliant and self confident because they will be motivated by what they know. Respondent 4 also referred to self-reliance as an opportunity.

People will be able to reclaim their dignity by giving meaning to their own lives rather than being treated as subjects of research. This was the sentiment of Respondent 3 who expounded that “for many years Black people were studied because Europe and the West wanted to satisfy itself that when it engaged with the natives, they would be able to control them and determine the natives’ destination and ensure that whatever is needed by them from the natives would be provided as they had studied the natives”.

Based on the inputs from the respondents it can be inferred that indigenous knowledge if properly implemented within the curriculum can serve as a means and process for articulating what local people know, and involving them in the creation of the knowledge required for development. In doing so they would transmit to future generations the best that the present has to offer (World Bank, 2002).

5.3.2 Changing Attitudes and Perceptions

Attitudes and mindsets have emerged as a key theme not only within the preceding discussion on challenges but also as opportunities with respect to the implementation of Principle 8. Three out of the five respondents made either direct or indirect reference to changing perceptions and attitudes.

For example, Respondent 2, in talking about traditional ways of nature conservation that exclude indigenous people from protected areas, explained that by integrating indigenous knowledge into teaching and learning at school, people will see conservation from a different perspective where indigenous communities can assist and benefit from it.

Respondent 3 specified that learners will come to understand that it is not only “through going on an excursion or becoming a game ranger that you become an environmentalist” but it is also through tapping into non-traditional holders of knowledge such as community elders that one can contribute to environmental justice. Also, he referred to the valuing of indigenous knowledge systems within the curriculum as a decolonising process, decolonising the mind in terms of Western perceptions thereby providing the opportunity to educate those who have been miseducated.

Respondent 4 made specific reference to environmental education stating that “an appreciation of the environment through a rigorous curriculum will also begin to turn around attitudes about things like labour. A lot of you young people today wouldn’t want to work with your hands, it’s seen as just a blue-collar job. But the world cannot live without an appreciation of the environment and an appreciation of training people on how to maintain the environment”.

5.3.3 Environmental Education

Indigenous knowledge systems can make a valuable contribution to the area of environmental education. One of the fundamental factors supporting this relates to the manner in which indigenous knowledge evolved i.e. in close association with the local environment. Ulluwishewa *et al* (1997) explain that local people have developed enormous volumes of knowledge about their local environments over the centuries by directly interacting with the environment.

Given this intimate relationship between IKS and the environment, it stands to reason that effectively teaching indigenous knowledge within the curriculum can assist to bring about constructive behavioural changes in learners with respect to environmental management and thus promote education *for* the environment. Respondent 4 aptly captured this by explaining that a good curriculum, that stresses the importance of the environment and the role of IKS in it, would help to develop a well balanced learner at the end of the day. This is line with the intended outcomes of the National Curriculum Statement which places primary emphasis on the type of learner that will emerge out of the schooling system, i.e. a learner that will be "imbued with the values and act in the interest of a society based on respect for democracy, equality, human dignity and social justice as promoted in the Constitution" (Department of Education, 2003:17).

Ulluwishewa *et al* (1997) warn that while the integration of indigenous knowledge into environmental education offers many advantages, the attempts to do so may be fraught with difficulties. Its uncodified, undocumented nature means that indigenous knowledge is not readily available for teachers. They also state that indigenous knowledge is

increasingly disappearing with the death of older people who are the bearers of indigenous knowledge. Therefore, measures should first be adopted for the collection and documentation of indigenous knowledge. This information may then be integrated into the curriculum towards environmental education.

> *We could also talk about an enlightened society. A society that is culturally, socially and environmentally intelligent. Just to go out and listen to a bird that is meant to be warning them-this is not understood by a lot of people. These are the bodies of knowledge that we have lost which if reinserted will teach an appreciation of the environment.*
>
> Respondent 4

A prime example of what Respondent 4 is referring to relates to the tsunami's that devastated much of South and East Asia in 2004. The Central Chronicle (2005) reported that in Kolkata, India, the five aboriginal tribes inhabiting the Andaman and Nicobar Islands emerged unscathed from the tsunamis because of their age old warning systems. It was reported that the tribes' ability to read the biological warning signals such as the cry of birds and the change in the behavioural patterns of marine animals gave them time to move to areas of safety.

Other environmental education matters raised by this study include the point of view of Respondent 3 that for environmental justice to be achieved, people's local knowledge must be validated and must play a role in formulating world views. He articulated that indigenous knowledge is actually environmental education.

