

**THE INTEGRATION OF INDIGENOUS KNOWLEDGE SYSTEMS  
(IKS) IN THE TEACHING OF CONSERVATION OF  
BIODIVERSITY & NATURAL RESOURCES: A CRITICAL CASE  
STUDY OF GRADE 10 LIFE SCIENCES EDUCATORS IN THE  
PINETOWN DISTRICT**

IJEOMA JACINTA NNADOZIE

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Master in Science Education, Faculty of Education, University of KwaZulu-  
Natal, Durban, South Africa

Supervisor: Dr B. P. Alant

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## **ABSTRACT**

This is a qualitative case study which sought to explore the integration of indigenous knowledge systems (IKS) in the teaching of conservation of biodiversity and natural resources by Grade 10 Life Sciences Educators in the Pinetown district. The study was done in two parts. Part one explored the Grade 10 Life Sciences educators' understanding of the integration of indigenous knowledge in Life Sciences and the extent to which the educators integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources. The data analysed was collected through questionnaires with open ended questions. Part two interrogated how the two educators who were purposively selected from part one of the study integrated indigenous knowledge in their teaching; as well as what informed the way they integrated indigenous knowledge in their teaching. The data analysed was collected through a pre-observation interview, a lesson observation and a post-observation interview with each of the two participants. The data was analysed within the conceptual framework of teachers as cultural brokers.

The National Curriculum Statement (NCS) policy document for Life Sciences explains indigenous knowledge as another way of knowing and as an alternative way of explaining concepts that are usually explained using scientific knowledge. Hence it encourages the interaction of different ways of knowing in formal schooling. The analysis of part one of the study showed that 90% of the educators that participated in the study said that they integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources. The analysis of how the educators integrated indigenous knowledge in their teaching and what they did when they integrated indigenous knowledge showed that, even though the educators verbally asserted that they integrated indigenous knowledge in their teaching, there was in fact no evidence of a proper understanding and integration of indigenous knowledge in their teaching. Instead, the educators' integration of indigenous knowledge point to the educators using indigenous knowledge to foster and strengthen the learning of scientific knowledge and to promote the interest of their learners in the learning of science knowledge. At the core

of the educators' integration of indigenous knowledge is their concern with their learners' learning of scientific knowledge. In this regard, the educators couldn't be seen to function as cultural brokers in helping learners move between their indigenous knowledge and the science knowledge of the concept of the conservation of biodiversity and natural resources. The analysis showed a limited understanding of the principles and ideas upon which indigenous knowledge can be integrated into the Life Sciences curriculum.

## DECLARATION

I hereby declare that this study “The integration of indigenous knowledge system (IKS) in the teaching of conservation of biodiversity and natural resources: a critical case study of grade 10 Life Sciences educators in the Pinetown district” is my own work and has not been submitted for any degree or examination in any other university.

Ijeoma Jacinta Nnadozie

Signed \_\_\_\_\_

\_\_\_\_\_  
Supervisor (Dr. B. P. Alant)

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# **CHAPTER 1**

## **INTRODUCTION AND CONTEXTUAL FRAMEWORK**

### **1.1 INTRODUCTION**

The achievement of the science for all approach throughout the world and total rebirth of science education in Africa has brought about considerations on how African learners move from their indigenous community knowledge to the scientific knowledge learnt in formal schools (Jegede & Aikenhead, 1999, p. 45). The learning of scientific knowledge at school could help learners in solving problems and better understanding of their daily life experiences (Tobin, 1993). This can only be achieved if learners effectively and meaningfully learn scientific ideas. For learners to effectively and meaningfully learn science, the school science has to connect to the learners' prior knowledge of which indigenous knowledge is part. As a result of this necessity, different educational systems in different countries have included indigenous knowledge in their formal school learning. The South African educational system has developed curricula which are based on the principle of inclusion of indigenous knowledge in education (Department of Education, 2003). Grange (2007, p. 581) explains that South Africa as a multicultural state has different indigenous "knowledges" that are important to the majority of South Africans, hence the integration of indigenous knowledge is a positive development which could provide chances for the interaction of indigenous ideas with the dominant western ideas learnt at school.

In 2003 a Revised National Curriculum was developed for grades R to 9 and the National Curriculum Statement (NCS) for grades 10 to 12. These curricula emphasize the notion of integrating indigenous knowledge into science education. The NCS developed for grades 10 to 12 was implemented in 2006 in grade 10 and in other grades progressively in subsequent years. The NCS for Life Sciences has three learning outcomes which stipulates the knowledge, skills and values that learners are to acquire at the end of the

learning process of the Further Education and Training band. Learning outcome three of the Life Sciences curriculum focuses on indigenous knowledge in Life Sciences. This learning outcome explains indigenous knowledge as one of the ways of thinking and knowing apart from western knowledge and emphasizes the need to recognize the scientific ideas of indigenous people by rediscovering indigenous knowledge in the present day (Department of Education, 2003). The year 2008 marked the third year since indigenous knowledge had been integrated in the South African school curriculum and three years that the new curriculum had been implemented in grade 10.

Mosimege (2005) and Nel (2005) argue that the integration of indigenous knowledge in the South African education curriculum is still at a rhetorical stage and as a result needs to be monitored and evaluated. Grange (2007) explains that successful and effective integration of indigenous knowledge in science learning can only be achieved if educators understand what integration of indigenous knowledge means and have the ability to properly integrate indigenous knowledge in their teaching. It is against this background that the present study situates itself. It seeks to explore, through employing a qualitative case study methodology, how indigenous knowledge in Life Sciences (specifically in the teaching of the concept of conservation of biodiversity and natural resources) has been integrated by grade 10 Life Sciences educators.

## **1.2 FOCUS AND PURPOSE OF THE RESEARCH**

The study focuses on the integration of indigenous knowledge in education, with particular reference to the South African science education. The purpose of the study is to explore the educators' understanding of the integration of indigenous knowledge in science education and to investigate how they mediate and reconcile indigenous knowledge in their teaching of the topic on the conservation of biodiversity and natural resources. To this end the study focuses on a group of grade 10 Life Sciences educators in the Pinetown district of KwaZulu-Natal.

### **1.3 RATIONALE FOR THE RESEARCH**

Firstly, my interest in this area of study arises from my experience as a young African science learner. Studies in science education have shown that in some cases indigenous learners do not make sense of the science learnt at school because it is contrary to most of the indigenous people's ways of making sense of their everyday lives (Tobin,1993 p. 282). I was one of those African children who saw school science merely as a combination of abstract ideas. In other words, the school science I learnt at school did not make connections to my life experiences. Throughout my formal education, there were hardly any explicit connections made between my daily experiences and what I learnt at school.

The second thing that roused my interest in the study is the knowledge and ideas developed through my postgraduate studies in science education. My recent experience in post-graduate studies exposed me to the challenges facing science education, particularly challenges relating to the effective learning of science in schools for non-western learners and the implications of teaching science within a non-western context like Africa. As a result, I have become strongly interested in exploring how the present integration of indigenous knowledge in South African schools can bridge the gap between learners' experiences and the science learnt at school. Indigenous knowledge which is part of the learners' daily life experiences is brought into the science class, thus it becomes imperative that we begin to explore how these experiences can be mediated and reconciled with science learning in the formal school environment.

Lastly, the call by various African scholars that there has to be a reform of Science Education in Africa contributed to my interest. It is significant to note that the recent call for a rebirth of science education in Africa emphasises the notion of contextualizing science education. It is argued that the science learnt at school should be made relevant to the learners' lives. Scholars like Hoppers (2002) and Jegede and Aikenhead (1999) see the integration of indigenous knowledge in the school curriculum as very important. The

South African educational system has begun with initiatives to mainstream indigenous knowledge, an initiative clearly reflected in the Learning Outcome 3 (LO3) mentioned above.

#### **1.4 STATEMENT OF PROBLEM**

The integration of indigenous knowledge in science education especially in South Africa has attracted immense attention within social and academic circles. Most academic scholars have commented on the success and failure of this integration especially with the introduction of the new National Curriculum Statement and Revised National Curriculum Statement. As pointed out earlier, Mosimege (2005) and Nel (2005) maintain that the integration of indigenous knowledge in South African education is still at a rhetorical stage. In this regard, they highlight the importance of proper monitoring and evaluation procedures to ensure successful and effective integration of indigenous knowledge in the curriculum. However, Grange (2007), argues that successful and effective integration of indigenous knowledge in science learning can only be achieved if educators understand what integration of indigenous knowledge means and have the ability to properly integrate indigenous knowledge in their teaching. Hence, educators should understand what this integration is all about and should be competent enough to integrate indigenous knowledge in their teaching of science in the classroom. In order to ensure this, proper monitoring on how and to what extent this is achieved by educators in their teaching of science in the classroom becomes necessary. In line with this, more research studies should be conducted to ascertain the level at which indigenous knowledge is integrated in the teaching and learning of science in the classrooms by science educators.

It is against this background therefore that this study seeks to explore, through employing a qualitative case study methodology, how indigenous knowledge in the Life Sciences (specifically in the teaching of the concept of conservation of biodiversity and natural resources) has been integrated by grade 10 Life Sciences educators. In exploring this, this study explored four research questions as addressed in the following section.

## **1.5 RESEARCH QUESTIONS**

The study was guided by the following four research questions. These research questions were dealt with in two parts in the study. Part one of the study focused on research questions one and two, while part two focused on research questions three and four.

1. What are grade 10 Life Sciences educators' understandings of the integration of indigenous knowledge systems in the Life Sciences curriculum?
2. To what extent do grade 10 Life Sciences educators integrate indigenous knowledge in their teaching of the conservation of biodiversity and natural resources in the Life Sciences curriculum?
3. How do the Life Sciences educators integrate indigenous knowledge in the teaching of the conservation of biodiversity and natural resources in the Life Sciences curriculum?
4. What informs the way in which these Life Sciences educators integrate indigenous knowledge in their teaching of the conservation of biodiversity and natural resources in the Life Sciences curriculum?

## **1.6 CONTEXT OF THE STUDY**

Part one of the study was conducted with 19 educators from high schools in the Pinetown district, while part 2 was conducted with 2 educators from high schools in the Ndengezi and Kwasanti wards, also in the Pinetown district. The Pinetown district constitutes the following categories of schools: ex-DEC/DET; ex-HoA; ex-HoD; ex-HoR – which are also referred to as historically Black, White, Indian and Coloured schools, respectively.



In part 1 of the study, the educators were drawn from all the high schools in the district, which can be classified as 'well resourced' or 'under resourced'. The well resourced schools which are known as the 'ex-model C' schools are located mainly in Pinetown central in the historically white suburbs. These are mostly multiracial schools with higher school fees and better learning facilities and environments. Learners from these schools come from diverse cultures and present diverse cultural beliefs, traditions, myths and experiences. This diversity should serve as an advantage in the way learners learn and comprehend what they are taught in class. Furthermore, the multiracial schools should provide a better and wider range of comprehending scientific phenomena, as learners are able to share their cultural knowledge and experiences with other learners from different backgrounds. Also, teachers in the ex-model C schools come from diverse cultures and, as a result, could be seen to be in a better position to assist learners to integrate their indigenous cultural knowledge in their understanding of scientific knowledge. Where teachers share the same cultural orientation and background as the learners they can obviously facilitate this integration.

The educators selected for part two of the study teach in under resourced schools. The under-resourced schools are mostly located within the historically black suburbs (townships), and are mostly attended by black Zulu speaking learners. These schools provide little (or even, in some cases, no) adequate learning facilities. Learners in these schools are disadvantaged and their parents cannot afford to assist the schools to provide adequate learning facilities. Learners are mostly from the Zulu cultural background, and, as in the case of the historically white schools, bring with them their cultural belief systems and indigenous knowledge which, once again, should play a vital role in the way they comprehend what they are taught in class. An important factor is that, notwithstanding the inadequate learning facilities, the educators in these schools generally share the same cultural background as the learners. As already explained above, this shared background should serve as an advantage in the way indigenous knowledge is integrated in the science classroom.

## **1.7 OUTLINE OF THE STUDY**

This Chapter, which is an introduction to the study, provided a brief background of the study, the focus and purpose of the study, the rationale behind the study, the problem statement, the critical research questions and the contextual background of the study.

Chapter two is the literature review of the study which focuses and explores literatures around the definition of indigenous knowledge systems, universality of knowledge, current emergence of interest in indigenous knowledge in education, indigenous knowledge in science education, integration of indigenous knowledge in science education in South Africa

Chapter three unpacks and elucidates the conceptual framework of this study which focuses on educators as cultural brokers in learners' border crossing and collateral learning.

Chapter four focuses on the research methodology which involves the design of the study (part 1 and part 2), research type and methodology, methods of data collection, sample site and methods, data analysis, ethical issues and limitations of the research.

Chapter five focuses on the data analysis and presentation of findings for part 1 and part 2 of the study, while chapter six which is the last chapter is the discussion of the key findings in relation to some of the ideas developed in the literature review and conceptual frame work for the studies and recommendations for educators, policy makers and further studies.

# **CHAPTER TWO**

## **LITERATURE REVIEW**

### **2.1 INTRODUCTION**

Issues around indigenous knowledge are controversial, ranging from its definition and recent recognition in education and development, to questions of its ownership and value. Despite these controversies, the present study focuses on indigenous knowledge as it relates to meaningful and effective science education, with special reference to science education in the new South African curriculum.

Semali and Kincheloe (1999) focus on the ideas behind the current emergence of indigenous knowledge in education and explore the debates and questions raised about indigenous knowledge in the academy. Nel (2005) and Mosimege (2005) focus on the place and implementation of indigenous knowledge in the postcolonial and post-apartheid South African educational system, arguing that indigenous knowledge has not been given its proper place in the present system despite being recognised by various educational bodies. They maintain that it is time for indigenous knowledge to move from being just a discussion to becoming a practical reality in education. All these issues will be explored in the sections that follow.

### **2.2 WHAT IS INDIGENOUS KNOWLEDGE, AND WHAT IS AN INDIGENOUS KNOWLEDGE SYSTEM?**

To Sillitoe (2002, pp. 8-10) the meaning of indigenous knowledge is not clear. Semali and Kincheloe (1999) regard its present use in educational and developmental circles as confusing. According to them, different terms are used to refer to indigenous knowledge, and they raise questions as to the reasons for the present interest in these formally subjugated ways of knowing in education and development. Posey (2002, pp. 25-26)

argues that the difficulty in defining indigenous knowledge begins with defining the word “indigenous”, starting with questions like “what is indigenous?” and “who are indigenous people?”. History shows that people move from their origin to different parts of the world. Various groups have been displaced by events like slavery, colonization and migration. Various laws have been put in place to protect people no matter where in the world they reside. Such laws limit discrimination and promote the interest of all. In a situation like this it becomes complicated to define “indigenous” and to establish who exactly the indigenes are. Even when the indigenes are defined politically, they are not necessarily referred to as such.

These complications apply particularly to South Africa, which is inhabited by various indigenous groups. As a result of this national communality the identities of the different indigenous groups have been lost. In most instances it is a political issue to decide who is indigenous. Because of the difficulty in defining indigenous knowledge, various alternative terms like “traditional”, “local”, “rural people” and “native knowledge” are used by various scholars when referring to indigenous knowledge (Sillitoe, 2002). The review of literature shows that, irrespective of what the scholars explain indigenous knowledge to be, the common denominator is an association with any knowledge that is jointly held by a group of people and which reflects their interpretation of the world.

In their attempt to arrive at a universally acceptable definition of indigenes and indigenous, Semali and Kincheloe (1999) explain that indigenous knowledge is a body of knowledge generated by members of a given community through their constant interaction with the local environment. In line with this, Maurial (1999) and Reynar (1999) maintain that this system of knowledge is local, holistic and not written down, but rather passed down from generation to generation in an oral form. Mkabela (2006, p. v) sees indigenous knowledge as the traditional knowledge that is embedded in a people’s culture and which is part of their everyday lives, sustaining their survival as a people. Furthermore, Onwu and Mosimege (2004, p. 2) sees indigenous knowledge to be all the knowledge that the indigenous people have used and are still using to live, get use to their environment as well as function in that environment. Du Toit (2005) emphasizes that

indigenous knowledge stems out of the shared experiences of a particular community. This includes the communities' customs, values, attitudes, traditions, beliefs, interactions and ideological orientations (Ngulube & Lwoga, 2007, p. 118). Grenier (1998, p. 1) defines indigenous knowledge as a body of knowledge that is original and rooted in a particular locality. Similarly Mkabela (2006, p. v) explains that this body of knowledge is the sum total of everyday life experiences, which implies that indigenous knowledge cannot be separated from the people that own and produce it.

Drawing from the above definitions, it is significant that indigenous knowledge is not knowledge owned and produced by one person alone, it is knowledge generated and owned by a community of people as they interact with one another and their environment. The community of people that produce indigenous knowledge share hereditary traits; as well as the culture and traditions, beliefs and methods of passing on this knowledge from generation to generation. It is the latter fact that qualifies the knowledge system as indigenous. Indigenous knowledge is produced and developed by a group of people in a particular locality. It is in no way foreign to the group of people that own it, and is embedded in the lives of the individuals of the community. Indigenous knowledge is practical in nature, reflecting the everyday experiences of the people owning the knowledge. It is passed down orally from generation to generation. It is not produced in institutions such as schools, yet it can most certainly be sustained through formal education.

Having defined indigenous knowledge, it becomes important to clarify the interchangeable use of "indigenous knowledge" and "indigenous knowledge system" by some scholars in the field. According to Hoppers (2002, p. 8), the "system" attributed to indigenous knowledge in some cases refers to combinations of different aspects of the indigenous knowledge of indigenous people; an example would be the indigenous knowledge of scientific, technological, social and other systems.

### **2.3 EXAMPLES OF INDIGENOUS KNOWLEDGE ASSOCIATED WITH A PARTICULAR INDIGENOUS COMMUNITY**

Indigenous people are found in different parts of the world, and one country can have many indigenous groups located in different part of the country. The following are some of the examples of indigenous knowledge pertaining to particular indigenous group.