Respondent 4 raised a number of other opportunities related to environmental education. Firstly, he spoke of new areas of environmental management and

its associated career paths opening up with the realisation of the role of IKS in environmental management. Secondly, he raised the matter of reinstating indigenous practices that are environmentally sustainable, which also have health implications. For example, the move towards organic foods that are less contaminated with chemicals such as pesticides. Such opportunities can be utilised for environmental education. Thirdly, he referred to an enlightened society that is “culturally, socially and environmentally intelligent” and is able to read environmental cues. For him, the reaffirmation of IKS will contribute to an appreciation of the environment.

It is apparent from this study and the findings of other research that indigenous knowledge systems have great potential value for environmental education and sustainable development. It is thus essential for this knowledge to be preserved for future generations and Ulluwishewa *et al* (1997) explain that one of the best mechanisms to achieve this is through its integration into formal education. However, integration without effective implementation will not bear fruit.

5.3.4 Research and Opportunities for Resource Materials

In the face of globalisation, rapid environmental changes, changing value systems and the breakdown of traditional communication networks, indigenous knowledge systems are facing rapid erosion and possible loss. It is thus essential for researchers and scholars to play an active role in capturing and documenting indigenous knowledge so that all sectors of society may have access to it for application towards sustainable development.

Respondent 2 highlighted that indigenous knowledge as part of the curriculum can offer the opportunity for learners to do active research. Learners can use this opportunity to find out about their own communities and the information that they collect can be used as resources for the school. The role of the teacher here is to ensure that the information the learners bring to the classroom is correct in order to ensure that fallacies or misconceptions are not perpetuated from year to year, especially if the research is retained to serve as reference materials.

Respondent 3 also spoke of research, but at a higher level. He explained that because Universities such as Limpopo University, University of Kwazulu Natal, Free State University and the University of the North West have already done work on IKS, they have created windows of opportunity for postgraduate students to study it. These research opportunities can contribute to the development of resource materials which if published should serve as reference material for others, especially teachers. In addition, the work being done by these Universities can be used as benchmarks by others and encourage research into relevant areas within IKS.

5.4 CONCLUSION

As mentioned in the preceding chapter, the findings of this study are closely linked to the findings of other research. Furthermore, the consistency in responses among the interviewees highlighted a general concurrence on the various issues relating to the effective implementation of indigenous knowledge systems within the school curriculum.

The findings of this study are replete with the challenges facing the effective implementation of the principle of “valuing indigenous knowledge systems”.

These included the Western method of decontextualising and categorising knowledge, wherein information is arranged into specific disciplines or focus areas and taught within these frameworks. Conversely, indigenous knowledge systems do not differentiate. Environmental education, for instance, is taught within the context of the people's lives and integrates all aspects of knowing and understanding.

Teacher training emerged as a critical success factor in preventing the loss and distortion in the intergenerational transmission of indigenous knowledge. If not adequately addressed this could also become a fatal flaw in its continued existence, especially within the school curriculum. The lack of training on how to integrate indigenous knowledge systems into the various subjects, the lack of teacher and learner support materials, the expectation of teachers to be able to integrate learners' informal education with their formal education and the need to prevent teachers imposing their own biases and preferences on learners, all portend against the effective implementation for Principle 8. Teachers are expected to undertake a multitude of tasks under very demanding circumstances and usually in difficult environments. Training programmes that effectively respond to the requirements of the curriculum, beyond mere orientation to the technicalities of the new pedagogy, are essential to properly equip teachers with the skills and knowledge necessary for them to meet the expectations placed on them by the National Curriculum Statement.

Furthermore, curriculum-related documents that do not clearly define indigenous knowledge systems, systemic issues within the Department of Education, monitoring and evaluation instruments that do not give consideration to indigenous knowledge systems specifically or adequately, the non-responsiveness of higher education institutions to the issue of

indigenous knowledge systems in the curriculum, and non-responsive teacher training programmes were highlighted as challenges. A major shortcoming was that, during the curriculum development phase, the complete trajectory of integrating indigenous knowledge into the curriculum was not taken into account thus leaving the value chain from concept to completion fractional.

Fortunately the picture is not completely gloomy. Self-reliance, dignity, respect, entrepreneurship, innovation and self determination featured among the opportunities that the effective implementation of Principle 8 can offer. Further to this, a curriculum that effectively integrates indigenous knowledge and consequently environmental education can open up new areas in environmental management and its associated career paths, as well as develop a well balanced learner. In addition, learners may be imparted with a greater appreciation of the role of indigenous knowledge in environmental management thereby steering them away from past discriminatory practices that effectively isolated indigenous people from their habitats in the name of environmental conservation.