Ngailo and Nortcliff (2007) studied the indigenous agricultural technology of the Wasukuma ethnic group in Tanzania. The Wasukuma people have indigenous ways of naming and classifying soil. Wasukuma farmers identify and classify soils based on their colour, texture, consistency and ability to support the growth of particular plants (Ngailo & Nortcliff, 2007). These criteria used in classifying soils are similar to those used by western soil science in its own classification of soils. Wasukuma soil types like “Ibushi”, “Itogolo”, “Ikungu”, “Luseni”, “Luguru” and “Mbunga” share the characteristics of soils that western science classifies as “Clay”, “Loamy”, “Sandy” and “Humus”.

The Zulu people of South Africa have an indigenous way of conserving maize which corresponds to the scientific way of storing maize in silos. Pits are dug into the ground which are then set alight and covered to kill ants and to dry out. When the maize is put in the pit, the pit is covered with grasses and a rock is put in the opening closing the pit. Cow dung is spread all over the rock to seal it. Some maize on the sides of the pit ferments, producing the gas carbon dioxide which acts as a natural pesticide, killing ants and weevils that might want to eat the maize. The condition inside the pits is similar to that of silos, in that scientists use pesticides that contain carbon dioxide to kill pests in silos (Ayerst et al., 2005, p. 66).

The Nguni people moreover have special ways of conserving sources of water like rivers. They protect the area of the water by placing rocks. They do not let their cattle drink from the water sources that they use for their own purposes, in order to avoid contamination of the water by the animal. They approach the water quietly, so as not to cause frightened water animals to stir up sediments. They also do not allow their children to urinate in

water, scaring them with stories of changing into the opposite sex if they were to do so. The Nguni indigenous knowledge of conserving water helps checking pollution of the water which can lead to disease and death. (Adapted from Ayerst, Langley, Majozi, Metherell, & Smith, 2005, p. 62).

Ayerst *et al.* (2005) also explain how the Swazi people in the past used their indigenous practices in conserving soil and planting trees. The Swazi elders would burn bushes at certain times of the year, not all the time. They would use cow dung as fuel, preventing the cutting down of trees as source of fuel. They planted tall crops (maize) with short (bean) crops, in this way helping the maize to get nutrients from the beans, the root of which has nitrogen fixing bacteria (Ayerst *et al.*, 2005).

Research has been conducted on indigenous knowledge practices that support sustainable development in places like Indonesia, Ecuador, Ethiopia and Venezuela (Grenier 1998, pp. 63-70). It is shown that in Bali (Indonesia) for example, where indigenous beliefs and practices are used to conserve resources, farming practices imitate local ecological processes and help maintain sustainable agriculture (Grenier, 1998). On this basis Grenier comes to the conclusion that indigenous people and their indigenous knowledge systems are important resources in achieving sustainability (Grenier, 1998; Reynar, 1999). The indigenes themselves recognize the fact that they live in complete harmony with nature, as can be seen in practice. Unlike people in Western cultures where nature has been completely altered, indigenous people take from their environment using an environmentally friendly approach. Indigenous knowledge has been identified as a very important tool in the achievement of sustainable development.

#### **2.4 HOW IS INDIGENOUS KNOWLEDGE PRODUCED IN A COMMUNITY?**

A community, as defined by Nel (2006, p. 99), is “a group of people distinguished in a plural society through association, cultural practices and shared outlooks”. In the same light, Jegede and Aikenhead (1999, p. 46) define a community as a “group of people with a shared past, that have ways of recognising and displaying their differences from other

groups”. According to them, culture is the tool that communities use to make sense of the world. As already stated, indigenous knowledge refers to knowledge systems developed by people in a community as they interact and make meaning of their environment. There is therefore no particular formula for generating this knowledge. Indigenous knowledge is informal, developed and produced through experiences, observations, trial and error. As people interact with their environment they produce knowledge about plants, animals, the weather and so on. This knowledge is passed down orally from generation to generation and is part of the life of the people. It is encoded in proverbs, stories, riddles, music and songs which form the deposit of knowledge.

## **2.5 THE UNIVERSALITY OF KNOWLEDGE: WHICH KNOWLEDGE IS LOCAL AND WHICH IS UNIVERSAL?**

There are debates about the universality of western knowledge and its dominance over other knowledge forms. The question arises which knowledge is universal and which is local? It is necessary to understand the meaning of the word “knowledge” before further exploring the universality of knowledge. Knowledge as defined by Ngulube and Lwoga (2007, p. 119) is concerned with the way in which people understand the world and apply meaning to their experiences. The word “local” means belonging to a particular place or district. Therefore, local knowledge is detailed knowledge of a given locality which is basically acquired by living in that locality. This implies that indigenous knowledge, which is knowledge generated by a group of people living in a particular environment, is local knowledge produced by the people of a community. People within a particular community have detailed knowledge of the area in which they interact, and apply meaning to their experiences (Ngulube & Lwoga, 2007, p. 118). This implies that there is a specific knowledge that one generates as a result of living in an area that is different from other areas. Hoppers (2002, p. 8) states that “knowledge is diverse and varied”; the knowledge of people found in area A will be different from the knowledge of people in area B, based on the fact that people interact differently with their environment as they attempt to understand and make sense of it. If all knowledge is local in this sense, it could be argued that western knowledge is a local knowledge like any indigenous knowledge.



According to Semali and Kincheloe (1999), western knowledge, contrary to claims that it is universal (applicable to all people and all places) is indeed one of many locally generated knowledge systems, but which denies its locality as it projects itself as universal. Loubser (2005) argues that abstract sciences originated from indigenous knowledge. He substantiates this reasoning by showing how Hippocrates, the founder of ancient medical science, built on traditional medicine. Therefore, the European knowledge that is seen as universal could be regarded as the local knowledge of Westerners. This knowledge was produced and developed by the Europeans as they tried to make sense of their own environment. No knowledge system can therefore claim universality and dominance over other knowledge systems.

Indigenous knowledge is certainly different from western knowledge in the sense that it deals with the everyday life of indigenous people and is acquired orally. Indigenous knowledge, unlike western knowledge, does not exist in laboratories and archives. It is inherited, and acquired through direct contact with the natural and social environment. Also, as explained by Semali and Kincheloe (1999), indigenous knowledge is not divided into sections in the way western knowledge is taught as different subjects at school.

## **2.6 THE DOMINATION OF THE WESTERN KNOWLEDGE SYSTEM AND THE SUBJUGATION OF AFRICAN INDIGENOUS KNOWLEDGE**

Leshan and Margenau (1982) and Fosnot (1988) (as cited in Semali and Kincheloe, 1999, p. 25), maintain that western knowledge was developed as the Europeans tried to understand their environment. After the Black Death in Europe, western scholars developed new ways of seeing the world in an attempt to understand and take control of it (Semali & Kincheloe, 1999, pp. 25-26). This led to the application of abstract thinking in the understanding of the natural environment (Mahoney & Lyddon, 1988 cited in Semali & Kincheloe, 1999, p. 26).

African indigenous knowledge were subjugated by colonisation and replaced by western knowledge (Semali & Kincheloe, 1999, pp.31-32). One of the consequences of African colonisation by the Europeans was the oppression of the indigenous people and subjugation of their indigenous knowledge. This resulted in the non-inclusion of indigenous knowledge in the formal school curriculum, because it was seen as being without any value (Emeagwali, 2003; Maurial, 1999; Nel, 2005; Semali & Kincheloe, 1999).

Knowledge acquired through formal education in Africa was promoted at the expense of the indigenous knowledge of the local people. The Westerners' oppression wiped out the indigenous knowledge of Africans, characterizing it as primitive, unscientific and unpolished. In the past no efforts were made by the colonizers to integrate the African indigenous knowledge in the school curriculum; western knowledge entirely dominated the school syllabus and curriculum. Thus, scholars were forced to learn compartmentalized subjects that were strange and abstract, and which failed to relate to their practical everyday life experiences.

One of the consequences of the subjugation of African indigenous knowledge is that there is a total disjuncture between what the African learners learn at school and what their natural and social environment provides them with. Thus gaps were created between western knowledge and indigenous knowledge in formal African schooling. This resulted in learners finding themselves in two worlds, and never making effective use of what they learnt at schools (Gupta, undated; Maurial, 1999; Semali & Kincheloe, 1999). This kind of learning conflict, as explained by Tema (2002), has resulted in an ineffective and meaningless learning of science.

## **2.7 LIMITATIONS AND PROBLEMS ASSOCIATED WITH THE WESTERN DOMINANT FORMS OF KNOWLEDGE IN AFRICA**

Western knowledge, through the power of colonisation, came into non-western parts of the world like Africa. Western knowledge was used to oppress indigenous people (Semali

& Kincheloe, 1999, p. 29). Western knowledge dominated and eradicated African indigenous knowledge. Indigenous knowledge never had a place in formal schooling in Africa. Through colonisation western knowledge succeeded in replacing the practices, languages, history and cultural values of the local people. It gave the indigenous people false identities as the experiences they encountered and the knowledge that came from those encounters were taken away from them. Above all, western knowledge promoted European expansion (Semali & Kincheloe, 1999, pp. 39-43).

The imposition of western knowledge on non-western people through colonialism and formal schooling has caused conflict in the lives of non-western indigenous groups. This is as a result of the fact that no link is established between the indigenous knowledge of these people and the western knowledge taught in the schools. In Africa, learners perceive the western body of knowledge as abstract ideas because it fails to relate to the realities of their immediate environment. To the African learners western knowledge was unreal and mysterious, hence the African learners referred to western knowledge as the white man's lies (Tobin, 1993, p. 282). Western knowledge alienated indigenous people from nature, as they were taught abstract things that have no direct link to the lives they live every day.

Another problem associated with the western form of knowledge is that it failed to recognise the contributions made by non-westerners in the areas of science and technological inventions (Emeagwali, 2003; O'Donoghue, 2004; Gupta, undated). Sertima (1999) shows that some of the scientific and technological inventions were first made in Africa before the 15<sup>th</sup> century. The Westerners failed to refer to these inventions in the schools they established for the indigenous people of Africa. O'Donoghue (2004) further shows how the colonists misinterpreted the scientific practices of the indigenous people of Africa. Westerners did not value or recognise the contributions made by other people in the production of scientific knowledge and technological inventions. One can say conclusively that this arrogance was rooted in western knowledge's claim as universal knowledge, and its subsequent non-recognition of other forms of knowledge systems.

## **2.8 THE CURRENT EMERGENCE OF INTEREST IN INDIGENOUS KNOWLEDGE IN EDUCATION AND DEVELOPMENT**

According to Semali and Kincheloe (1999), indigenous knowledge has presently taken centre stage in educational and developmental discourse. The promotion of western knowledge at the expense of indigenous knowledge has been criticised, resulting in new calls to give indigenous knowledge a place in education (Semali & Kincheloe, 1999, pp. 4-7). The achievement of a well-balanced and effective learning requires the closure of the gap between western knowledge and indigenous knowledge in the formal school system. This means that one knowledge system should not to be taught at the expense of the other. Indigenous knowledge has to be incorporated in education (Semali & Kincheloe, 1999).

Another issue that necessitated the current emergence of indigenous knowledge in education is the “African renaissance” (Du Toit, 2005; Semali & Kincheloe, 1999; Reynar, 1999). The African renaissance refers to a change taking place in Africa, which is aimed at achieving a deeper understanding of Africa, its languages and ways of development in the 21<sup>st</sup> century (Hoppers, 2002, p. 2). This requires the rebirth of the African continent and the establishment of the terms for African development. As part of this change, indigenous knowledge is examined as an initiative for the recovery of African identity (Du Toit, 2005, p. 56). The rediscovery of Africa cannot be achieved if the knowledge of the African learners is not included in their formal learning. Therefore the value of African indigenous knowledge as a way of re-establishing the lost identity of African people is seen as an imperative.

According to Grenier (1998), the quest to achieve sustainable development and the concern with the balance between man and the ecosystem are among other factors that brought about the increased interest in indigenous knowledge. Grenier (1998, p. 8) states that present needs could be achieved through sustainable development without

compromising the future generation's ability to meet its own needs. Presently, there is an awareness of the value of indigenous practices in taking care of the natural environment in terms of its sustainability. (Some of these have been discussed earlier in this chapter as examples of indigenous knowledge). Burford, Ngila and Rafiki (2003, [www.scienceinafrica.co.za](http://www.scienceinafrica.co.za)) explain that indigenous communities have lived in harmony with their environments and that they have used environmental resources in very sustainable ways. The world's goal of sustainable development has led to the acceptance of indigenous knowledge and the role it can play in achieving sustainability.

The three factors leading to a renewed interest in indigenous knowledge are interrelated. The African rebirth cannot be achieved without achieving the aims of sustainable development, and these two aims cannot be achieved when the learners who represent future generations cannot relate what they learn in school to their everyday lives. Our environment cannot be sustained unless science education is effective and meaningful. It means that all knowledge systems need to be acknowledged and integrated in science education for the intrinsic value they possess. Successful sustainable development can be achieved if work and learning take place at the local, regional, national and international level (Grenier, 1998, pp. 8-11). For work and learning to take place at the local level, there is a need to involve the indigenous people in the project of achieving sustainability and change in African development through the incorporation of their knowledge.

## **2.9 INTEGRATING INDIGENOUS KNOWLEDGE INTO FORMAL SCHOOLING: THE EDUCATIONAL BENEFITS**

Education as defined by Semali (1999, p. 316) "is the engagement of educators and learners in mutual construction of meaningful knowledge". Studies have been carried out on the area of education, and the findings from these studies indicate that indigenous people have deep knowledge of their environment in which they dwell. Therefore, for effective and meaningful learning to occur the educational system has to take into account these indigenous knowledge systems (Semali, 1999); by integrating indigenous knowledge into the formal school system will have many positive educational

consequences. Firstly, it will give learners a firm foundation in their education by giving them the opportunity to recognize their identity. This has many socio-psychological implications for African learners, as they will begin to value their own knowledge and be able to link it to other knowledge systems. Their education will no longer be directed only towards western patterns of thought; but will provide a balance between western and African knowledge systems (Emeagwali, 2003).

Secondly, integrating indigenous knowledge into the formal school system simply suggests that academic knowledge will become richer in content. Western and African indigenous knowledge systems will be given equal place in the academic arena. In this way, academic knowledge becomes a more integrated body of knowledge, embracing different forms of knowledge and thought.

Thirdly, integrating indigenous knowledge in the formal school syllabus and curriculum will create harmony between the two bodies of knowledge. It will give educators the opportunity to use what is obtainable from the immediate environment in teaching learners (Jegede & Aikenhead, 1999). Learners on the other hand will be able to comfortably relate what they have learnt in school with what they experience in their lives; this will enhance meaningful and effective learning. Education will take the form of exposing learners to their natural and social environments, and getting them to move from what they know to what they do not know. This process will ensure more effective learning and be a more holistic form of knowledge acquisition, and it will moreover be inexpensive to implement. Formal learning will no longer be restricted to what is learnt in the classroom alone, but would include every bit of the learner's daily experiences.

Lastly, the integration of indigenous knowledge will bring a total turn-around in the global educational system by giving education a new look. In the school system, African learners will no longer see and take western knowledge as being too abstract and irrelevant to their everyday life experiences. Western knowledge and African indigenous knowledge will complement each other. Learners would be able to use the one body of knowledge in order to explain the other. Science learners would be able to relate

laboratory experimentation to phenomena within their immediate environment. Experiments will no longer be restricted to the science laboratories alone, but could also take the form of the learner's observation of the environment and everyday life experiences (Semali & Kincheloe, 1999). Physics, Chemistry and other science subjects can be taught in African schools by using indigenous explanations. Instead of presenting learners with examples and explanations that are too abstract and far from what they perceive in their immediate environment, they will be taught to connect what they learn in the class to what they observe and experience. In this way the role of the teacher will be to ensure that school learning is relevant to the context of the learners.

## **2.10 THE VALUE OF INTEGRATING INDIGENOUS KNOWLEDGE INTO THE SCHOOL CURRICULUM**

Integrating indigenous knowledge into the school curriculum will not only enrich the curriculum but will also intellectually and psychologically empower the people by recognizing their intellectual capabilities and values. This will further bring about social change in the society and promote justice and equity (Semali & Kincheloe, 1999, p. 15). In the same vein, Paulo Freire and Antonio Faundez (1989), as cited in Semali and Kincheloe (1999, p. 15), maintain that "indigenous knowledge is a rich social resource for any justice-related attempt to bring social change". This social change manifests itself in the recognition of indigenous knowledge and the inclusion of this knowledge in the school curriculum. As a result of this process indigenous people are empowered socially and intellectually.

Transformation implies a shift from what has been. Indigenous knowledge has been dismissed through the imposition of a western knowledge projected as universal knowledge (Semali & Kincheloe, 1999). A clear example is the effect of colonisation on the indigenous people's lives in Ladi's story, told in Semali and Kincheloe (1999, p. 8). In this story there is a total loss of indigenous knowledge and practices. The indigenous people find themselves in a world that is difficult to understand. They have a strange knowledge that they cannot link to their own knowledge (Semali & Kincheloe, 1999).

The integration of indigenous knowledge in the science curriculum will change indigenous people's perceptions of the world. This transformation will also change western perceptions of indigenous people and their practices. Indigenous people will be empowered by their local practices rather than made to feel inferior.

## **2.11 INDIGENOUS KNOWLEDGE AND SCIENCE EDUCATION IN AFRICA**

The main aim of education is to give learners quality training so that they will be able to reach their full potential and be able to meaningfully contribute to society (Department of Education, 1997). This can only be achieved if learning is meaningful and effective. One of the things that has been identified as contributing to African learners' unsuccessful learning of science is the conflict that exists between the learners' indigenous knowledge and the science knowledge learnt at school (Tema, 2002, p. 128). Science education in Africa has been criticized because of its lack of relevance to African people's ways of living (Engida, 2002). School science has not connected with the learners' daily experiences. There is presently a need for school science to relate to the learners' daily lives and to enable students to use it in their daily lives (George, 2001).