With respect to higher education institutions, some Universities have already commenced with research into indigenous knowledge systems as well as training interventions for teachers. These interventions can be used as benchmarks for others, encourage greater interest in indigenous knowledge research, and help develop the sorely needed resource materials for learner and teacher support. In the absence of a critical mass of well-trained teachers, a potential short-to-medium term solution is the availability and accessibility of suitable and adequate resource materials.

A key finding of this research is that it is essential for present learners coming through the education system to realise that there are different ways of

knowing and understanding the world in which we live. Therefore, instead of only favouring Western perspectives, or subjugating indigenous perspectives, learners should be encouraged to embrace both bodies of knowledge as complementary. The inclusion of indigenous knowledge systems in the curriculum does not require the development of a completely new subject. Instead, what is required is the effective integration of this body of knowledge into existing subjects. This must be done in a manner that presents the subject matter in a way that logically connects the factual elements of the subject with indigenous knowledge whilst being cognisant of the learner's experience. All this requires a serious re-orientation of subjects and teachers.

CHAPTER SIX

CONCLUSION, RECOMMENDATIONS AND FURTHER WORK

6.1 CONCLUSION

The South African Department of Education has, in consultation with numerous stakeholders, recognised and acknowledged the value of indigenous knowledge systems as indispensable components of South African people's education, evidenced by the incorporation of Principle 8 in the National Curriculum Statement. However, whilst this policy might have emphasised the importance of a culturally responsive curriculum, there remains much work to be done to fully achieve the intent.

During the first decade of democracy, South Africa was swamped by a range of legislation and policy aimed at redressing the effects of apartheid policies and practices. The problem with many of the policies and legislation was that very few had clear and formal associated implementation plans and rollout programmes. Even where provided, these were inadequate. The inadequacies related to poor costing, poor monitoring and evaluation mechanisms and poor resourcing. The findings of this study point to the National Curriculum Statement, and its indigenous knowledge provision, as being an example of a policy that is rooted in redress, but poorly constructed with respect to its implementation.

The effective implementation of indigenous knowledge systems, as a thread that cuts across all aspects of the National Curriculum Statement, and consequently as a valuable mechanism of environmental education, hinges

upon highly competent teachers, trained to implement the requirements of the curriculum and supported by appropriate guidelines, frameworks and resource materials. Currently the situation is characterised by:

- teacher training programmes that are focussed on curriculum orientation or pedagogical technicalities rather than being content and subject specific with a focus on indigenous knowledge systems;
- the lack of a clear definition of indigenous knowledge systems and guidelines on how to implement it within the curriculum;
- teachers that have been trained within Western epistemologies;
- inadequate resource materials to support implementation of indigenous knowledge systems; and
- a dearth of training courses run by higher education institutions for both pre- and in-service teachers and the expectation on teachers to adapt quickly and effectively to a new pedagogical approach thus testing their teaching competencies even further.

Furthermore, the legacy of South Africa's colonial and apartheid past is proving to be enduring. Western perspectives still dominate learning and teaching, and many South Africans, including its indigenous peoples have developed the belief that Western epistemologies are superior and are directly correlated with progress or civilisation. Indigenous knowledge systems are consequently relegated to the status of backward or obsolete. Even some African scholars, expected to be strong supporters of the cause for indigenous knowledge systems, have become so immersed within the Western system of knowing, that they are unable to understand indigenous culture and history and their place in its preservation and promotion.

The growing challenge to the assumption that the products of modern Western science provide the answers to the world's development needs, brings to the fore the importance of indigenous knowledge systems. Education has a major role to play in this regard and opportunities such as Principle 8 should thus be fully embraced. The intention should not be to subjugate any body of knowledge, whether Western or indigenous, but to instil in the learner the realisation and appreciation of the value that different knowledge systems can bring to an understanding of the world, how it works and our role within it. In so doing, learners will be provided with the skill to make judicious decisions regarding important points of convergence between knowledge systems which can help contribute to sustainable development.

6.2 RECOMMENDATIONS

Recommendation 1: Streamlining the Definition of Indigenous Knowledge Systems

It is recommended that the definition of indigenous knowledge systems within the National Curriculum Statement and other generic documents be streamlined in order to provide a more comprehensive picture of what it encompasses. For this, a variety of sources can be utilised including this study, which spells out the multifaceted and inter-disciplinary nature of indigenous knowledge systems.

Recommendation 2: Learning and Teaching Support Materials

Indigenous teachers and elders from indigenous communities should play a more prominent role in the development of learning and teaching support material. Such an endeavour should be spearheaded by the National

Department of Education in order to ensure that this requirement is built into the terms of reference for the development of learning and teaching support material.

Secondly, learners should be actively encouraged to engage in their own research and discovery and to bring their findings into the classroom for interrogation, modification and adoption. This will serve a twofold purpose namely, allowing learners to explore their own local knowledge and environments and also to promote the development of locally responsive resource materials that can be used repeatedly in the classroom.

Finally, the Department of Education should support the research and advocacy efforts of higher education institutions working to broaden the recognition and impact of indigenous knowledge systems. In addition, the Department should liaise with these and other stakeholders in the field of indigenous knowledge systems to establish a teacher-accessible repository of resource materials and locally available expertise.

Recommendation 3: Pre-Service and In-Service Teacher Training

The inclusion of indigenous knowledge training in pre-service and in-service teacher training is critical in order to assist teachers to understand how to integrate it into their teaching, how to identify useful and correct information and how to assist their learners to integrate their prior learning with the formal curriculum. Given the newness of indigenous knowledge systems to the curriculum, it is essential that education managers within the Department of Education initially identify how it can be effectively incorporated into teaching and learning. They must first identify what is appropriate, the level of complexity at which it should be brought in and to link that level of complexity

to the assessment standards and learning outcomes of the different grades. But, at the same time, the relevance of understanding must not be confined to a specific Grade as this will undermine the principle of prior learning.

Pre-service training (PRESET) of teachers should include the study of indigenous practices as well as its links to environmental education. Ideally, this should result in certification in at least one module on teaching IKS. The training should include several indigenous practices emanating from different communities in South Africa and should build on the experiential knowledge of the educator where possible. This will serve to expose teachers to the realities of the various sources of indigenous knowledge as well as provide them with the experience to facilitate the integration of indigenous knowledge systems into their teaching, especially the experiential knowledge of their learners. The development of such training programmes should be done in close collaboration with organisations and/or community representatives with knowledge and understanding of IKS.

In-service training (INSET) should expose teachers to their local indigenous practices and they should be instructed on how to integrate the out-of-school experience of their learners with the formal curriculum. New pedagogical methods that are grounded in the skills and concepts of indigenous knowledge and imaginative teaching approaches, among others, should be employed to update educator's skills. Universities and other tertiary institutions, already recognised for their work in indigenous knowledge systems, should provide in-service training. From these programmes Master Educators should be identified to serve as local trainers to other educators.

Both INSET and PRESET training programmes should include education *in* the environment so as to provide teachers with hands-on and holistic learning

opportunities that familiarise them with the use of local environmental resources in their teaching. The advantages of this approach is that it will raise awareness amongst teachers and their learners about local environmental issues as well as provide a rich source of material for the infusion of indigenous knowledge into the curriculum. In addition, education *in* the environment will assist learners to more easily bridge the gap between the familiar and novel as they are already *au fait* with their local environments. The training should not be prescriptive but allow for flexibility so the teachers will be able to effectively use their local environments as a source of material and ideas when developing their learning programmes. Part of the competency development requirements for the teacher should be the skill to establish beforehand what the learner's experiential understanding of the material is.

INSET and PRESET programmes should be reoriented to be subject specific rather than generic. These programmes should emphasise the competency of the teacher to infuse indigenous knowledge into their teaching. Alternatively, every teacher development programme should have at least one module dedicated to training teachers on how to infuse indigenous knowledge systems into their teaching.

All teacher training should also take cognisance of the multi-cultural nature of classrooms and thus equip teachers with the skills, attitudes and behaviour necessary to facilitate teaching and learning in multi-cultural classrooms so as to avoid teachers imposing their own preferences on learners.

The Department of Education should investigate opportunities for ensuring that indigenous knowledge systems are integrated into the training for the professional teacher qualification. International best practice on culturally

responsive curricular should be used as benchmarks thereby ensuring that the teacher qualification is still internationally comparable but locally responsive.

***Recommendation 4*: Higher Education Institutions and Research Areas**

Higher Education Institutions should prioritise the infusion of indigenous knowledge systems into their teacher education programmes. These programmes should include skills development on how to extract and exploit learners' experiential knowledge in the classroom as well as how to merge indigenous and Western knowledge systems in a coherent manner.