The reform of science education is aimed at effective and meaningful learning. This has made the integration of indigenous knowledge in science education necessary. Jegede and Aikenhead (1999, pp. 45-62) explain that meaningful and effective learning of science cannot be achieved unless the learners' prior knowledge, of which indigenous knowledge is a part, is effectively incorporated in the learners' school science. They further explain that this development requires of educators to act as "cultural brokers".

Indigenous knowledge has been integrated recently in some school curricula and in some educational programmes across the globe. Examples of educational programmes that have successfully integrated indigenous knowledge are the World Learning for International Development (WLID), the Alaska Rural Systemic Initiative project (AKRSI) and the Global Fund for Children (GFC) (World Bank, 2005). In these educational programmes, the indigenous knowledge of the different groups served as a



foundation for further development. Learning is based on the people's knowledge, which made it very meaningful (World Bank, 2005).

In South Africa, the National Statement Policy document for Life Sciences Learning was developed and implemented in Grade 10 in 2006 and has moved across the further education and training (FET) band in a progressive manner. Learning outcome 3 of the Life Sciences NCS policy document explains the integration of indigenous knowledge in the teaching of Life Sciences (Department of Education, 2003). Indigenous knowledge is seen as another way of knowing. Western scientific ideas are also local knowledge. All knowledge systems must be recognised in the new South African Life Sciences education (Department of Education, 2003).

Another programme that has integrated indigenous knowledge is Education for Self-Reliance (ESR) in Tanzania (Semali, 1999). Semali (1999, p.310) explained that the programme ESR was more ideological than pedagogical and this brought about the failure of the programme. Thus, programmes designed to integrating indigenous should focus more on the tutorial or instructional practices rather than dwelling endlessly on the ideas and principles of integrating indigenous knowledge in education.

## **2.12 WAYS OF INTEGRATING INDIGENOUS KNOWLEDGE INTO SCHOOL SCIENCE LEARNING**

Having considered the value of integrating indigenous knowledge at school, one needs to explore the ways in which indigenous knowledge can be integrated, for example in science education.

Firstly, the policies should recognize the value of indigenous knowledge in the science programme. The curriculum should include the learners' indigenous knowledge system and practices. An example of a curriculum that values indigenous knowledge is the South African Revised National Curriculum Statement for natural science grade 9 and the National Curriculum Statement grade 10 to 12. Assessment standard 3 of Learning

Outcome 3 for the teaching of Life Sciences in grades 10 to 12 of the South African National Curriculum Statement asserts that “learners should be able to explore and evaluate scientific ideas of the past and present cultures” (Department of Education, 2003, p. 29). Clearly this curriculum values and recognizes the indigenous practices and knowledge of the people.

Secondly, textbooks and other resources should be designed in such a way that they incorporate the activities and practices of the indigenous people. The local settings should be considered in the design of the learning materials. Stories of how indigenous people engaged in scientific practices should be compiled for use in science classrooms (O’Donoghue, 2004, p. 180). Semali (1999, p. 311) explained that “indigenous educators do not have any other model to follow rather than their own ideas developed from local knowledge”. Hence, educators should draw from their own indigenous knowledge when teaching.

Thirdly, the inclusion of indigenous knowledge in the school curriculum should not be treated as a separate entity, but should be embedded in the already existing body of knowledge which will then be open to multiple interpretations (Semali & Kincheloe, 1999). The indigenous knowledge of the learners should be recognised and given a place in the different learning areas. Learners should be given the opportunity to evaluate local history and engage in critical thinking. This will promote democracy and social justice. Education should take the form of a dialogue between teachers, learners and researchers. This will help to empower local students (Maurial, 1999). Learners should be encouraged to explore different views on a phenomenon. A science programme which includes indigenous knowledge alongside western science will place the students in a position to analyse two ways of knowing (Jegede & Aikenhead, 1999).

A constructivist perspective in teaching moreover implies that the science phenomena that are specified to be taught at school should be such that they form part of the contexts of the learners and have relevance for them (Jegede & Aikenhead, 1999). Constructivism means that learners construct knowledge from what they already know; learners construct

knowledge from their social interaction with peers, communities and others (Bennett, 2003). Learning starts from what learners have already learnt in their experiences and contexts.

As learners make connections between their own knowledge and science, the study of science becomes more meaningful and effective. A successful integration of indigenous knowledge into science requires a shift from teacher-centred and content-based teaching to learner-centred and context-based teaching (Emeagwali, 2003). The learner-centred approach will further get learners engaged and involved in the learning process, making them responsible for their own learning. This will automatically put them in a position to explore ideas for better understanding of phenomena. As learners take responsibility for their own learning in their own context, they will challenge existing knowledge. This will lead to improved knowledge development and production. Social interaction with resources in their environment will result in more meaningful knowledge.

The teachers need to be well-informed about the concept and practice of indigenous knowledge and its place in education today. Teachers have to do research on indigenous knowledge, especially on the indigenous knowledge found in the localities where they teach and where their learners come from. Through this research they will become familiar with the knowledge of the learners and develop better ways of integrating this knowledge in their lessons. They also need to understand thoroughly what the curriculum document says about indigenous knowledge and its integration in formal learning.

Integrating indigenous knowledge into science requires teachers to draw from the culture of the learners, resulting in a learning that is meaningful and applicable to the learners and that will enable them to understand the role science could play. Opportunities should further be created for learners to access different ways of thinking about phenomena; this will guide them in formulating their own knowledge (George, 2001; Jegede & Aikenhead, 1999). Local materials and local people should serve as a resource to be used in the schools (Jegede & Aikenhead, 1999; O'Donoghue, 2004). Farmers, for instance, could be invited to schools to teach learners about farming practices.

Since successful integration of indigenous knowledge involves the exploration of alternative views of phenomena and relating science to learners' everyday experiences, teachers need to use strategies that will enable them to teach by drawing from the learners' prior knowledge. The learners move from what they know (their indigenous knowledge) to what they do not know, as they investigate the relationships in the ideas (Bennett, 2003). This will help learners to make a connection between their indigenous knowledge, life experiences and school experiences. The teachers can point to the historical development of concepts and refer to the indigenous understanding of them in order for the students to see that concepts can be understood from different angles (Semali & Kincheloe, 1999).

## **2.13 INDIGENOUS KNOWLEDGE IN SOUTH AFRICAN SCIENCE EDUCATION**

The South African educational system has undergone transformation since the end of the apartheid era. Its aim is to introduce a curriculum that suits the new democratic era and its diverse citizenry. The present educational policy calls for the integration of indigenous knowledge into the science curriculum (Department of Education, 2003, p.12). The new educational policy recognizes the fact that South Africa is diverse and that the learners come to the classroom from different communities with different and unique indigenous knowledge systems. This has implications for science teaching and science teachers in South Africa.

According to Nel (2005), indigenous knowledge in South Africa has remained at a rhetorical level. Nel argues that indigenous knowledge has never been included in the educational system, and that the failure to integrate indigenous knowledge is continuous. This failure to integrate indigenous knowledge can be associated with unwillingness and ignorance (2005, p. 3). In the same vein, Semali (1999, p. 311) stated that "tension and contradictions are always experienced between what is intended by the curriculum and what actually happens in the classrooms". On the other hand, O'Donoghue (2004)

maintains that it is a challenge for African teachers to integrate indigenous knowledge in a system of education whose curriculum is firmly based on Western scientific thought. Nel (2005) further argues that the implementation and monitoring of indigenous knowledge in education has still not been made clear despite the fact that most educational policy documents recognize the importance of indigenous knowledge in school learning. Indigenous knowledge cannot be implemented at tertiary level if it is not employed at the secondary and primary levels. In his analysis of the development of indigenous knowledge policy in South Africa from 1999/2000 to 2004, Mosimege (2005) expresses the need for proper implementation. He maintains that developmental programmes for indigenous knowledge are only taking place in higher education while not much is happening in mainstream education (Mosimege, 2005). The review of literature in this area shows that in order for indigenous knowledge to be effectively implemented, proper means of monitoring and evaluation need to be effected (Mosimege, 2005; Nel, 2005). In this same vein, Grange (2007) explains that for indigenous knowledge to be successfully integrated in science education, the educators need to understand the integration and also have the ability to properly integrate indigenous knowledge in their teaching of science.

It is against this background that the present study, situated in the Pinetown district of KwaZulu-Natal, explores grade 10 Life Sciences educators' integration of indigenous knowledge.

## **2.14 LEARNING OUTCOME THREE OF THE LIFE SCIENCES NCS POLICY DOCUMENT**

Life Science has three learning outcomes which state the knowledge, skills and values learners are to achieve by learning Life Sciences. These are:

- i. Learning outcome 1 which focuses on scientific inquiry and problem-solving skills.
- ii. Learning outcome 2 which focuses on construction and application of Life Sciences knowledge.

- iii. Learning outcome 3 which focuses on Life Sciences, technology, environment and society.

The Life Sciences NCS policy document under learning outcome 3 states that “ a learner is able to demonstrate an understanding of the nature of science, the influence of ethics and biases in Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society” (Department of Education, 2003, p. 12). The document further explains the importance of learners’ understanding that scientific ideas build on the continuous development of knowledge and ideas (Department of Education, 2003) and also mentions that “modern science is based on the traditions of thought that came together in Europe about 500 years ago” (Department of Education, 2003, p. 12). The document sees indigenous knowledge as another way of knowing and thinking. This is evident from the quote below;

*People from other cultures developed other ways of thinking and different knowledge, which are increasingly interactive with western science. People from different cultures have contributed to scientific innovations by making their indigenous scientific knowledge available to scientist from the western frame work of science. This indigenous knowledge needs to be rediscovered for its value in the present day. Scientific knowledge is, in principle, tentative and subject to change as new evidences become available. The study of historical perspectives on the acceptance of scientific explanations highlights how knowledge is contested and accepted depending on the social, religious and political factors. All forms of scientific knowledge need to be explored and critically evaluated. As responsible citizens, learners need to evaluate the past and make decisions about the present and the future uses of science. (Department of Education, 2003, pp. 12-13).*

The above quotation shows the Department of Education’s emphasis on the need to mediate and reconcile indigenous knowledge in Life Sciences education. This is in line with Giroux’s (1991) thinking that knowledge and methods of knowing cannot be

singularly universal. There are many ways and methods of knowing. The policy document also explains the need to rediscover the value of indigenous knowledge in the present day as well as acknowledge that western science is the indigenous knowledge of Europeans (Department of Education, 2003, p. 12).

## **2.15 TEACHING CONSERVATION OF BIODIVERSITY AND NATURAL RESOURCES IN THE NEW NCS FOR LIFE SCIENCES**

Natural resources as described by Ramalingam (1993, p.154) are “the entire earth's natural environment which includes air, water, soil, wildlife, forest, fossils, fuels and minerals”. Biodiversity on the other hand is part of the earth's natural resources which refers specifically to the varieties of living things found on earth (Ayerst *et al.*, 2005; Yuankai, 2010). Natural resources found on the earth provide humans with food, energy and materials very necessary for life (Ramalingam, 1993). Example of the uses of natural resources in our environment is the use of water in the production of electricity for humans. This same water is a form of habitats for some living organisms which help in the production and transfer of energy in our environment. Also natural resources like plants and animals are sources of food to humans as they provide energy and nutrients to human.

Conservation of natural resources (biodiversity included) means protecting and keeping all the natural resources in good condition for further use. They natural resources in our environments need to be used in a sustainable way so that they are not destroyed and hence are available for future use (Ayerst *et al.*, 2005). This is necessary as we humans and other living organisms depend 100% on these resources that are found in our environment to take care of our needs (Ramalingam, 1993; Yuankai, 2010). If the natural resources are not conserved, humans as well as other organisms will run out of resources which will eventually result to hardship and death (Knight, 2003). One of the major means by which humans loose natural resources found in our environment is through development (Ayerst *et al.*, 2005). Example of development that has a negative effect on our natural resources is industrialization. When industries are built, the lands where some

animals and plants inhabit are destroyed which leads to these living organisms dieing off and hence cannot serve their purposes in our environment. The industries also release pollutants into our environment which results to health problems and death of living organisms (Knight, 2003).

Sustainable development takes centre stage in academic and economic debates in the recent times. In 2002, South Africa hosted the United Nations World Summit on sustainable development where there were talks on how development can be achieved without causing harm to our natural resources (Ayerst et al., 2005). “The United Nations General Assembly declared 2010 the international year of biodiversity with the theme *biodiversity is life* and *biodiversity is our life* which is a wake up call for people to prevent the loss of biodiversity in the world”( Yuankai, 2010, p. 42). Ways of achieving sustainable development are being explored globally.

In order for sustainable development to be achieved, the local, regional, national and the international communities need to work together (Grenier, 1998 p. 9). Nel (2006) stated that sustainable development should involve communities and their indigenous knowledge which they have been using in making sense of their environment. According to Burford; Ngila & Rafiki (2003), indigenous communities have live at peace with the environment and have used the resources found in their environments without causing damage to them. This is evident from the discussion in 2.3 on the examples of indigenous knowledge of some indigenous people. The examples of the indigenous people’s knowledge given in 2.3 showcases the positive values and attitudes of the indigenous people towards the natural resources that are found in their communities. They indigenous people’s ways of living were sustainable because their indigenous knowledge molded their actions towards the resources in their environment (Burford *et al.*, 2003). Therefore, since indigenous knowledge are used in achieving sustainability, it is important to preserve and utilize indigenous knowledge in the present need of achieving sustainability (Grenier, 1998). Scholars like Burford *et al.* (2003) see the integration of indigenous knowledge into the formal school curriculum as the most appropriate way to preserve indigenous knowledge. Some Educational curriculum has adopted the



integration of indigenous knowledge into formal schooling of which the South African Educational System is part of. This is further discussed in 2.11.

The new National Curriculum Statement (NCS) for Life Sciences implemented in 2006 has four knowledge content areas. These are Tissues, Cells and Molecular Studies; Structure, Control and Processes in basic life system of plants and animals; Environmental studies and Diversity, Change and Continuity. In the knowledge content area of diversity, change and continuity, conservation of biodiversity and natural resources are one of the concepts that are dealt with in Life Sciences teaching and learning from grade 10-12 (Department of Education, 2003). The NCS for Life Sciences in line with the world's goal for sustainable development included the concept conservation of biodiversity and natural resources in its knowledge content area of diversity, change and continuity.

The educators, in teaching the concept conservation of biodiversity and natural resources in the new NCS have to help learners achieve the three learning outcomes of Life Sciences. These three learning outcomes specify what the learners are to achieve at the end of the learning process in Life Sciences from grade 10-12 (Department of Education, 2003). The three learning outcomes are outlined in 2.14 and learning outcome three which relates to this study is discussed in details. Learning outcome three which is Life Sciences, technology, environment and society focuses on the integration of indigenous knowledge in Life Sciences. Hence, the educators in achieving learning outcome three have to teach the concept conservation of biodiversity and natural resources in a way the learners will be able to demonstrate the interrelationship between indigenous knowledge, the environment and society (Department of Education, 2003).

## 2.16 CONCLUSION

This chapter has highlighted the place and implications of indigenous knowledge in education and science education in particular. The recent emergence of interest in indigenous knowledge in the spheres of education and development has attracted the attention of numerous researchers and scholars. It wouldn't be wrong to say that this is a positive move. The most striking is the call to integrate this body of knowledge in the school curriculum. Different countries have come to realize the importance of integrating indigenous knowledge into the formal school learning process. The South African educational system has designed curricula that adopt the integration of indigenous knowledge in science subjects like Life Sciences. The successful and effective integration of indigenous knowledge in science learning lies in the hands of the science educators. The educators are faced with the challenge of the successful integration of indigenous knowledge in science education. Not much has been written on what the educators are supposed to do when they integrate indigenous knowledge in their teaching. Jegede and Aikenhead (1999) used the concept "educators as cultural brokers to describe the role of a teacher when he/she is helping learners move from their everyday knowledge to their science knowledge learnt as school. The concept educators as cultural brokers serve as the conceptual framework that underpinned this study. This concept is explored in the following chapter.

## **CHAPTER 3**

### **CONCEPTUAL FRAMEWORK**

#### **3.1 INTRODUCTION**

This study investigates how grade 10 Life Sciences educators in schools in the Pinetown district integrate indigenous knowledge in the teaching of conservation of biodiversity and natural resources. Given the nature of the study and its emphasis on educators' understanding of the integration of indigenous knowledge in Life Sciences, it is deemed necessary to use a conceptual framework that presents educators as cultural brokers. The reason for using the conceptual framework of educators as cultural brokers is that it provides an understanding of how the educators can integrate indigenous knowledge in science learning.

The concept “educators as cultural brokers” was first used by Stairs (1995) (as cited in Jegede and Aikenhead, 1999, p.55). He analyzed the role of educators in resolving cultural conflicts that arise in cross cultural education. Jegede and Aikenhead (1999) relate the concept of educators as cultural brokers to science education and focus on how educators can help learners to negotiate and mediate the borders of their community culture and science culture. In this chapter, the concept of educators as cultural brokers is discussed alongside “collateral learning” and “cultural border crossing”. The latter concept closely relate to the need for educators to function as cultural brokers.

#### **3.2 CULTURAL BORDER CROSSING**

Cultural border crossing is the movement of learners from the cultures of their everyday life to the culture of science (Jegede and Aikenhead, 1999, p. 45). Jegede and Aikenhead explain that a learner lives in the midst of many sub-cultures. These include the culture of

home, the culture of peers, the culture of school and the culture of the science classroom. A learner is rooted in all these cultures as he makes sense of his world. Learners coming into school science carry with them all the cultures that they are imbued with while still being expected to interact with the new science culture. Jegede and Aikenhead argue that learning the culture of science implies that learners move from the culture of their daily life experiences to the culture of science. In the process of this movement, clashes of these cultures always occur, resulting in “cultural conflict” (Jegede & Aikenhead, 1999, p. 50). This cultural conflicts experienced by the learners have implications for science educators and science teaching.