Existing research on indigenous knowledge systems should be expanded and streamlined to parallel the requirements of the National Curriculum Statement with a view towards linking transformation theories with educational imperatives.

***Recommendation 5*: Monitoring and Evaluation**

Indigenous knowledge systems must form an important component of the curriculum monitoring instrument in order to qualitatively determine how this aspect of the curriculum is being adhered to.

Secondly, evaluation instruments for support material should be amended to explicitly refer to indigenous knowledge systems across the various subjects, especially those that more easily lend themselves to indigenous knowledge integration and environmental education.

6.3 FURTHER WORK

The following additional work has been identified through this study. This would further enhance the outcomes of this study and also provide a direct benefit to the process of effective integration of indigenous knowledge systems into the school curriculum.

5.3.1 Evaluation of teacher training programmes to determine the level of integration of indigenous knowledge systems and education *in*, *for* and *about* the environment and the impact thereof.

5.3.2 Evaluation of monitoring and evaluation materials for the curriculum and for learning and teaching support material to determine the efficacy of implementation of Principle 8.

5.3.3 Survey on support materials and interventions to directly or indirectly assist with the implementation of Principle 8.

7. REFERENCES

Appleton, H., Fernandez, M.E., Hill, C.L.M. and Quiroz, C. (1995) Claiming and using indigenous knowledge, In *Missing Links: Gender Equity in Science and technology for Development*. International Development research Centre, Canada.

Bornman, M. (1997) Environmental education and the curriculum: a South African perspective, *Educare*, vol. 26, no.1, pp. 56-67.

Burger, J. (1990) *The Gaia Atlas of First Peoples: A Future for the Indigenous World*, Penguin Books, Ringwood.

Central Chronicle (2005) Age old warning systems saved Andaman tribes: ASI, *Central Chronicle*, www.centralchronicle.com, 1,11,2005.

Champion, R. (2003) Taking measure: start with a plan, pick subjects carefully, train interviewers to listen, *Journal of Staff Development*, vol. 24, no.3, /www.nsdc.org/library/publications/jsd/champion243.cfm, 11,10,2005.

Cochran, P.A.L. (2004) *What is traditional knowledge?*, Alaska Native Science Commission, www.nativescience.org, 23,02,2004.

Degenaar, J.P. (1988) Environmental education as part of the school curriculum, *Spectrum*, vol. 26, no. 3, pp. 45-47.

De Jager, E.J. (2003) *Inclusion of environmental education in the teaching of the biology curriculum for grades 10-12*, MSc Thesis, University of South Africa, Pretoria.

Department of Education (1995) *White Paper on Education and Training*, Department of Education, South Africa, Cape Town.

Department of Education (2000) *Norms and Standards for Educators*, Government Printer, Pretoria.

Department of Education (2001a) *Report of the History /Archaeology Panel to the Minister of Education*, Department of Education, South Africa.

Department of Education (2001b) *Revised National Curriculum Statement*, Government Printer, Pretoria.

Department of Education (2003) *National curriculum statement Grades 10-12 (General): overview*, Department of Education, South Africa.

Department of Education (2004) *C2005: Revised National Curriculum Statement Grades 4-6 (schools): Intermediate Phase*, Department of Education, South Africa.

Department of Education (2005) *National Curriculum Statement Grades 10-12 (General): Learning Programme Guidelines: Life Sciences*, Department of Education, South Africa.

Department of Education (2006a) *Mission and vision,* www.education.gov.za, 21,09,2006.

Department of Education (2006b) *The National Policy Framework for Teacher Education and Development in South Africa,* Pretoria.

Department of Environmental Affairs and Tourism (1997) *White Paper on Environmental Management,* Department of Environmental Affairs and Tourism, South Africa.

Department of Environmental Affairs and Tourism (2003) *National environmental education programme*, www.environment.gov.za/projprog/2003neep/capacity building 21052003, 25,05,2005

Department of Science and Technology (2004) *SADC Workshop Report on Indigenous Knowledge Systems Policy Development and Regional Co-operation,* Department of Science and Technology, South Africa.

Department of Science and Technology (2005) *Indigenous Knowledge Systems*, Department of Science and Technology, South Africa.

Dickson, D. (2002) *Traditional knowledge and modern science*, Science and Development Network, www.scidev.net, 06,09,2004

Doyle, J.K. (2004) *Handbook for IQP advisors and students: Introduction to Interviewing Techniques*, Worcester Polytechnic Institute, www.wpi.edu/Academics/Depts/IGSD/IQPHbook/ch11c, 25,05,2004

Du Toit, C.W. 2005. The environmental integrity of African indigenous knowledge systems: probing the roots of African rationality, *Indilinga: African Journal of Indigenous Knowledge Systems,* vol. 4 (1), pp 55-71.