The idea of cultural border crossing is founded in Giroux’s (1992) work *Border Crossing: cultural workers and the politics of education* (Jegede & Aikenhead, 1999). Giroux (1992) (as cited in Jegede and Aikenhead, 1999), distinguishes between modernist and post-modernist views on education, and explains that post-modernism persuades individuals to develop holistic explanations of reality as they live in a world of border crossings. Jegede and Aikenhead drawing on Giroux’s (1992) ideas of border crossing and cultural anthropology presented the learning of science as the gaining of science culture. Hence, Jegede and Aikenhead argue that the process of learners moving from their everyday life culture to the culture of science is a particular type of border crossing.

Cultural border crossing as the movement of learners from the culture that characterizes their everyday life to the culture of school science has large implication for non-western learners that learn western scientific ideas at school. For non-western learners, the school science culture embedded in western thought will be too far from the culture of their daily life experiences of which their indigenous ways of knowing are part. Hence, the learners’ learning of science implies crossing from the learners’ community culture to the science culture (Jegede & Aikenhead, 1999). Mulholland and Wallace (2003) explain that learners crossing from the culture of their everyday life to the culture of science do not imply that the learners dump their culture to take up the science culture. The crossing of cultural borders only makes the other culture reachable and accessible. Individuals can

borrow valuable knowledge and skills from other cultures while still keeping their own culture (Mulholland & Wallace, 2003). Hence in science learning, as the learners move from their communities' culture comprising their indigenous knowledge to scientific knowledge, learners learn science knowledge while still keeping their indigenous knowledge.

Cultural border crossing isn't an easy task for learners. Successful border crossing is important in achieving effective and meaningful learning of science. For a learner to successfully border cross across cultures, the learner needs to have the ability to think differently in the various other cultures and to resolve the conflicts that arise from the coming together of the different cultural ideas (Jegede & Aikenhead, 1999). When the learners successfully cross the border of community culture and science culture, effective and meaningful learning occurs. Learners' successful crossing of borders depends on the extent of the disparity experienced by the learners between the community culture and the culture of science. How successfully the learners move between the cultures depends on the type and amount of help the learners get from their teachers in moving between the cultures (Jegede & Aikenhead, 1999).

Bourdieu (1990) (as cited in Mulholland and Wallace, 2003), explains that learners crossing borders experience "symbolic" violence which Jegede and Aikenhead (1999) refer to as "cultural violence". Cultural violence or symbolic violence occurs when an individual who is part of a group of people whose actions do not make sense to him is expected to achieve the aim of being in the group (Jegede & Aikenhead, 1999). In non-western contexts like Africa, learners who are rooted in their communities' indigenous knowledge may experience cultural violence with regard to the science curriculum to the extent that they have to learn the western scientific ideas of the science classroom (Jegede & Aikenhead, 1999).

Studies have shown unsuccessful crossing of borders into the science culture by some Aboriginal students as a result of differences in culture. The story was told of an Aboriginal science student who refused to attend geology courses because he did not

want to contaminate his spiritual belief of nature with the geological explanations of landscape (Aikenhead, 1998).

The global aim of science education is to eradicate cultural violence and to nurture equitable opportunities for success for all pupils. Effective and meaningful learning depends on how successful learners can move between their everyday life cultures and the culture of science (Jegede & Aikenhead, 1999). Learners cannot cross the cultural borders successfully unless adequate help is received from the science educators. This call for teaching strategies that can help the learners in crossing the borders of their everyday life and school science learning. The pedagogy that is proposed by Jegede and Aikenhead is that the educators need to function as cultural brokers to help learners effectively border cross in their learning.

### **3.3 THE THEORY OF COLLATERAL LEARNING**

This theory provides an explanation as to what happens in the mind of the learners when they are at the borders of their community culture and science culture. Learners can hold ideas of their community culture and the contrasting ideas of the science culture in their memory simultaneously for a long time. These conflicting ideas can either interact or not interact. In the case where the conflicting ideas interact, the learners develop good grounds for holding on to the conflicting ideas and will have identified similarities in the ideas which will lead to the learners developing new ideas in the long term memory. Hence, the conflict of ideas is resolved (Jegede & Aikenhead, 1999). In a situation where the conflicting ideas do not interact, the learners access the ideas separately depending on whether they are where the community cultural ideas are used or where the science cultural ideas are used (Jegede & Aikenhead, 1999). The four types of collateral learning identified by Jegede and Aikenhead (1999) are:

- *Parallel collateral learning* refers to a situation where there is coexistence of the opposing ideas of indigenous knowledge and science knowledge. The learners hold these two ideas in their schemata for a long time while trying to make sense

of them. The two ideas do not interact and as result are accessed differently according to the contextual needs of the learners (Jegede & Aikenhead, 1999).

- *Simultaneous collateral learning* is where learners simultaneously learn about a concept from both the indigenous community and their science culture. The learners look for the differences and similarities in the ideas of their indigenous knowledge and science knowledge that relate to the concept in question (Jegede & Aikenhead, 1999).
- *Dependent collateral learning* refers to a situation where the learners modify one idea based on the challenge posed by the other idea which results in the formulation and learning of new ideas. It could be the modification of indigenous knowledge based on the opposing idea of scientific knowledge or vice versa (Jegede & Aikenhead, 1999).
- *Secured collateral learning* refers to a situation where the conflicting ideas interacted with each other, enabling the conflict posed to be resolved (Jegede & Aikenhead, 1999).

Collateral learning provides an explanation of what learners experience when they bring their indigenous knowledge to the science class and engage in science learning. As the learners border cross, collateral learning helps the educators to understand how the learners experience the science knowledge in addition to the learners' indigenous knowledge. This helps the educators in devising better strategies to function as cultural brokers.

### **3.4 EDUCATORS AS CULTURAL BROKERS**

“Broker” is an economics word that has been adopted into cultural studies. Michie (2003) defines a broker as a middle man who most commonly features in situations of commerce. Linking this definition of broker to culture, Michie (2003) further explains cultural brokers to be people facilitating the crossing of a person or a group of people from one culture to another. In other words, a cultural broker is the person who helps negotiate between people's culture and another culture. Relating this to science

education, a cultural broker therefore is someone who facilitates the learners' movement from their communities' culture to the scientific culture. Educators as cultural brokers is used by Jegede and Aikenhead (1999) to refer to the role of educators in helping learners' cultural border crossing during the learning of scientific knowledge at school. In the science classroom into which the learners have come with their indigenous knowledge from their local communities, the work of the educators is to take up the role of cultural brokers, implying that they act as the middle man between the learners' indigenous knowledge and the scientific knowledge.

The concept of border crossing and the theory of collateral learning necessitate that educators become cultural brokers. Since learning science requires that learners move from their community culture to the culture of science, the work of an educator will be to help learners as they border cross, ensuring that collateral learning is effectively used in helping the learners resolve the conflicting ideas held in their memories (Jegede & Aikenhead, 1999). The educators' utilization of ideas of collateral learning will help the learners reconcile cultural borders/conflicts. The educator will have to guide the learners to move successfully from the culture of their everyday life to the culture of science learning. This is why Stairs (1995) (as cited in Jegede and Aikenhead, 1999), uses the metaphor "teachers as cultural brokers" in his analysis of the teachers' role in resolving conflicts that arise in cross cultural education (Jegede & Aikenhead, 1999).

The concept of educators as cultural brokers implies that educators use teaching strategies that make learners feel free with the new culture, rather than teaching strategies that alienate them from the new culture (Jegede & Aikenhead, 1999). For learners to feel free with the new culture, the educators need to integrate the ideas of the learners' communities in explaining natural phenomena to the learners in the science classroom. Also, the educators have to explore and discover some of the learners' indigenous scientific ideas and theories and use them in the science class. Educators also need to promote the values of the learners' indigenous community through the teaching of science (Jegede & Aikehead, 1999). Educators have to help learners develop a way to



accommodate and make sense of their indigenous knowledge and western science knowledge (Semali, 1999).

### **3.5 TEACHING STRATEGIES FOR EDUCATORS AS CULTURE BROKERS**

In the bid to ensure that meaningful and effective learning of science is achieved, researchers have been exploring and analyzing teaching strategies that will help learners in crossing the border of everyday lives into science learning (Jegade & Aikehead, 1999). In Canada, a strategy was initiated requiring learners to fill in two columns, one titled “my ideas” and the other titled “the culture of science ideas”. At the end of the lesson, the learners complete the columns. The educator reads through the learners’ notes and develops ideas about what is going on in the learners’ minds with regard to their community ideas and science ideas. This helps the educator to develop strategies that will be used in helping the learners reconcile the ideas (Jegade & Aikenhead (1999).

Solomon (1992) (as cited in Jegede and Aikenhead, 1999), outlines fifteen teaching strategies that can be employed by educators to serve as cultural brokers. These fifteen strategies are outlined below. Educators who are cultural brokers

- 1. Use many resources and material from different cultures and ensure that racially stereotyped materials are eliminated or addressed in an anti-racist fashion.*
- 2. Ensure that oral narratives and heritage should be part of the school experience and not demarcated as being mere myth and legend.*
- 3. Ensure that the similarities and differences and strengths and limitations of the two traditions should be articulated and explored during instruction.*
- 4. Pay attention to the language of science and help learners who are accustomed to an oral tradition or who have language difficulties.*
- 5. Acknowledge cultural imperialism.*
- 6. Hold discussions about science in relation to history, morality, justice, equality, freedom and spirituality*
- 7. Allow, where possible, for classification schemes to be made in both traditions. .*

8. *Show learners how some concepts such as heat, snow and life cycles are culturally laden in both traditions.*
9. *Provide instruction using sensory experiences and experiential pupil centered learning.*
10. *Provide instruction using local approaches of achieving sustainability.*
11. *Relate the learners' worlds to science instruction.*
12. *Provide a multicultural view of science and technology by drawing from a variety of cultures.*
13. *Design activities to help learners recognize the likelihood of continual change, conflict, ambiguity and increasing interdependence.*
14. *Encourage interactivity amongst learners, encouraging them to identify their own ideas and beliefs.*
15. *Adopt teaching strategies that emphasize solving science and technology problems and resource management in a sustainable way. Pupil empowerment is the goal (Solomon, 1992. Adapted from Jegede & Aikenhead, 1999, pp. 57-58).*

The purpose of the teaching strategies mentioned above is for the educators to give consideration to the learners' community cultural background and indigenous knowledge in their teaching of science in order to help learners border cross successfully. Educators using resources derived from the learners' culture in teaching science will help in making learners feel at ease with scientific knowledge. Educators need to allow the learners to examine the difference between their community cultural ideas and science ideas. The use of the strategies above will help the learners to resolve conflicting ideas that persist in their schemata.

### **3.6 CRITICAL LOOK AT THE CONCEPT OF EDUCATORS AS CULTURAL BROKERS**

It was not easy to locate a conceptual framework that relates to this study on how the educators integrate indigenous knowledge in their Science teaching. Much has not been written on what the educators should do to in order to successful integrate indigenous

knowledge in formal schooling. Researches have mainly being on the need and values of integrating indigenous knowledge in education without how it should be done. Hence this study finds it adequate to use the concept educators as cultural broker which arose from the field of anthropology. One questions the implication of the concept cultural brokers for curriculum and assessment.

### **3.7 CONCLUSION**

This study uses the concept of educators as cultural brokers to explore how educators effectively integrate indigenous knowledge in their teaching. The concept serves as the basis upon which the research questions posed in the study were interrogated and answered.

# **CHAPTER 4**

## **RESEARCH METHODOLOGY**

### **4.1 INTRODUCTION**

This chapter explains in detail the research methodology used in the study. The chapter describes the type of research, the research design and research instruments, the method of data collection and analysis, and the techniques of sampling employed in the process of gathering the data that were used to answer the four research questions. It also describes the ethical issues involved in the research, the limitation of the research and the credibility of the research methodology.

### **4.2 WHAT IS A QUALITATIVE CASE STUDY METHODOLOGY?**

This study is a qualitative type of research that employed a case study methodology in exploring the integration of indigenous knowledge in the teaching of conservation of biodiversity and natural resources by grade 10 Life Sciences educators. Qualitative research is the type of research approach which studies issues whose variables are not known. These variables are then explored in the course of the study (Creswell, 2008 p. 53). The variables in qualitative research are discovered through information provided or gathered from the research participants (Creswell, 2008).

In qualitative research, the participants freely express their thoughts, ideas, experiences and behaviours in their natural settings without any form of interference. This situation makes it possible for the researched or participant to provide/ produce depth and reliable data, thereby enabling the researcher to harvest rich and detailed data from the participants. In this case, participants are not limited in giving information they could give out in the forms of expressing their thoughts and ideas, experiences and behaviours in the cause of a research (Henning, 2004). Thus, qualitative research is “concerned with

the process and the social and cultural contexts that underlie various behavioural patterns” (Henning, 2004 p. 51). As a result, the data usually collected in qualitative study are text. In the data analysis, themes and descriptions are developed from the data text from which the findings are drawn (Creswell, 2008).

This study in using a qualitative approach employed a critical case study methodology. Creswell (2008, p. 462) defined a case study as “an in depth exploration of a bound system which could be an activity, event, process or individuals”. In the same light, Cohen, Manion, and Morrison (2007, pp. 253-254) explained that case study is a research methodology that provides a close look at reality and as a result provides detailed explanations of the phenomena being investigated by focusing on specific instances in a bounded system. The bounded system implies that the case being investigated is detached in terms of boundaries like time, place or some physical boundaries (Creswell, 2008). Further more, a case study involves the detailed study of an individual or a group of people as an entity and gives examples of real people in real situations (Cohen *et al.*, 2007, p. 253). The detailed understanding of a case in a case study is achieved through the use of multiple data sources (Creswell, 2008).

In this study, the case being explored is the integration of indigenous knowledge in the teaching of conservation of biodiversity and natural resources. This case is explored in the bound system of only grade 10 Life Science educators who integrate indigenous knowledge in their Life Sciences teaching. It was important to choose this approach and methodology because it exposes one to the natural setting where the research phenomenon exists and helps in gaining in-depth understanding of the phenomenon investigated. This methodology provided the researcher with the opportunity to go to the schools to interview and observe the grade 10 Life Sciences educators as they integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources. Since a case study methodology requires the use of multiple sources of data in the constitution of data, this research used a questionnaire, interviews and observation. The data gathered through these methods are in the form of text which is one of the characteristics of qualitative research.

### **4.2.1 A critical case study**

This study is seen as a particular kind of a case study; it is a critical case study. This means that its aim is not only intended to evoke further research interests and debates on how best IKS can be integrated in the teaching of science but also intended to make recommendations that will serve as emancipatory measures; measures which are geared towards bringing about positive changes in the way science educators integrate IKS in their teaching of sciences in the classroom. In line with this aim, it is good to note here that the major characteristics of critical case study is the use of its findings to give support and promote equality in the society, and also bring about positive changes through the emancipation of marginalized groups in our society (Creswell, 2008 p. 478). This is evident as this study explored how the formally subjugated indigenous knowledge of indigenous people is being integrated in the formal learning. By doing so, this study draws attention to effective and proper inclusion of indigenous knowledge in formal school which will enhance learners' understanding of scientific concepts.

## **4.3 RESEARCH DESIGN**

This study was divided into two parts.

### **4.3.1 Part one**

Part one of the study answered research questions 1 and 2:

- (1) *What are the Grade 10 Life Sciences Educators' understandings of the integration of indigenous knowledge in Life Science?*
  
- (2) *To what extent do grade 10 Life Sciences educators integrate indigenous knowledge systems in their teaching of conservation of Biodiversity and Natural Resources?*

The data collection method used to gather data for the answering of the two research questions was an open ended questionnaire (see Appendix 4). The data collected were analysed and two of the educators were selected to participate in the second part of the study.

### **4.3.2 Part two**

Part two of the study explored research questions 3 and 4:

*(3) How do the Life Sciences Educators integrate indigenous knowledge in the teaching of conservation of Biodiversity and Natural Resources?*

*(4) What informs the way in which the educators integrate indigenous knowledge in their teaching of Biodiversity and Natural Resources?*

Only two educators participated in the second part of the study. These educators were selected based on the criteria outlined below:

- They must have indicated that he/she integrates indigenous knowledge in the teaching of the conservation of Biodiversity and Natural Resources.
- They must have indicated the willingness to participate in part two of the study.
- They must be in different wards in the Pinetown district.

The methods of data collection used were pre- and post-observation interviews and observations (see Appendices 5-7).

## **4.4 RESEARCH SITE**

Part 1 of the study was conducted amongst grade 10 Life Sciences educators in the high schools of the Pinetown district. In part two of the study, the two educators selected taught in black schools located in different townships in the Pinetown district.

#### **4.5 GAINING ACCESS**

Ethical clearance was applied for to the faculty research office of the University of KwaZulu-Natal. The research office got consent from the KwaZulu-Natal Department of Education on behalf of the researcher. On receiving the ethical clearance certificate (see Appendix 1) from the faculty research office, an informed consent letter (see Appendix 2) was sent to the principals of the high schools in the Pinetown district seeking their permission to carry out the study with the grade 10 Life Science educators in their schools. On getting the principals' consent, a letter (see Appendix 3) was sent to the grade 10 Life Sciences educators in the schools seeking their participation in the research. Questionnaires were given to the 19 educators whose consent was received. After part the first part of the study, the two educators were selected and contacted for the second part of the study.

#### **4.6 PURPOSIVE AND CONVENIENT SAMPLING**

For part one the sample was made up of 19 grade 10 Life Science educators who signed and returned the consent letters that asked for their participation in the research. For part two, the sample was made up of two educators selected from the 19 educators who participated in part one. The method of choosing the samples was purposive and convenient. Only grade 10 Life Science educators were chosen, because the national curriculum statement that supports the inclusion of indigenous knowledge in Life Science was first implemented in grade 10 in 2006. By 2008 the educators already had three years of experience with the new NCS in grade10.

Convenient sampling, as explained by Cohen *et al.* (2007, pp. 113-114), "is a way of choosing the nearest individuals until the sample size is obtained or the choosing of individuals that happen to be available and accessible". The choice of the 19 educators is convenient sampling, based on the fact that not all the educators that the consent letters were sent to participated in the study. The 19 educators who responded were the ones who were available and accessible. The selection of the 2 educators for part two was also



purposive and convenient, based on the fact that the educators met the criteria for selection in 4.3 and were also the nearest to the researcher. In part one of the study, the sampling size was not specified in the consent letters, as I was unsure what the educators' responses would be. The study therefore made use of two sample sizes.

## **4.7 DATA COLLECTION AND INSTRUMENTS**

### **4.7.1 Piloting of research instruments**

The research instruments used in this study are questionnaire, pre-lesson observation interview schedule, lesson observation schedule and post lesson observation interview schedule. The research instruments were piloted with Life Sciences educators in the researcher's former school and also with the members of the researcher's research group. As a result of the piloting, some questions were reframed before the instruments were used in the main study.

### **4.7.2 Questionnaire**

A questionnaire is the method of data gathering that was used to collect data for part one of the study in answering the first and second research questions. Questionnaire is a type of data collection where the participants are given questions on paper to complete on their own. The type of questionnaire used was open ended. An open ended questionnaire gives space for the participants to answer in their own words (Maree & Pietersen, 2007, p. 155). The purpose of using opened questionnaires was to allow the educators to freely give their impressions about the integration of indigenous knowledge in Life Science. The questionnaire asked seven questions that were used in response to research questions 1 and 2 asked in part one of the study (see Appendix 4). The questionnaire was hand-delivered and collected from the 19 educators who participated in part one of the study.

### **4.7.3 Interviews**

The interview was one of the data collection techniques used in part two of the study, in order to collect data for research questions 3 and 4. Nieuwenhuis, (2007, p. 87) explains interview as a two way conversation, requiring the researcher to ask the participants questions in order to learn about their ideas, beliefs, views, opinions and behaviours. The type of interview used was semi-structured. In the semi-structured interview there is a set of predetermined questions that the researcher asks the participants, although it allows for further probing and clarification of ideas (Nieuwenhuis, 2007, p. 87).

Two interviews were done for each of the two educators selected for part two of the study. The first interview (pre-observation interview) was conducted before the observation of the educators' lessons. It was guided by three main questions, but further questions were asked to probe the educators' responses in an attempt to clarify their ideas (see the interview schedule containing the three questions in Appendix 5). The second interview was done after observation of the educators' lessons (the post-observation interview). This second interview contained only one major question but, just as in the first interview, further questions were asked, based on the educators' responses, for further probing and clarification (see the interview schedule used for the second interview in Appendix 7).

### **4.7.4 Classroom observation**

The main method of collecting data for research question 3 was through observation. Observation is a method of data collection that gives the researcher a first hand experience with the phenomenon being studied, as the researcher is present in the natural context of the phenomenon in order to see what happens (Henning, 2004, p. 81). After the pre-observation interview, each of the educators was observed during their lessons. This provided a wealth of ideas on how the educators integrated indigenous knowledge in their teaching.

The classroom observation was used as a way of validating the information gathered through the questionnaire and pre-observation interview, and for the purpose of personally experiencing how the educators integrated indigenous knowledge in their teaching (see the observation schedule in Appendix 6).

#### **4.8 DATA ANALYSIS**

The data collected were qualitative data and the analysis used a content analysis technique. Content analysis is a systematic approach to qualitative data analysis that identifies keys in the text that will assist in understanding and interpreting the raw data ((Nieuwenhuis, 2007; p. 101).The recorded interviews were transcribed before the analysis was done.

The data were read over and over for a better understanding and in order to identify the key ideas. They were organised and sorted into categories to bring out the themes. The themes that emerged from the data are analysed and discussed in Chapters 5 and 6.

#### **4.9 CREDIBILITY**

Credibility is one of the criteria that are used to measure the authenticity of a qualitative research. Credibility of a research implies how true the research processes and findings are considered to be (Alant, 1999). In this study, the following were done to enhance the credibility of this study.

Credibility was ensured in this study by the use of triangulation. Triangulation is the method of using two or more methods of data collection in a research (Cohen *et al.*, 2007). The multiple sources of data collection methods used in this study were discussed in 4.7. These include questionnaire, interviews and observation. The data collected from different methods were used to check the research findings before conclusions were made.

Credibility can be ascertained if other participants understand and interpret the findings of a study in the same way as the researcher (Toma, 2006). The present study made use of this idea. The research data and findings were discussed with the researcher's research group as well as the supervisor in order to ensure that the researcher's interpretations of the findings were not different from the ideas of others in the field.

Credibility is further based on the participants understanding of the data. The findings are considered true when the researcher explains what is true for the participants (Toma, 2006). In this study, credibility was ensured by allowing the research participants to listen to the recorded data. The participants were also allowed to read the transcribed data and make comments and corrections. This is a way of verifying the data.

#### **4.10 LIMITATIONS**

The study was limited to schools in the Pinetown District and not all the grade 10 educators in the schools participated in the study. The findings can therefore not be generalised as applicable to all Life Sciences educators. The educators also took longer than expected to complete the questionnaires. The collection of the questionnaires on the stipulated days had to be extended as some of the educators had misplaced their copies.

#### **4.11 ETHICAL ISSUES**

Ethical clearance was obtained from the faculty research office of the University of KwaZulu Natal, which involved a thorough examination of the research instruments in order to ensure that the study would not pose problems to any party involved. Permission was obtained from the Department of Education through the faculty research office of the University of KwaZulu Natal. Permission was also obtained from the school principals involved and the educators that participated gave their consent. The nature of the study was described and made clear to the participants from the outset. In addition the anonymity of the participants was maintained throughout the study. The taped interviews were played to them after every interview, and they were given the opportunity to correct

the interview transcripts. The data collected and the findings were discussed in a forum attended by the supervisor and the research group in order to enhance credibility.

#### **4.12 CONCLUSION**

This chapter presented how the study was conducted. The type of research and the methods of data collection were discussed in detail and the reasons for the use of purposive and convenient sampling were justified. In Chapter 5 the collected data are analysed in response to the four research questions addressed in the study.

# **CHAPTER 5**

## **DATA ANALYSIS AND PRESENTATION**

### **5.1 INTRODUCTION**

In this chapter, the qualitative data collected through questionnaires, interviews and observations are analysed and the findings presented. The chapter is organised in two parts in line with the order of the research methodology as already discussed and explained in chapter 4. The analyses of the data are presented as responses to the four research questions. Part one of the chapter analyzes the data collected from the 19 educators who participated in part one of the study, while part two analyzes data collected from the two educators purposively selected from part one for further research in part two. Part one of the chapter answers research questions 1 and 2, while part two answers research questions 3 and 4.

### **5.2 DATA ANALYSIS AND PRESENTATION FOR PART ONE**

Part one explores the Grade 10 Life Sciences educators' understanding of the integration of indigenous knowledge in Life Science and the extent to which the educators integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources. The data analysed was collected through questionnaires with open ended questions (see Appendix 4). As mentioned earlier, this part of the study was guided by the following two research questions:

- (1) What are the grade 10 Life Sciences Educators' understandings of the integration of indigenous knowledge systems in Life Sciences?*
- (2) To what extent do grade 10 Life Sciences educators integrate indigenous knowledge systems in their teaching of conservation of Biodiversity and Natural Resources?*

With regard to the data obtained in part one a second order analysis was done, which means that the responses of the 19 participants were not treated separately. This means they were not analyzed at an individual level, but at a collective level. The aim is not to compare the responses, but rather to present the emerging themes from the entire set of data. The themes emerging from the data are outlined and discussed and quotations from the educators' responses are presented in substantiation of the emerging ideas.

**5.2.1 Research question 1: *What are grade 10 Life Science educators' understandings of the integration of indigenous knowledge systems in Life Science?***

Three elements were interrogated here, namely the preparedness of the educators for the integration of indigenous knowledge in Life Sciences, the educators' understanding of Learning Outcome 3 of the National Curriculum Statement (NCS) policy document for Life Sciences and eventually the educators' understanding of the integration of indigenous knowledge in Life Science. These three elements are discussed in the section below.

**5.2.1.1 Preparedness of Educators for integrating IKS in Life Sciences**

With regard to the question relating to the educators preparedness in integrating indigenous knowledge into Life Sciences, three themes were explored:

- The educators' qualifications;
- The time frame in which the qualifications were obtained;
- The training that the educators received in the new NCS for Life Sciences.

These three themes are discussed below.

### ***Type of qualification***

Of the 19 educators, 16 had teaching qualifications, but not all these qualifications were in Life Sciences (formerly called Biology). Two educators did not have teaching qualifications. One other educator did not state her specialization, despite having a diploma (see table 2, attached as Appendix 8).

### ***The time frame in which the educators obtained their qualifications***

Table 2 (Appendix 8) gives an insight into the time frame during which the educators obtained their qualifications. Out of the 16 educators that have teaching qualifications, only 4 educators obtained their qualifications from the year 2003 onwards, while the other 12 educators obtained their qualifications before the year 2003. This is significant, because the new NCS policy document was adopted in 2003 and implemented in the further Education and Training (FET) phase of the schools in 2006 in grade 10, moving to grades 11 and 12 in subsequent years. This implies that the 12 educators who obtained their teaching qualifications before the year 2003 were not trained in the new NCS. Of the 4 educators who obtained their qualifications from the year 2003 onwards, one educator obtained the qualification in 2003 when the NCS was adopted, and was not trained in the new NCS document (which was at that stage still in the pipeline). Only the three educators who obtained their qualifications after 2003 received training in the new NCS.

### ***The training that the educators received in the new NCS policy document for Life Sciences***

During the designing of the questionnaire, consideration was given to the fact that some of the educators could have graduated before the adoption and implementation of the new NCS. Questions were asked to determine if the educators, irrespective of when they qualified, had received training in the new NCS document. The responses of the educators are attached as table 2 (see Appendix 9). Seven of the 19 educators had



received one week of training in the new Life Science policy document, another seven had received two to three weeks training and one educator had received four weeks. Three educators did not receive any training in the new NCS curriculum document. One educator did not respond to the question.

It is interesting to note that although most of the educators had obtained qualifications before the implementation of the new NCS and some did not have teaching qualifications, they all had some knowledge of the new curriculum implemented in 2006. Even one of the two educators without a teaching qualification had knowledge of the new NCS policy document, as he had received a few weeks of training. Thus, it will be interesting and relevant to explore the educators' understanding of learning outcome 3 and their integration of indigenous knowledge in the teaching of Life Sciences.

#### **5.2.1.2. The educators' understanding of learning outcome 3 (LO3)**

It was necessary for this study to explore the educators understanding of learning outcome three of the Life Sciences NCS document because LO3 focused on the inclusion of indigenous knowledge in Life Sciences. Examination of the educators' understanding of learning outcome 3 shows that the educators drew and developed their ideas from the NCS policy document. Four categories are identified flowing from the educators' understanding of learning outcome 3. (See table 3, Appendix 9). The educators understand learning outcome 3 in the following four ways:

- Learning outcome 3 relates to Life Science, technology, environment and society;
- Learning outcome 3 emphasizes the relevance of linking learning to the learners' daily life experiences;
- Learning outcome 3 promotes the place of indigenous knowledge in Life Science;
- Learning outcome 3 requires the investigation of the past and present scientific knowledge of all cultures.

***Educators see learning outcome 3 as relating the subject Life Sciences to technology, environment and society.***

The educators understand that learning outcome 3 relates Life Sciences, technology, environment and society. In the educators' expression, most of the words are the same as those of the NCS policy document, while other words further emphasize the ideas of the document. Examples of the educators' responses (see table 4, Appendix 9) are:

*...interaction between Life Sciences, technology, environment and society*

*...technology, environment and society, there must be connection among the three*

The educators in their expression used Life Science, technology, environment and society which are what they pick from the NCS policy document for Life Sciences.

***Learning outcome 3 delineates the relevance of linking learning to the learners' daily life experiences***

The educators see learning outcome 3 as describing the importance of relating school learning to the learners' everyday life experiences. The educators explained that learning outcome 3 focuses on the need for educators to link formal school knowledge with the learners' informal knowledge. This can be deduced from the following educator statement (see Appendix 9):

*The learners need to integrate their everyday life into their learning of Life Sciences*

The educators understand that learning outcome 3 highlights the relevance of school learning to the learners' daily life experiences. This idea is in accordance with Jegede and Aikenhead's (1999) idea that effective and meaningful learning can only occur when

school learning is linked to learners' daily experiences of which their indigenous knowledge is part.

***Learning outcome 3 promotes the place of indigenous knowledge in Life Sciences education***

Semali (1999) explains that effective and meaningful learning can only occur if education takes into account indigenous knowledge systems. The educators understand that learning outcome 3 recognises this, and incorporates indigenous knowledge into Life Sciences education. This is apparent in the following quotes (see Appendix 9):

*It deals about indigenous knowledge; acknowledging indigenous knowledge systems...*

*It demonstrates the interrelationship of science, technology, indigenous knowledge, the environment and society*

It is evident that the educators are not ignorant of the inclusion of indigenous knowledge in Life Sciences education.

***Learning outcome 3 requires the investigation of the past and present scientific knowledge***

The educators understand that learning outcome 3 requires them to make learners study scientific ideas of both the old and the new for the development of the learners' own scientific ideas (see Appendix 9):

*It is the exploration and evaluation of scientific ideas of the past and present cultures.*

The educators understand that fact that the old generations have scientific ideas that they have used and learners as they learn the present scientific ideas need to explore the old one.

### **5.2.1.3 Educators understanding of integration of indigenous knowledge in Life Sciences**

In exploring the educators' understanding of the integration of indigenous knowledge in Life Science, it was necessary to explore firstly the educators' understanding of indigenous knowledge before examining their understanding of the integration of indigenous knowledge in Life Sciences. As a result two issues were interrogated, namely educators' understanding of indigenous knowledge as such and, secondly, the educators' understanding of the integration of indigenous knowledge in the Life Sciences curriculum.

#### **5.2.1.3.1 Educators understanding of indigenous knowledge**

Of the 19 educators 18 indicated that indigenous knowledge meant something to them while 1 educator did not respond to the question. (See Appendix 10). The educators' understandings of indigenous knowledge fall into four categories. The educators:

- Acknowledge indigenous knowledge as a body of knowledge;
- See indigenous knowledge as knowledge embedded in culture and traditions;
- Understand indigenous knowledge as knowledge that isn't linked to the school curriculum;
- Refer to indigenous knowledge as the origin of some scientific knowledge.

#### ***Acknowledging indigenous knowledge as a body of knowledge***

From the educators' responses, it is apparent that the educators recognise indigenous knowledge as a body of knowledge. This is reflected in the educators' explanations of

indigenous knowledge. Some of the educators' responses are quoted below (see Appendix 10):

*It means the body of knowledge in African philosophies and social practices of past and present cultures that a learner should be aware of.*

*Knowledge gained from one's culture, traditions*

The educators' expressions all started with "is knowledge...". The educators clearly understand this body of knowledge as a type of knowledge and one of the many ways of knowing. The following quote supports this interpretation (see Appendix 10):

*Range of diversity, knowledge systems through which we make sense of and attach meaning to the world in which we live*

The educators' understanding of indigenous knowledge as a body of knowledge and one of the different ways of knowing is similar to some scholars' ideas of indigenous knowledge. Scholars like Semali and Kincheloe (1999) and Makabela (2006) explain indigenous knowledge as a body of knowledge that indigenous groups produce as they make sense of their environment, while Hoppers (2002) acknowledges indigenous knowledge as one of many ways of knowing (see chapter 2).

***Indigenous knowledge is seen as knowledge embedded in culture and traditions***

The educators' expressions reflect that indigenous knowledge is knowledge characterised by cultural practices and traditions. They understand that indigenous knowledge is developed as a particular group of people belonging to a particular community relate with their environment through their traditional practices and exercises. Some of the views expressed in this regard were (see Appendix 10):

*It is the knowledge I gained from the traditions and practices of my culture/religion*

*Knowledge from generation to generation (traditional knowledge) pertaining to culture*

*Knowledge gained from the past based on culture and traditional belief systems example; herbal medicines, traditional circumcisions*

*It is the knowledge of your own experience as you grow up*

The educators clearly associate indigenous knowledge with culture, tradition and religion; it is the knowledge of people with a common life style. The educators similar to Onwu and Mosimege (2004) described indigenous knowledge as knowledge gained by living and functioning in a particular locality. (See Chapter 2). This is also in line with Makabela (2006) and Du Toit's (2005) ideas that indigenous knowledge is embedded in indigenous people's culture and traditions (see Chapter 2).

### ***Indigenous knowledge as knowledge that isn't linked to the school curriculum***

Despite the inclusion of indigenous knowledge in the present educational system, the educators' explanations of indigenous knowledge still reflect indigenous knowledge as knowledge that falls outside the school curriculum and that is also not found in textbooks. These reflections are revealed in the following quotations (see Appendix 10):

*It is the knowledge that one does not have to go to school for*

*Knowledge of older people concerning certain practices, those are not in textbooks but are peculiar to certain cultures*

The educators associated indigenous knowledge to culture in the sense that it characterizes different cultures. This supports Mkabela (2006) that indigenous knowledge is traditional knowledge that is embedded in a people's culture and which is part of their everyday lives.

### ***Indigenous knowledge as origin of scientific knowledge***

It is significant that the educators expressed the view that indigenous knowledge is the foundation on which some scientific knowledge has developed, although they declined to give examples of specific instances. The following quotations show support for the idea that indigenous knowledge is a foundation of science (see Appendix 10):

*...Science does not occur in vacuum but it originated from somewhere. Scientific knowledge arises from information that already existed...*

*...Scientific ideas from generation to generation, ...scientific methods used by traditional healers*

The educators' notion of scientific ideas somehow originating from indigenous knowledge reflects the arguments of Loubser (2005) and Ayerst et al. (2005) discussed earlier that abstract science originated from indigenous knowledge. Remind the reader what this is about.