Emkiwe-Abayao, L. 2003 Ifugao knowledge and formal education – Systems of learning in the Phillipines, *Cultural Survival Quarterly*, issue 27, no. 4, http://www.culturalsurvival.org, 13,10,2006.

Fernandez, M.E. (1994) Gender and indigenous knowledge, *IK Monitor*, vol. 2, no. 3, www.nuffic.nl/ciran/ikdm/2-3/articles/fernandez, 17,03,2004

Fiske, E.B., and Ladd, H.F. (2004) *Equity: Education Reform in Post Apartheid South Africa*, Brookings Institution Press, Washington D.C.

Grenier, L. (1998) *Working with indigenous knowledge: A guide for researchers*, International Development Research Centre, Canada.

Gordon, W. (1999): *Goodthinking: a guide to qualitative research*, Ad-Map, Henley-on-Thames.

ICAE. (1992) *Treaty on environmental education for sustainable societies and global responsibility*, http://www.prosus.uio.no/english/sus_dev/alternativ-agenda/Environmental_Education.html, 09, 06, 1992,

IMERCSA. (2005) *Factsheet 9: Indigenous Knowledge Systems*, www.sardc.net/imercsa/zambezi/zfsheet/zsheet09.html, 21,01,2005.

James, W. (ed). (2001) *Manifesto on values, education and democracy*, Ministry of Education, South Africa.

Kreisler, A. and Semali, L. (1996) Indigenous knowledge in the management of malaria and visceral leishmaniasis among the Tugen of Kenya, *IK Monitor*, vol. 5, no. 1, www.nuffic.nl/ciran/ikdm/5-1/articles/semali, 25,04,2004

Kroma, S. (1995) Popularising science education in developing countries through indigenous knowledge, *Indigenous Knowledge and Development Monitor*, vol. 3, no. 3, www.nuffic.nl/ciran/ikdm/3-3/articles/kroma, 25,04,2005.

Lang, G. and Heiss, D.H. (1994) *A practical guide to research methods,* University Press of America, Lanham.

Langill, S. (2004) Introduction to indigenous knowledge, *The Overstory: Agroforestry E-Journal*, www.agroforestry.net, 06,09,2004.

Lindsay, J.M. (1997) *Techniques in human geography*, Routledge, London

Lotz-Sisitka, H.B. and Raven, G. (2001) Active learning in OBE: environmental learning in South African schools, In *Research report of the National Environmental Education Programme-GET pilot research project*, Department of Education, South Africa.

Mail and Guardian (2005) South African National parks-learning from the elders, *Mail and Guardian Online*, www.mg.co.za, 03,05,2006.

Maila, M.W. (2003) *Issues and challenges regarding the implementation of environmental education policy in formal education in South Africa*, MSc Thesis, University of South Africa, Pretoria.

Mazur, R.E. (1996) The indigenous knowledge movement: global support for local resource and decision-making control, In *Indigenous Knowledge and its Uses in Southern Africa*, Normann, H., Snyman, I. and Cohen, M. (eds), HSRC Press, Pretoria.

Mokuku, T. and Mokuku, C. (2004) The role of indigenous knowledge in biodiversity conservation in the Lesotho Highlands: exploring indigenous epistemology, *Southern African Journal of Environmental Education*, vol. 21, pp 37-49.

Ntsoane, O. (2002) Colonial education and the production of rural misfits, In *Teaching Endogenous Knowledge: Issues, Approaches, Teaching Aids.* Africa Research Centre, Belgium.

Odora-Hoppers, C.A. (2004) *Indigenous knowledge and the Integration of Knowledge Systems: Towards a Conceptual and Methodological Framework,* Human Sciences Research Council, South Africa.

Odora-Hoppers, C.A. (2005) *Culture, Indigenous Knowledge and Development: The Role of the University*, Centre for Education Policy Development, Johannesburg.

Ogunniyi, M.B. (2005) *Teacher' Understanding of the Nature of Science and Indigenous Knowledge Systems*, University of the Western Cape, www.interaction.nu.ac.za, 21,09,2005.

Panday, S. (2002) *The relationship between environmental education and science education in the South African context*, Masters Thesis, University of South Africa, Pretoria.