#### **5.2.1.3.2 Educators' understanding of the integration of indigenous knowledge in Life Sciences**

It is significant that the educators' ideas of the integration of indigenous knowledge in Life Sciences is based on their knowledge of learning outcome 3 and their understanding of indigenous knowledge (see Appendix 11). The educators' understanding of the integration of indigenous knowledge in the Life Sciences curriculum shows three dimensions. The integration of indigenous knowledge in the Life Sciences is seen:

- As an effort towards mainstreaming indigenous knowledge;
- As an addition to western scientific knowledge;
- As fostering empowerment and justice.

***Integration of indigenous knowledge as an effort to mainstream indigenous knowledge***

The educators understand the integration of indigenous knowledge into Life Sciences as an attempt to mainstream indigenous knowledge. They understand that learning outcome 3's focus on the integration of indigenous knowledge in Life Science is an effort to include the indigenous knowledge that has not been there before in the educational curriculum. This is evident from the following educator's response (see Appendix 11):

*...attempts to legitimize local knowledge and establish a niche for these systems in the overall education system focus. Learners need to understand that what they are taught as 'Science' is not something created out of nowhere. So, integrating indigenous knowledge in Life Sciences will allow learners to involve their parents or other members of community when they do their research on given topic; to incorporate cultural knowledge and practices in the teaching of Life Sciences.*

Scholars like Dumbrill and Green (2008) explain the integration of indigenous knowledge as the inclusion of indigenous knowledge into science learning. Semali (1999) in this regard talks about the move of indigenous knowledge from daily life experience to school. The educators' views on mainstreaming indigenous knowledge are in clear accord with these scholarly arguments.

***Integration of indigenous knowledge as an addition to western scientific knowledge***

The integration of indigenous knowledge in Life Science is understood by the educators as an addition to the western knowledge that is taught at school. This is reflected in the following quotations (see Appendix 11):



*It adds to the western knowledge that we teach students.*

*Using indigenous knowledge to understand, strengthen and explain scientific knowledge.*

The NCS policy document for Life Sciences doesn't present the integration of indigenous knowledge as an addition to western knowledge, but rather as an opportunity for indigenous knowledge to interact with western scientific knowledge (Department of Education, 2003). In the process of this interaction, the two knowledge systems are reconciled and mediated. The educators' idea that integration of indigenous knowledge implies the addition of indigenous knowledge to science knowledge is therefore somewhat contrary to the formulation in the policy document.

### ***Integration of indigenous knowledge as a way of fostering empowerment and justice***

The educators perceive the integrating of indigenous knowledge into Life Science as a way of encouraging diversity in the knowledge learnt at school and of empowering the learners whose indigenous knowledge comes to be explored in formal schooling. This view supports that of Semali and Kincheloe (1999), who talk about the integration of indigenous knowledge as a means of addressing social inequalities and promoting equity. (See chapter 2). The following quote reflects the opinion of the educators (see Appendix 11):

*It recognizes the richness of indigenous knowledge system and their contribution to transforming the learner and instilling the pride in the learners*

*...we are given opportunity to teach science as a subject and to look at our own beliefs and try to compare the two. This encourages us Africans not to look down upon our beliefs.*

*Integration of indigenous knowledge is seen as comparing indigenous knowledge and scientific knowledge.*

The educators have are of the notion that when learners learn about their own indigenous knowledge in formal schooling, they become confident in their own ways of knowing as they come to value their indigenous knowledge more.

**5.2.2. Research question 2: *The extent to which the educators integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources***

In exploring research question 2 two elements were interrogated: the number of educators that integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources; and how these educators integrate indigenous knowledge in their teaching.

**5.2.2.1 The educators that integrate indigenous knowledge in their teaching**

Of the 19 educators 17 said that they integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources in Life Sciences. These educators included the two educators who did not have teaching qualifications as well as the one educator who did not indicate her qualification. (The remaining two educators did not respond to the question). The educators that claimed to integrate indigenous knowledge also included the 15 educators that were trained in Life Sciences, the two educators that had no training in the field and the one educator that did not respond to the question on training (see Appendix 12).

### **5.2.2.2 How the educators integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources?**

The 17 educators that said they integrated indigenous knowledge in their teaching were asked to explain how they did it. Three categories emerged from the educators' responses, namely that they:

- contextualise their teaching of conservation of biodiversity and natural resources;
- use their own ideas of indigenous knowledge as teaching model;
- focus on the importance of the indigenous knowledge practices that are used in the conservation of biodiversity and resources.

#### ***Educators contextualise their teaching of conservation of biodiversity and natural resources***

The educators' explanations imply that they link their teaching to the learners' communities' indigenous knowledge and practices of conservation. They do not teach according to the textbooks but rather according to the learners' experiences of conservation of biodiversity and natural resources in their indigenous communities.

The educators make their learners investigate the ways the older generations in their communities' conserved biodiversity and natural resources. In doing so the learners come to see the older people in their communities as resources. The educators also explained that they gave the learners the opportunity to explore the traditional practices that were used by past generations in caring for and protecting the resources found in the communities. The following statement bears out this approach (see Appendix 13):

*Teaching about conservation of water, learners were asked to find out about the ways that water was cleaned for consumption before the sewage systems (taps)*

*came into existence. So, they needed help from elderly people who knew and had experience in that field.*

The last sentence in the quotation above states that learners needed to get the information on how their communities conserved their resources from the older people in the communities. The educators expect the learners to source the information from older community members. The elders are therefore seen by the educators as resources in the integration of indigenous knowledge in their teaching of conservation of biodiversity and natural resources.

The educators' idea of contextualizing their teaching relates to three of the 15 strategies for teachers as cultural brokers outlined in Jegede and Aikenhead (1999), namely strategies 2, 10 and 11 (see chapter 3). Educators as cultural brokers should:

- i. Include the oral narratives and heritage as part of the learners' school experience rather than labeling them as mere myth and legend.

The educators encourage learners to gather their communities' indigenous knowledge from the elders. As a result, the learners' heritage is included in the learners' school experiences.

- ii. Instructions should provide local approaches of achieving sustainability.

The learners' indigenous knowledge of conservation of their resources serves as local approaches of achieving sustainability.

- iii. The learners' worlds should be related to science instruction.

The exploration of the learners' communities' indigenous knowledge of conservation reflects the linking of the learners' worlds to science instruction.

***Educators use their own ideas of indigenous knowledge as a teaching model***

The educators' explanations show the use of their own indigenous knowledge in the integration of indigenous knowledge and natural resources. This can be deduced from the following quote (see Appendix 13):

*Since I am Zulu, I tend to relate to most of the things that the students are familiar with especially the ones who grew up in rural areas*

Semali (1999, p.311) explains that “indigenous educators do not have any other model to follow than their own ideas developed from local knowledge”. The educators' idea of using their own indigenous knowledge when integrating indigenous knowledge in their teaching of conservation of biodiversity and natural resources illustrates this assertion.

***Educators focus on the importance of the indigenous knowledge practices that are used in the conservation of biodiversity and resources***

The educators, having given their learners the chance to explore the indigenous practices of their past and present cultures, subsequently focus on the importance that these indigenous practices of conserving biodiversity and natural resources might have. This approach can be gleaned from the quote below (see Appendix 13):

*Values of traditional methods in aspects of farming and food production.*

The educators acknowledge in their responses that indigenous knowledge of importance in the conservation of biodiversity and natural resources.

### **5.3 DATA ANALYSIS AND PRESENTATION OF DATA FOR PART TWO**

Part two of this study interrogated how the two educators who were purposively selected form part one of the study integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources; as well as what informed the way they integrated indigenous knowledge in their teaching. The data used in answering the two research questions for part two of the study were collected through a pre-observation interview, a lesson observation and a post-observation interview for each of the two participants. (See appendices 5, 6 and 7).

#### **5.3.1 Research question 3: *How do grade 10 Life Sciences Educators integrate indigenous knowledge in the teaching of conservation of biodiversity and natural resources?***

The analysis of this research question highlighted what the educators did when they integrated indigenous knowledge in the teaching of conservation of biodiversity and natural resources, and how they did it. The ‘how’ here refers to educators’ explanations of how they integrated indigenous knowledge in their teaching, while the ‘what’ refers to the things that the educators were seen doing in the class during the lesson observations. The data analysed was collected through interviews and observations. (For the educators’ interview responses see Appendix 14; for the detailed lesson activities which include educators’ activities, learners’ activities and resources, see Appendix 15).

Three themes emerged as to *how* educators integrated indigenous knowledge. Educators claimed to:

- use indigenous knowledge to foster the learning of scientific knowledge;
- use indigenous knowledge as a tool for stimulating learners’ interest in the learning of Life Science;
- use indigenous knowledge to promote the learners’ participation in the classroom.

In the analysis of *what* educators did, two themes emerged. Educators were observed to:

- Use indigenous knowledge to foster the learning of scientific knowledge of conservation of biodiversity and natural resources;
- Use indigenous knowledge as a tool for stimulating learners' interest and participation in the learning of scientific knowledge.

These themes can be deduced from the following brief explanations of the two educators' lessons on conservation of biodiversity and natural resources.

### **Educator 1**

The educator in the previous lesson taught scientific knowledge of conservation of biodiversity and natural resources. In this lesson, the educator focused on the use of indigenous knowledge in conserving biodiversity and natural resources. She started by asking learners to define indigenous knowledge. Upon receiving no responses from the learners she explained to them that it is traditional knowledge passed down from generation to generation. She gave out case study on the San man's use of traditional skills in tracking animals in the game reserve. Learners read the story and the educator asked them to explain the importance of the indigenous knowledge used in tracking the animal. The detailed lesson activities included as appendix 15.

### **Educator 2**

The educator had not taught any previous lesson on conservation. The educator started the lesson by explaining to the learners the meaning of conservation, biodiversity, and natural resources. After this, he asked learners to mention the ways their communities conserve the resources found in their places. He read out a story on the Zulu's indigenous practices of conserving maize. He then put learners in groups and asked them to discuss the communities' indigenous ways of taking care of their resources. After, he gave the learners the story on the Zulu's indigenous knowledge of conservation of maize and

scientific ways of conservation of maize to compare in a table. This was the end of the learning activities as he gave learners home work to research one of their communities' ways of conservation. He then concluded by telling learners that in the next lesson they will focus on the scientific knowledge of conservation. Detailed lesson activities included as Appendix 15.

The five themes mentioned were drawn from the analysis of data collected through the pre observation interviews and lesson observations on how the educators integrated indigenous knowledge in their teaching are further explored in the table that follows.

**Table 1: What the educators said they do and what they actually did**

<b>Participant</b>	<b>Pre-observation interview focused on (How)</b>	<b>Lesson observation focused on (What)</b>
<b>Educator 1</b>	Used indigenous knowledge to build on the scientific concept. Taught the scientific knowledge of conservation of biodiversity and natural resources and afterwards used indigenous knowledge to foster the scientific ideas.	Taught indigenous knowledge of conservation as one of the ways of conserving biodiversity and natural resources. Teaching method did not indicate the interaction of indigenous knowledge and science knowledge even though indigenous knowledge was mentioned in the lesson.
<b>Educator 2</b>	Used indigenous knowledge as foundation for the lesson. Indigenous knowledge was first explored and scientific ideas were taught afterwards. Also used indigenous knowledge to stimulate learners' interest in the subject. Lastly, used indigenous knowledge to create interactive forum and increase participation of the learners.	Put indigenous knowledge of different indigenous groups at the centre of the concept of conservation of biodiversity and natural resources and afterwards taught scientific knowledge.



Educator 1 used indigenous knowledge to further strengthen the scientific knowledge of conservation of biodiversity. Her method showcased indigenous knowledge of conservation as an example of ways to achieve conservation of biodiversity and natural resources. Although indigenous knowledge was mentioned, there was no interaction between the indigenous knowledge and science knowledge. Educator 2 based the teaching of conservation of biodiversity on the indigenous knowledge of the learners, but his intention, as he explained, was different from the policy document's aim of integrating indigenous knowledge into Life Sciences. This educator rather used indigenous knowledge as a tool to stimulate learners' interest in the learning of scientific knowledge which will be taught in the next lesson.

The educators' intentions and strategies of integrating indigenous knowledge were different from the NCS policy document's intention of integrating indigenous knowledge. The NCS policy document intends indigenous knowledge to be reconciled and mediated with science knowledge through the interaction of the two forms of knowledge in formal learning. This sounds different from the educators' intentions and actions, which had more to do with using indigenous knowledge to foster the learning of science or to stimulate interest in the learning of science. This is a clear example of Semali's (1999) assertion that contradictions are always experienced between what is intended by the curriculum and what actually happens in the classroom. The identified educators' intention of using indigenous knowledge to strengthen science learning and to promote learners' interest in scientific ideas are a far cry from the policy document's idea of mediating and reconciling indigenous knowledge and scientific knowledge.

Attempts to identify the 15 strategies of educators as cultural brokers indicate that the educators' strategies did not reflect any of the 15 interactive teaching strategies in Jeede and Aikenhead (1999). Educator 1 did make an attempt to contextualise the teaching but this was not well articulated, as it was limited to mentioning indigenous knowledge. There was no attempt to show how the indigenous knowledge interacted with science knowledge of conservation. Educator 2, though focused the lesson on indigenous knowledge of conservation, all was for the purpose of getting learners interested in the

learning of scientific knowledge of conservation that will be done in the next lesson. This educator failed to establish any connection between indigenous knowledge and scientific knowledge of conservation.

### **5.3.2 Research question 4: *What informs the way in which Life Sciences educators integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources?***

Data was collected through a post-observation interview in which only one open-ended question was asked. This question was developed during the interview on the basis of the educators' responses. Three themes emerged. The educators' integration of indigenous knowledge in their teaching of conservation of biodiversity and natural resources are informed by:

- Educators' indigenous background and awareness of indigenous practices;
- Educators' understanding of the NCS policy document for Life Sciences;
- Educators' knowledge of the subject area.

#### ***Educators' indigenous background and awareness of indigenous practices***

Through their Zulu origins both educators have knowledge of some of the indigenous practices used in conserving biodiversity and natural resources. In teaching conservation of biodiversity they refer to their own indigenous knowledge. The following quotation reflects this practice (see Appendix 16):

*...I am an African, a Zulu. So I have an understanding of African practices that are used in order to conserve or protect the resources.*

This is the same idea discussed earlier (see Chapter 2) and supported by Semali (1999), namely that educators use their indigenous knowledge as model for the integration of indigenous knowledge in their teaching.

### ***NCS policy document***

The educators are informed by the NCS policy document, yet they explained that in their view the policy document over-emphasized the need to integrate indigenous knowledge in Life Science, as is borne out below (see Appendix 16):

*The policy document is stressing indigenous knowledge as being important. Scientific knowledge is not enough according to the policy. So it is stressing indigenous knowledge, traditional knowledge.*

This interpretation can be seen from the analysis of the educators' understanding of learning outcome 3 of the NCS for Life Sciences. The educators understand that the policy document wants them to expose learners to different types of knowledge of which indigenous knowledge is a part. The educators also understand that the NCS policy document makes it clear that indigenous knowledge is not enough. In teaching conservation of biodiversity and natural resources, the indigenous knowledge used by certain indigenous people in conserving the resources of their environment is brought into the lesson.

### ***Educators' knowledge of the subject content***

The educators contended that their understanding of the concept of conservation of biodiversity and natural resources informed their ability to integrate indigenous knowledge into it. Because they had what they regarded as good knowledge of conservation of biodiversity and natural resources, they could identify the indigenous knowledge practices that related to the topic. They could classify some indigenous knowledge as knowledge of conservation of resources.

## 5.4 CONCLUSION

The interrogation of the educators' understanding of the integration of indigenous knowledge and their ability to properly integrate indigenous knowledge in their teaching of conservation of biodiversity identified six key findings which answer the four research questions of the study. The key findings are outlined under the research questions which they answer.

Research question one: *What are the grade 10 Life Sciences Educators' understandings of the integration of indigenous knowledge systems in Life Sciences?*

- Educators understood the integration of indigenous knowledge in Life Sciences at two levels:
  - as an effort to mainstream indigenous knowledge and
  - as an addition to the western science learnt at school.

Research question two: *To what extent do grade 10 Life Sciences educators integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources?*

- The analysis showed that 90% of the educators that participated in the study said that they integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources.

Interestingly, there were disjunctures between policy and practice. Contradictions were noted between what the educators did when they integrated indigenous knowledge and what the NCS policy document means by the integration of indigenous knowledge in Life Sciences.

Research question three: *How do the Life Sciences Educators integrate indigenous knowledge in the teaching of conservation of biodiversity and natural resources?*

Two distinctly different ways of integrating IK were noted:

- Educators used indigenous knowledge to foster and strengthen the scientific ideas learnt in schools.
- Educators used indigenous knowledge as a tool to simulate learners' interest and participation in the learning of scientific ideas.

Research question four: *What informs the way in which the Life Sciences Educators integrate indigenous knowledge in their teaching of biodiversity and natural resources?*

Two sources were identified:

- Personal experience - the educators drew from their own understanding and experience of indigenous knowledge and
- the NCS Life Sciences policy document – what and how the educators understood how policy was talking to the issues of IK integration in the Life Sciences.

These key findings are discussed in chapter 6 in relation to some of the ideas developed in the literature review (Chapter 2) and conceptual frame work (Chapter 3) of the study.

# **CHAPTER 6**

## **DISCUSSION AND RECOMMENDATION**

### **6.1 INTRODUCTION**

In this chapter, the key findings identified in chapter 5 are discussed in relation to some ideas developed in the literature review and conceptual framework. This discussion relates in particular to the following ideas:

- Nel's (2005) and Mosimege's (2005) contention that integration of indigenous knowledge in formal school learning has largely been at a rhetorical level and that no actual implementation seems to be taking place;
- Grange's (2007) idea that effective integration can only occur if educators understand the integration of indigenous knowledge and have the ability to properly integrate indigenous knowledge;
- Jedge and Aikenhead's (1999) conception of educators as cultural brokers;
- Solomon's (1992) 15 teaching strategies for educators as cultural brokers, cited in Jedge and Aikenhead (1999);
- Semali's (1999, p. 311) assertion that "tension and contradictions are always experienced between what is intended by the curriculum and what actually happens in the classrooms".
- Semali's (1999) view that the failure of programmes to integrate indigenous knowledge is a result of their focus on ideological rather than pedagogical implications.

Following on the ideas developed in the discussion of the findings, recommendations are made to educational stakeholders.

## 6.2 DISCUSSION OF KEY RESEARCH FINDINGS

Part of this study explored the extent to which indigenous knowledge is integrated by educators in their teaching of conservation of biodiversity and natural resources. The analysis showed that 90% of the educators that participated in the study said that they integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources. This finding seemingly contradicts the views expressed by Mosimege (2005) and Nel (2005), namely that the integration of indigenous knowledge in the South African education system has been at a rhetorical level.

The study went further however, and explored educators' integration of indigenous knowledge in the teaching of the Life Science concept of conservation of biodiversity. In this instance the analysis contradicted the educators' verbal indications that they integrated indigenous knowledge, and therefore found a basis for Nel and Mosimege's argument.

Analysis of how the educators integrated indigenous knowledge in their teaching and what they did when they integrated indigenous knowledge shows that, even though the educators verbally asserted that they integrated indigenous knowledge in their teaching, there was in fact no evidence of a proper understanding and integration of indigenous knowledge in their teaching. Instead, the educators' integration of indigenous knowledge point to the educators using indigenous knowledge to foster and strengthen the learning of scientific knowledge and to promote the interest of their learners in the learning of science knowledge. At the core of the educators' integration of indigenous knowledge is their concern with their learners learning of scientific knowledge.

The NCS policy document for Life Sciences explains indigenous knowledge as another way of knowing and as an alternative way of explaining concepts that are usually explained using scientific knowledge. Hence it encourages the interaction of different ways of knowing in formal schooling (Department of Education, 2003). In my understanding of the interaction of the different ways of knowing that the policy

document talks about, the document does not imply that indigenous knowledge should be used to strengthen the learning of scientific ideas. Rather, the role of the educator is to mediate and reconcile the two different ways of knowing in the learning of Life Sciences concepts. The analysis of the educators' integration of indigenous knowledge does not indicate any actual interaction between the learners' indigenous knowledge and western science knowledge. As a result, one cannot but agree with Mosimege and Nel that the integration of indigenous knowledge is still to occur in the schools.

From the discussion so far, one can deduce that the study didn't find proper and effective integration of indigenous knowledge in Life Science to have been achieved. Grange (2007) explains that for effective integration of indigenous knowledge in science learning to occur, educators need to understand the integration of indigenous knowledge and have the ability to properly integrate indigenous knowledge. The study found educators to have only a superficial conceptualization and understanding of the principles and ideas behind the proclaimed move of indigenous knowledge into formal schooling. As a result of this, there is a lapse in the way they integrate indigenous knowledge in their teaching.

The ways in which the educators integrated indigenous knowledge in their teaching of conservation of biodiversity and natural resources reflect their highly literal understanding of the integration of indigenous knowledge in Life Sciences. As mentioned before, the educators use indigenous knowledge in support of the learning of scientific ideas, and in this manner use indigenous knowledge to promote learners' interest in the learning of western science. Despite the fact that the educators included indigenous knowledge at some point in the lesson, this did not reflect any particular principles and ideas relating to the integration of indigenous knowledge. There was no evidence of the mediation and reconciliation of indigenous knowledge with the scientific knowledge of conservation; rather indigenous knowledge merely served as a tool through which the learners could develop better understanding of scientific ideas. On the whole, Grange's requirement for educators to properly understand the integration of indigenous knowledge as a basis for its effective integration was not met.



The educators' limitation to integrate indigenous knowledge is also reflected when one relates the educators' actions to the 15 teaching strategies for educators as cultural brokers outlined by Solomon (1992), as cited in Jedge and Aikenhead (1999). The analysis indicated the use of three of these 15 strategies. In the course of the lesson observations, only one of these strategies was manifested, and it was never fully developed. This related to strategy 2, which encourages educators to include oral narratives and heritage as part of the learners' school experience, rather than labeling them as being mere myth and legend. The educators attempted to use this strategy when they gave the learners case studies on the Zulu practice of conserving maize and the San's use of indigenous skills in tracking animals. These stories were however not linked with the scientific knowledge of conservation. The educator that provided the learners with the case study of the San people's traditional knowledge of tracking animals did not explore the story, and only asked the learners to identify the importance of the San's knowledge of animal tracking. She did not link the story with the previous lesson she had done on the scientific knowledge of conservation.

The other educator that made an attempt to use the strategy was unable to develop his ideas. After giving the learners a case study of the Zulu indigenous knowledge of conserving maize, he asked them to draw a table to compare the Zulu's indigenous knowledge of conserving maize and the scientific knowledge of conserving maize in silos. But the educator did not develop this activity, and went on to give the learners homework. What is common in the educators' inclusion of indigenous knowledge in their teaching is the inability to link the indigenous knowledge included in the lesson to the scientific knowledge of conservation. One could also see that the use of the teacher as cultural broker strategy 2 was not well articulated in the lesson, although both educators brought the local knowledge of indigenous South Africans into the lesson.

The **inability** of the educators to connect the indigenous knowledge of conservation to the science ideas of conservation reflects the **incompetence** of the educators as cultural brokers. Semali (1999, p.311) explains that "tension and contradictions are always experienced between what is intended by the curriculum and what actually happens in the

classrooms”. The analysis of the educators’ integration of indigenous knowledge provides clear evidence of this statement. The educators’ integration of indigenous knowledge indicates the use of indigenous knowledge to foster the learning of science knowledge, while the NCS policy document presents indigenous knowledge as an alternative way of knowing that needs to be mediated with scientific knowledge. There are clear contradictions between the educators’ integration of indigenous knowledge and the policy document’s integration of indigenous knowledge.

Semali (1999, p.311) further contends that the failure of the integration of indigenous knowledge in educational programmes like Education for Self-Reliance (ESR) in Tanzania is the result of too much concentration on the ideas and principles behind the integration of indigenous knowledge and too little concentration on tutorial or instructional strategies that could be used to properly integrate indigenous knowledge. A critical analysis of learning outcome 3 of the NCS policy document highlights that despite the focus of this learning outcome on integrating indigenous knowledge in Life Sciences, it only expresses the principles and ideas around which indigenous knowledge should be integrated. It doesn’t offer any concrete suggestion as to how the educators are to integrate indigenous knowledge in their teaching of Life Sciences.

In summary, the discussion of these key findings points to the fact that educators do not have adequate understanding of the integration of indigenous knowledge. As a result, they fail to “properly” integrate indigenous knowledge in their teaching of Life Sciences concepts. The inadequate understanding of the integration of indigenous knowledge is linked to their literal interpretation of the integration of indigenous knowledge in the Life Sciences curriculum.

## **6.3 RECOMMENDATIONS**

It is evident that the educators failed to function as cultural brokers in helping learners move between their indigenous knowledge and the science knowledge of the concept of conservation of resources. They lack an understanding of the principles and ideas upon which indigenous knowledge can be integrated into Life Sciences. The policy document, despite focusing and expressing the ideas and principles upon which indigenous knowledge is to be integrated in the teaching of Life Sciences, doesn't specify how the educators are to do this integration. The following recommendations are made based on the key research findings and the discussion of the findings. The recommendations are directed at educators in the classroom and educational policy makers, and should also prove useful for further studies in the area of the integration of indigenous knowledge in education.

### **6.3.1 Recommendation for educators**

The educators first and foremost must understand that successful integration of indigenous knowledge in science learning is based on their ability to properly integrate indigenous knowledge in science education. This ability cannot be developed without the educators understanding the principles and ideas behind the integration of indigenous knowledge in education. Educators need to fully understand what it means to integrate indigenous knowledge in science education and not just what the policy document has stated. They must understand that policy documents are more a statement of what needs to be done and not how it is to be done. Therefore, educators have to be scholars and researchers as they teach in the classroom. They need to understand that when they integrate indigenous knowledge in Life Science, they place both ways of knowing on the same platform upon which the ideas of the respective ways of knowing can be interrogated for better understanding of the concept. When they integrate indigenous knowledge they act as cultural brokers because they have to help learners move between their indigenous knowledge and western science knowledge. Hence, educators should use

Solomon's 15 interactive teaching strategies as a guide in developing better approaches to the integration of indigenous knowledge in science.

### **6.3.2 Recommendation for curriculum designers**

The curriculum designers need to make the ideas of the policy documents more explicit, by including some instructional strategies in the policy document. One job of curriculum designers should be to develop the ideas and another to implement the ideas. There could be books designed for each policy document which illustrate via teaching and learning examples how the ideas in the policy document can be implemented in the classroom.

### **6.3.3 Recommendation for further studies**

Studies which specifically look at how educators integrate the identified indigenous knowledge of a particular group of learners will be important in understanding how the educators come to act as cultural brokers. Studies which explore learners' ideas of a concept when their indigenous knowledge and scientific knowledge have been used in the teaching of the concept will be useful in understanding how learners culturally border cross in their formal learning.

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# APPENDIX 1

Ethical clearances from the University of KwaZulu Natal



RESEARCH OFFICE (GOVAN MBEKI CENTRE)  
WESTVILLE CAMPUS  
TELEPHONE NO.: 031 – 2603587  
EMAIL : ximbap@ukzn.ac.za

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7 MARCH 2008

MRS. IJ NNADOZIE (206515495)  
SCIENCE, MATHEMATICS, COMPUTERS & TECHNOLOGY EDUCATION

Dear Mrs. Nnadozie

**ETHICAL CLEARANCE APPROVAL NUMBER: HSS/0059/08M**

I wish to confirm that ethical clearance has been granted for the following project:

"The Integration of Indigenous Knowledge System (IKS) in the teaching of conservation of Biodiversity & Natural Resources: A critical case study of Grade 10 Life Science Educators in the Pinetown District"

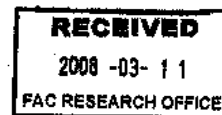
**PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years**

Yours faithfully

  
.....

MS. PHUMELELE XIMBA

cc. Supervisor (Dr. B Alant)  
cc. Mr. D Buchler



Founding Campuses:     Edgewood     Howard College     Medical School     Pietermaritzburg     Westville

## **APPENDIX 2**

### **LETTER TO THE PRINCIPALS OF SCHOOLS IN PINETOWN DISTRICT**

School of Mathematics and  
Science Education  
Faculty of Education  
University of KwaZulu Natal  
03 March 2008

The principal

#### **RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH IN YOUR SCHOOL**

My name is Ijeoma Jacinta Nnadozie, a Master's student at the above named institution. I am currently doing research on the Integration of Indigenous Knowledge Systems (IKS) in the teaching of Conservation of Biodiversity and Natural resources by the Grade 10 Life Sciences Educators in the Pinetown district. The research is towards the completion of my Master's degree in Science Education. It is aimed at investigating how Grade 10 Life Sciences Educators reconcile, mediate and promote indigenous knowledge systems in their teaching of Conservation of Biodiversity and Natural resources at Grade 10 level.

The study has two parts. Part one will be guided by the following questions:

1. What are Grade 10 Life Science Educators' understandings of the integration of indigenous knowledge systems (IKS) in Life Science?
2. To what extent do grade 10 Life Science Educators integrate indigenous knowledge in their teaching of conservation of Biodiversity and Natural resources?

Part two of the research will be guided by the following questions:

3. How do the Grade 10 Life Science Educators integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources?
4. What informs how grade 10 Life Science Educators integrate indigenous knowledge in their teaching of Conservation of Biodiversity and Natural resources?

I hereby request to conduct my research at your school for the following period:

Part one of the study - March- June 2008

Part two of the study- the period during which the grade 10 Life science Educator/s in your school will be teaching the concept Conservation of Biodiversity and Natural Resources.

Your school is selected on the basis of it being a high school in Pinetown district. Please fill in and sign the attached declaration letter indicating your grant of permission for me to do the study in your school.

You are assured that all information gathered during the research will be used for the purpose of this study only. In this regards, no harm will be caused to your school and the educator/s participating in this study. Further more, the anonymity of both the school and the educator/s are assured. Should you wish to withdraw your school from the research project you have the option to do so.

If you need further information regarding the research, please do not hesitate to contact either myself or my supervisor Dr Busisiwe Alant. Herewith are our contact details: MS Nnadozie: 0781952108; Dr Alant:031-2607606

Thanking you in advance for your cooperation

Yours sincerely

Ijeoma Jacinta Nnadozie

**DECLARATION BY THE PRINCIPAL**

**I ..... , the principal of .....  
grant permission to MS Nnadozie Ijeoma J to conduct her study in the above  
mentioned school**

**SIGNATURE OF THE PRINCIPAL**

\_\_\_\_\_

**DATE**

\_\_\_\_\_

## **APPENDIX 3**

### **LETTER TO THE GRADE 10 LIFE SCIENCES EDUCATORS OF SCHOOLS IN PINETOWN**

School of Mathematics and  
Science Education  
Faculty of Education  
University of KwaZulu Natal  
03 March 2008

Dear Life Sciences Educator,

#### **RE: REQUEST FOR YOUR CONSENT TO PARTICIPATE IN MY STUDY**

My name is Ijeoma Jacinta Nnadozie, a Master's student at the above named institution. I am currently doing research on the Integration of Indigenous Knowledge Systems (IKS) in the teaching of Conservation of Biodiversity and Natural resources by the grade 10 Life Sciences Educators in the Pinetown district. The research is towards the completion of my Master's degree in Science Education. It is aimed at investigating how grade 10 Life Science Educators reconcile, mediate and promote indigenous knowledge systems in their teaching of Conservation of Biodiversity and Natural resources at Grade 10 level.

I hereby ask for your consent to participate in my study. The study has two parts. Part one will be guided by the following questions:

1. What are Grade 10 Life Sciences Educators' understandings of the integration of IKS in Life Science?
2. To what extent do grade 10 Life Science Educators integrate indigenous knowledge in their teaching of conservation of Biodiversity and Natural resources?



Part two of the research will be guided by the following questions:

3. How do the grade 10 Life Science Educators integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources?
4. What informs how grade 10 Life Science Educators integrate indigenous knowledge in their teaching of Conservation of Biodiversity and Natural resources?

In the part one of the study, you will be asked to complete an open ended questionnaire. This will take 30 minutes to 1 hr. In the part two, you will be interviewed by your lesson, observed in your lesson on Conservation of Biodiversity and Natural resources and interviews after the lesson.

You are assured that all information gathered during the research will be used for the purpose of this study only. Further more, your anonymity is assured. Should you wish to withdraw from the research project at anytime, you have the option to do so.

If you need further information regarding the research, please do not hesitate to contact either myself or my supervisor Dr Busisiwe Alant. Herewith are our contact details: MS Nnadozie: 0781952108; Dr Alant: 031-2607606.

Please fill in and sign the attached declaration letter indicating your willingness to participate in the research.

Thanking you in advance for your cooperation.

Yours sincerely

.....

Ijeoma Jacinta Nnadozie

**DECLARATION BY THE LIFE SCIENCE EDUCATOR**

**I ....., a grade 10 Life sciences educator at  
..... confirm my willingness to participate in this  
research. I understand the content of the document and the nature of the study.**

**I understand that this research will not be harmful in anyway, that I can withdraw  
from the study should I desire, that I will remain anonymous and that the  
information that will be gathered will only be for the purpose of this study.**

**SIGNATURE OF THE PARTICIPANT**

\_\_\_\_\_

**DATE**

\_\_\_\_\_

**APPENDIX 4**  
**QUESTIONNAIRE**

This questionnaire aims to examine the understanding of integration of indigenous knowledge in Life Sciences and the extent to which indigenous knowledge system is integrated in the teaching of Conservation of Biodiversity & Natural resources. Please answer all questions. The information provided will be treated confidentially and you are assured of anonymity. Could you kindly ensure the questionnaire is returned after completion.

**Question 1**

What teaching qualification/s do you have?

<b>Qualification</b>	<b>Year</b>	<b>Majors</b>
Doctorate		
Masters		
Honours		
Post Graduate Certificate in Education		
Degree		
Other:		

**Question 2**

Did you have any training in the new Life Sciences curriculum for grade 10?

Yes	No

If yes, how long was the training?

Weeks	Months	years

**Question 3**

What is your understanding of the following in the new National Curriculum Statement for Life Sciences?

LO3: \_\_\_\_\_

\_\_\_\_\_

AS1: \_\_\_\_\_

\_\_\_\_\_

AS2: \_\_\_\_\_

\_\_\_\_\_

AS3: \_\_\_\_\_

\_\_\_\_\_

**Question 4**

Does indigenous knowledge system mean anything to you?

Yes	No

If yes, please elaborate:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Question 5**

What is your understanding of the integration of indigenous knowledge in Life Sciences?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Question 6**

Do you integrate indigenous knowledge in the teaching of Conservation of Biodiversity & Natural resources? If so, how?

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**Question 7**

Please indicate if you would like to be contacted and are willing to participate in further activities pertaining to this research study.

Yes	No

If yes please fill in your contacts below

Name:

---

School:

---

Area of school location:

---

Contact number:

---

## **APPENDIX 5**

### **PRE LESSON OBSERVATION INTERVIEW SCHEDULE**

The semi-structured interview will be guided by the following key questions:

1. What is/are the importance of integrating IKS in the teaching of conservation of Biodiversity and natural resources?
2. When you integrate IKS in the teaching of conservation of Biodiversity and natural resources what do you intend to achieve?
3. How do you integrate IKS when you teach conservation of biodiversity and natural resources in grade 10

## APPENDIX 6

### LESSON OBSERVATION SCHEDULE

The lesson observation will be guided by the following:

- Any manifestations of IKS in the teachers'/learners' activities as well as in the resources used for the lessons.
- How is IKS represented in the lesson?