Payle, K.D. (2002) The promotion and mainstreaming of IKS: fundamental to achieving and promoting the public understanding of research (PUR) in developing countries, *Public Understanding of Research in the Developing Countries: Workshop Proceedings*. U.S National Science Foundation and South African Foundation for Education, Science and Technology, South Africa.

Rahman, A. (2000) *Development of an integrated traditional and scientific knowledge base: a mechanism for accessing, benefit-sharing and documenting traditional knowledge for sustainable socio-economic development and poverty alleviation*, University of Waterloo, http://r0.unctad.org/trade_env/docs/rahman.pdf, 18,05,2005.

Rampedi, M.P. (2001) *Criteria for a model for the integration of environmental education into the school curriculum of the Northern Province*, Masters Thesis, University of South Africa, Pretoria.

Rhea, Z.M. (2002) *Raising awareness of indigenous knowledge in science and technology education*, Science and Development Network, www.scidev.net, 09,2002

Robinson, G.M. (1998) *Methods and techniques in human geography*, John Wiley and Sons, England.

Samuels, K.G. (2003) *Perceptions and knowledge regarding indigenous knowledge and environmental education in the natural science curriculum*, Doctoral Thesis, University of South Africa.

Schienerer, S. (2002) Traditional knowledge and sustainable development, *Biodiversity and Sustainable Development.,* Secretariat of the Convention on Biological Diversity, Canada.

Science and Development Network. (2004) *Indigenous knowledge: full introduction*, Science and Development Network, www.scidev.net, 30,08,2004.

Shiva, V. (1993) *Monocultures of the mind: perspectives in biodiversity and biotechnology,*. Zed Books, London.

Shuter and Shooter Publishers (2005) *Understanding FET and the new curriculum*, Shuter and Shooter Publishers Pty (Ltd), Pietermaritzburg.

Snively, G. and Corsiglia, J. (1997) *Rediscovering traditional science in multicultural science education,* www.educ.uvic.ca/connections/conn97/13snively, 06,09,2004

South Africa, (1994) *Reconstruction and development programme*, Government Printer, Pretoria.

South Africa, (1996) *The Constitution of the Republic of South Africa*, Government Printer, Pretoria.

South Africa, (1998) *National Environmental Management Act*, Government Printer, Pretoria.

Stephens, S. (2000) *Handbook for culturally responsive science curriculum*, Alaska Science Consortium and Alaska Rural Systemic Initiative, www.ankn.uaf.edu/handbook.pdf, 06,09,2004.

Tauli-Corpuz, V. 2006 - *The Resistance of the Indigenous Peoples of Asia against Racism and Racial Discrimination*, www.tebtebba.org/tebtebba_files/summit/wcar/racism.htm, 13,10,2006

Toms, R.B. (2005) Indigenous Knowledge Icons, Education and Sustainable Natural Resource Management, *Indilinga: African Journal of Indigenous Knowledge Systems,* vol. 4 (1), pp 264-269.

Ulluwishewa, R., Kaloko, A.A. and Morican, D.H.M. (1997) *Indigenous knowledge and environmental education*. Paper presented at Environmental Education Workshop, University of Brunei, Darussalam

Venter, E. (2006) *Philosophy of Education as a Means to Educate Humanity in a Diverse South Africa,* University of South Africa, http://www.bu.edu/wcp/Papers/Educ/EducVent.htm, 19,07,2006.

World Bank. 2002 Developing indigenous knowledge in Francophone Africa: A four-nation overview, *IK Notes*, no. 42, http://www.worldbank.int/, 05,10,2006.

8. APPENDICES

APPENDIX A

CONSENT FORM 1

I _____ (state title, name and surname) hereby consent to being interviewed by Nirvashnee Naidoo for the purposes of her research project that aims to contribute to an understanding of the issues surrounding the conceptualisation and implementation of principle 8 of the NCS. I understand that my details (such as name, position and rank in organisation) will be kept confidential at all times during this research project.

_____

Signature

Date:

CONSENT FORM 2

I _____ (state title, name and surname) hereby consent to being tape recorded during my interview with Nirvashnee Naidoo for the purposes of her research project that aims to contribute to an understanding of the issues surrounding the conceptualisation and implementation of principle 8 of the NCS. I understand that the interview tapes will be destroyed once Ms Naidoo's final research project has been accepted by the University of the Witwatersrand.

_____

Signature

Date:

APPENDIX B

SUBJECT INFORMATION SHEET AND INTERVIEW SCHEDULE

Before the interview commences, check the following and tick off the boxes:

The respondent has consented to the interview	
The respondent has consented to the taping of the interview	

Good morning/afternoon, my name is Nirvashnee Naidoo. I am currently a part-time student at the University of the Witwatersrand studying towards a coursework Master of Science degree in Environmental Studies. As part of the requirements to obtain my degree I am undertaking a research project that aims to contribute to an understanding of the issues surrounding the conceptualisation and implementation of principle 8 of the National Curriculum Statement (NCS), with a specific focus on the link between indigenous knowledge systems and environmental education. Principle 8 refers to Valuing Indigenous Knowledge Systems.

I kindly invite you to participate in this research as an interviewee. Given your role in the development/implementation of the NCS, you have been selected/recommended to be interviewed about your experiences, opinions and insights on the integration of indigenous knowledge systems (IKS) into the National Curriculum Statement.

The interview should last between 30 to 45 minutes. The interview will be tape recorded to ensure that I capture all the important details of the interview. Please note that you are under no obligation to participate or to answer any question that you do not want to and you may withdraw from the

interview process at any stage. There will be no implications should you choose not to participate, to withdraw from the interview process or not answer specific questions. All data collected from you will be kept confidential as I will be using a coding system rather than actual names of respondents to report my results. ***No reference will be made to your position and rank when referring to your opinions***. If there is anything that you may want clarified, please feel free to ask. Should you wish to contact me at any time regarding this research, please feel free to do so (provide participant with business card). Your participation in this study will add great value to my research.

INTERVIEW SCHEDULE

1. What is your understanding of IKS?
2. What, in your opinion, is the relation between IKS and environmental matters?
3. What in your view was the rationale underpinning the integration of IKS into the NCS?
    a. Who do you understand to have been the key advocates/proponents for its integration and are you able to tell me the reasons why you think they advocated for its inclusion?
    b. Were there opponents to the inclusion of IKS and what were their reasons for opposing its inclusion?
4. Was an implementation plan envisaged during the conceptualisation stage?
    a. How was the implementation envisaged? Was a plan put in place as to whose responsibility it would be to conduct the implementation?

b. What, according to the plan, IKS would be implemented and why was that content selected?
c. How would monitoring of the effectiveness of implementation of Principle 8 be done?

5. To your knowledge, are there any frameworks, guidelines, methodologies or training programmes currently in place to assist with the implementation of IKS?
6. What do you see as the barriers to implementation of Principle 8?
7. What do you see as the opportunities that implementation of Principle 8 may offer?

CLOSING THE INTERVIEW

I would like to thank you for your input. This will go a long way in assisting me with my research. The results will be submitted to the University of the Witwatersrand.

APPENDIX C

CATEGORIES AND RULES FOR INCLUSION

CATEGORY	RULES FOR INCLUSION
1. Nature of IKS	1a). community based/local 1b). not codified/unstructured/undocumented 1c). dynamic/evolves 1d). holistic 1e). contextual 1f). complex 1g). experiential 1h). applied 1i). spiritual dimension 1j). environmental dimension (i). proverbs and idioms (ii). environmental conservation/protection (iii). human-environment relationship 1k). understanding/explaining the world 1l). non-linear 1m). relates and integrates with other bodies of knowledge
2. Colonial legacy	2a). Apartheid/colonialism 2b).CNE 2c).subjugation/exclusion/devalue IKS 2d). Western epistemology 2e).loss of IK/disconnection of Africans/western bias
3. Valuing IKS/Curriculum Transformation	3a). NCS 3b). experiential learning/learner's context 3c). recognition of other knowledge systems 3d). recognition/acknowledgement of African knowledge systems/local knowledge 3e). integration of IKS into curriculum

	3f). culture 3g).new pedagogy/OBE 3h).environmental education/awareness
4. Advocates	
5.Opponents	
6. Conceptual and Implementation Shortcomings	
7. Role-players in coordination, implementation, monitoring and evaluation.	
8. Challenges	8a). ignorance, misunderstanding, lack of appreciation 8b). attitudes, mindsets and the legacy of colonialism 8c). IKS integration into the different subjects 8d). politics 8e). failure to look beyond our borders 8f). lack of resources/support/guidelines 8g). system challenges 8h). monitoring and evaluation instruments 8i). educator challenges (training, development, new pedagogy) 8j). de-contextualisation and separation
9. Opportunities	9a). environmental management and conservation 9b). self reliance/self respect/dignity/respect 9c). entrepreneurship and innovation 9d). research opportunities 9e). environmentally aware/enlightened 9f). changing perceptions and attitudes
10. Recommendations	