<b>LESSON STAGE</b>	<b>TEACHER ACTIVITIES</b>	<b>LEARNERS ACTIVITIES</b>	<b>RESOURCES</b>
<b>INTRODUCTION</b>			
<b>DEVELOPMENT</b>			
<b>CONCLUSION</b>			

## **APPENDIX 7**

### **POST LESSON OBSERVATION INTERVIEW SCHEDULE**

This is guided by one key question which will be further developed in the course of the interview

1. What informs the way you integrate indigenous knowledge systems in your teaching of Conservation of Biodiversity and Natural resources? Explain



## APPENDIX 8

### EDUCATORS QUALIFICATIONS

**Table 2: Educators' qualifications and period of qualification**

What teaching qualifications do you have?	Dr	Year	MEd	Year	Hons	Year	PGCE	Year	Degree	Year	Other	Year
Educator 1							Biology	2001	<b>BA:</b> Psychology ; Zulu	1995	<b>Diploma:</b> Guidance; Zulu	1996
Educator 2							Biology; General Science	1976	<b>B.Sc:</b> Zoology; Physiology <b>B.Ed:</b> Administra tion	1975  1981		
Educator 3											<b>F.D.E</b> Biology: Botany & Zoology	2000
Educator 4											<b>H.D.E:</b> Biology	1987
Educator 5									B.Sc: Chemistry & Applied	2007		

									chemistry			
Educator 6							Biology	2001				
Educator 7							Biological Sciences	2001			Secondary Teachers Diploma: Biology & IsiZulu	1990
Educator 8			Science Education	2003					B.Sc: Botany; Psychology	1992	JSED: Biology; Physics	
Educator 9									B.Ed; Maths, Life Sciences, Physics	2004		
Educator 10							Life Science; Environmental studies	2006				
Educator 11						Botany, Zoology	1999					
Educator 12							Curriculum studies	2000	Zoology, Psychology	1996	Diploma Biology, Physical science	1986
Educator 13											JSED Physical science and Biology	-----
Educator						Educator	2007					

14					onal Technol ogy							
Educator 15											Diploma	
Educator 16									B.A Education/ Economics		JSED Biology and physical science  FDE Education managem ent	
Educator 17									B.Com Accounting and Economics	1986	LSED Maths, Accounting , General science	1972
Educator 18					B.Ed (Hons)	1994			B. Paed(Sc) Zoology 111. Education1 11			
Educator 19			M.Sc	2000					B. Paed Sc. Education and Botany	1985		

APPENDIX 9

EDUCATORS TRAINING IN THE NEW NCS AND UNDERSTANDING OF LO3

**Table 3: Educators trained in the National Curriculum Statement for Life Sciences**

Did you have any training in the new Life Sciences curriculum for grade 10? If yes, how long was the training?	Yes	Duration	No
<i>Educator 1</i>	√	1 week	
<i>Educator 2</i>	√	2 weeks	
<i>Educator 3</i>	√	2 Weeks	
<i>Educator 4</i>	√	1 Week	
<i>Educator 5</i>		Has not done any teaching course	√
<i>Educator 6</i>	N/A	N/A	N/A
<i>Educator 7</i>	√	1 week	
<i>Educator 8</i>	√	2 weeks	
<i>Educator 9</i>	√	2 weeks	
<i>Educator 10</i>			√
<i>Educator 11</i>	√	1 week	
<i>Educator 12</i>	√	Weeks	
<i>Educator 13</i>	√	1 week	
<i>Educator 14</i>	√	1 Weeks	
<i>Educator 15</i>	√	Weeks	
<i>Educator 16</i>	√	4 weeks	
<i>Educator 17</i>			√
<i>Educator 18</i>	√	1 Week	
<i>Educator 19</i>	√	Weeks	

**Table 4: The educators understanding of learning outcome 3 of the National Curriculum statement for Life Sciences**

<b>What is your understanding of the following in the new National Curriculum Statement for Life Sciences?</b>	<b>Learning outcome 3 (LO 3)</b>
Person 1	Life Sciences, technology, environment and society
Person 2	The interaction of Life Sciences with technology, environment and society
Person 3	Deal about indigenous knowledge
Person 4	Involvement of technology in Life Sciences. Acknowledging Indigenous knowledge systems
Person 5	None because I have not done a teaching course
Person 6	Technology, Environment and society. There must be connection among the three
Person 7	The learners need to integrate their everyday life into their learning of Life Sciences.
Person 8	Interaction between Life Sciences, technology, environment and society
Person 9	It is the exploration and evaluation of scientific ideas of the past and present cultures
Person 10	Is based on what is happening in our society and as well as in technology
Person 11	Technology, environment and society
Educator 12	Science and society

Educator 13	Technology, Environment and Society
Educator 14	It demonstrates the interrelationship of science, technology, indigenous knowledge, the environment and society.
Educator 15	The learners explore, relate to real life experiences and more insight
Educator 16	Interrelationship of science, technology, indigenous knowledge, environment and society
Educator 17	Life Sciences , technology, environment and society
Educator 18	Involves the development of resources and products and their impact on environment and society
Educator 19	-----

|

## APPENDIX 10

### EDUCATORS UNDERSTANDING OF INDIGENOUS KNOWLEDGE

**Table 5: Educators' understanding of indigenous knowledge**

<b>Does indigenous knowledge system mean anything to you? If yes, please elaborate:</b>	Yes	Elaborate
Person 1	√	It means the body of knowledge in African philosophies and social practices of past and present cultures that a learner be aware of
Person 2	√	It is the knowledge I gained form the traditions and practices of my culture/religion
Person 3	N/A	N/A
Person 4	√	Acknowledgement of indigenous information
Person 5	√	It is the knowledge that one does not have to go to school for (basically). It is knowledge that is passed down from generations to generations
Person 6	√	Indigenous knowledge of the past. I think it means you to be aware of the things happened in the past and present cultures
Person 7	√	It means that science does not occur in vacuum but it originated from somewhere. Scientific knowledge arises from information that already existed
Person 8	√	Knowledge gained from ones culture, traditions
Person 9	√	It is the knowledge of your own experience as you grow up
Person 10	√	I think that our indigenous knowledge is now being appreciated even in the third world countries example

		the use of African potatoes as an immune booster
Person 11	√	Learn to accept and admire the values, characteristics and behaviours of plants and animal.
Educator 12	√	Knowledge of older people concerning certain practices that are not in textbooks but are peculiar to certain cultures
Educator 13	√	Our backgrounds and knowledge gained play important roles on the way we interpret scientific knowledge
Educator 14	√	I recognize the wide range of diversity, knowledge systems through which we make sense of and attach meaning to the world in which we live.
Educator 15	√	The learners become interested in indigenous technological and scientific processes. Example, the knowledge of various causes and symptoms diseases, affordable cure for diseases, and cure for incurable chronic diseases as well
Educator 16	√	Knowledge gained from the past based on culture and traditional belief systems example; herbal medicines, traditional circumcisions
Educator 17	√	-Scientific ideas from generation to generation -traditions practiced by community-providing indigenous knowledge -scientific methods used by traditional healers -knowledge gained by interaction with the environment
Educator 18	√	It is passing of knowledge from generation to generation (traditional knowledge) pertaining to culture
Educator 19	√	Knowledge of past generation in our country



## APPENDIX 11

### **EDUCATORS UNDERSTANDING OF INTEGRATION OF INDIGENOUS KNOWLEDGE IN SCIENCE EDUCATION**

**Table 6: Educators’ understanding of the integration of indigenous knowledge in Life Sciences**

	<b>What is your understanding of the integration of indigenous knowledge in Life Sciences?</b>
Educator1	Life Sciences integrate indigenous knowledge as it recognizes the richness of indigenous knowledge system and their contribution to transforming the learner and instilling the pride in the learners
Person 2	Using indigenous knowledge to understand, strengthen and explain scientific knowledge
Person 3	N/A
Person 4	Attempts to legitimize local knowledge and establish a niche for these systems in the overall education system
Person 5	It adds to the western knowledge that we teach students
Person 6	The Life Sciences is more clear and perfect when you look at the integration of indigenous knowledge
Person 7	Learners need to understand that what they are taught as ‘Science’ is not something created out of nowhere. So, integrating indigenous knowledge in Life Sciences will allow learners to involve their parents or other members of community when they do their research on given topic
Person 8	To incorporate cultural knowledge and practices in the teaching of Life Sciences
Person 9	The blending of indigenous knowledge and Life Sciences

Person 10	I think we are given opportunity to teach science as a subject and to look at our own beliefs and try to compare the two. This encourages us Africans not to look down upon our beliefs
Person 11	Pupils/learners have to be aware of plants and animals that have lived or grown naturally in the place where they are as opposed to others that were brought there
Educator 12	We are suppose to add to our curriculum the knowledge of communities that are not in the textbooks
Educator 13	Learners do not only accept information via textbook, lectures from others, also express what they know, given a chance to contribute.
Educator 14	It gives me an understanding of the nature of science
Educator 15	This promotes an inquiry aid. The research of various species and conservation of the environment
Educator 16	Relating traditional/cultural practices that have become useful the present scientific knowledge
Educator 17	To compare the influence of different beliefs, attitudes and values of indigenous knowledge - can this knowledge be used for the wellness of man and society as a whole. - Evaluation of its benefits and impact on the environment in terms of conservation.
Educator 18	-Comparing of traditional method to scientific methods -looking at the advantages and disadvantages of each method
Educator 19	To view the knowledge of our cultures from scientific perspective

## APPENDIX 12

### **THE EDUCATORS THAT INTEGRATE INDIGENOUS KNOWLEDGE IN THEIR TEACHING**

The table below shows the educators out of the 19 educators that integrate indigenous knowledge in their teaching of conservation of biodiversity. The educators highlighted in capital letters are the educators without teaching qualification while the educator put in italics are the educators that did not have training in the NCS.

**Table 7: Educators that integrate indigenous knowledge in their teaching of conservation of biodiversity and natural resources**

Educator	Do you integrate indigenous knowledge in the teaching of Conservation of Biodiversity & Natural resources?
Educator 1	Yes
Educator 2	Yes
Educator 3	N/A
Educator 4	N/A
<i>EDUCATOR 5</i>	Yes
Educator 6	Yes
Educator 7	Yes
Educator 8	Yes
Educator 9	Yes
<i>Educator 10</i>	Yes
EDUCATOR 11	Yes
Educator 12	Sometimes
Educators 13	Have not taught that as yet but will do so
Educator 14	Yes

EDUCATOR 15	yes
Educator 16	yes
<i>Educator 17</i>	yes
Educator 18	yes
Educator 19	yes

## APPENDIX 13

### PART 1 EDUCATORS' EXPLANATION ON HOW THEY INTEGRATE INDIGENOUS KNOWLEDGE IN THEIR TEACHING

**Table 8: How the educators integrate indigenous knowledge in their teaching**

Educator	Do you integrate indigenous knowledge in the teaching of Conservation of Biodiversity & Natural resources?	If so, how?
1	Yes	Indigenous knowledge is about social practices that have evolved over thousands of years. Conservation of biodiversity and natural resources involves a lot of indigenous information as it looks at human species that existed for more than 100 000 years, the history of classification of life forms, the impact of humans on biodiversity and the natural environment. Learners are given an opportunity to explore, discuss and research about biodiversity
2	Yes	Value of traditional methods in aspects of farming and food production. Care of biotic components in ecosystems. Effect on ecological footprint. Traditional views on use of medicinal plants of the wise use of these plants
3	N/A	N/A
4	N/A	Have not reach this stage of the syllabus yet and first

		year at grade 10
5	Yes	Since I am Zulu, I tend to relate to most of the things that the students are familiar with especially the ones who grew up in rural areas
6	Yes	Biodiversity consists of the population of all species without management and conservation efforts, these populations will most likely become extinct. Biodiversity does more than provide a variety of products and resources. It also helps to maintain the atmosphere keep soil fertile, purify water and generally keep the world running smoothly
7	Yes	Teaching about conservation of water, learners were asked to find out about the ways that water was cleaned for consumption before the sewage systems (taps) came into existence. So, they needed help from elderly people who knew and had experience in that field.
8	Yes	Value of traditional farming methods. Its effects on an ecological footprint
9	Yes	First, we do group work to discuss indigenous knowledge and the teacher will then introduce the scientific knowledge. The comparison of the two must be made by learners
10	Yes	When I plan my lesson, I also include the things we share as society (ethnic group) like talking about the research done by students in the headache medicine (Umbheniso). It is concluded that there were traces of Aspirin in that Muthi which suggest that our muthi has the same ingredients as the western medicines and this encourages us to be proud of our own beliefs
11	Yes	Explain extinction and loss of biodiversity as it relates

		<p>to local resources by focusing on</p> <p>Threats to biodiversity</p> <p>Categories of organisms which are extinct or threaten with extinction</p> <p>Examples of South African organisms which extinct or threatened with extinction</p>
Educator 12	Sometimes	Cures for illnesses
Educators 13	Have not taught that as yet but will do so	-----
Educator 14	Yes	It raises learners awareness of the existence of different view points of the multicultural society that are based on scientific knowledge
15	yes	This shows an integration between the living and the non living factors, this will ensure the sustainability of natural resources
16	yes	Practical work/ test programme and common teaching
17	yes	<p>Case studies, newspaper article of alien plants, CTA supplied by the department of education</p> <p>NB: during the world summit for sustainable development, the following new slogan was adopted “no water no future”.</p> <p>Excursions-Ushaka, botanical gardens, shark board, bird sanctuary</p>
18	yes	The syllabus allows for indigenous knowledge to be incorporated into certain aspects of work. When we talk about deforestation, we talk about the trees and plants used by the traditional healers. We also discuss the impact of not replacing these important trees and plants for future healing. We try to find solutions like

		replanting, only using small portion of the plant example leaves and not damaging the entire tree.
19	yes	Local knowledge from our pupils-class discussion

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## APPENDIX 14

### PART 2 EDUCATORS' EXPLANATIONS ON HOW THEY INTEGRATE INDIGENOUS KNOWLEDGE IN THEIR TEACHING

**Table 9: The two educators' responses on how they integrate indigenous knowledge in the teaching of conservation of biodiversity and natural resources**

<b>How do you integrate indigenous knowledge when you teach conservation of biodiversity and natural resources</b>	<b>Responses</b>
<b>Educator 1</b>	<p>In this case in my class which is grade 10 em. They know about biodiversity because I have introduced it. They know a little bit about conservation, we are going to have a discussion, discussion about biodiversity and am going to give them an article to read. They are going to analyze the article. The article involves biodiversity conservation and also natural resources. We are going to look at the indigenous Knowledge aspects of conservation linking it to what we are doing in biodiversity and natural resources and then they are going to answer questions.</p>
<b>Educator 2</b>	<p>I desire my lesson flow straight forwardly starting from the acknowledged to the unknown. Is very very easy for a lesson to flow if you are starting from what the learners are familiar with. So it flows easily and at the same time they will be able to compare what they know and what they do not know which is what they are going to get from the teacher and they will be able to compare the two in order to come up with a good</p>

	<p>understanding of the concept and at the same time they will be able to rectify or they will be able to correct their misconceptions with regards to what they knew from their IKS which indigenous knowledge. That is the first thing I would say. Secondly, I want to inspire the love of Biology. Just to stimulate the love of biology because most of the learners have negative attitude towards Biology. They don't like it, since everyone has the chance to say something, right; everyone is given a chance to say some thing because as I said the combination of the two promotes group discussion which means everyone will have a chance to say something, everyone will have something to share with the class so and their love of biology will be stimulated. Thirdly, since learners have diverse background, they are able to share their knowledge in an open discussion, right, that is the third thing. Fourthly, this combination promotes a group work discussion where everyone is participating in the learning process and stimulates the love of the subject as well the coherence amongst learners in the class. Eh as I said it promotes participation for learners.</p>
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## APPENDIX 15

### **PART 2 EDUCATOR'S TEACHING STRATEGIES WHEN THEY INTEGRATE INDIGENOUS KNOWLEDGE IN THEIR TEACHING OF CONSERVATION OF BIODIVERSITY AND NATURAL RESOURCES**

#### **What the educators do when they integrate indigenous knowledge**

The educators were observed once in their teaching on conservation of biodiversity and natural resources. The observation schedule divided the lesson into three stages. These are the introduction, development and conclusion of the lesson. In the three stages of the lesson, teacher's activities, learners' activities and resources are interrogated with the aim of identifying the manifestations of indigenous knowledge and the representations of indigenous knowledge in the lesson

#### **Manifestation and representation of indigenous knowledge in Educator 1 lesson observation**

##### *Educator's activities*

The educator and all learners belong to the indigenous group of South Africans called Zulu's. The educator already had a lesson previously with the learners where she explained to learners the scientific knowledge of conservation of biodiversity and natural resources with out involving indigenous knowledge of conservation. At the introductory stage of the lesson, the educator explained to the learners that the lesson is focused on the use of indigenous knowledge in conservation of biodiversity and natural resources. The educator in integrating indigenous knowledge first interrogated learners understanding of indigenous knowledge. The educator explained to the learners that indigenous knowledge is "traditional knowledge passed down from generation to generation". The educator at the developmental stage of the lesson handed out a case study on conservation using traditional knowledge. The case study focused on how a SAN man working at a game

reserve used his indigenous skills of understanding animal behaviours and foot prints to trace a missing Zebra that had been assumed to a horse. The educator questions, the learners understanding in the use of indigenous knowledge in conserving biodiversity. Question asked was the learners understanding of the article. The educator emphasizes that the traditional healers' protection of the medicinal plants is conserving the plants.

### ***Learners' activities***

The learners were not able to give the educator their understanding of indigenous knowledge when asked for so. The learners read the case study, discussed and pointed out to the educator that the Zebra would have been lost if the SAN man did not use his traditional skills to track the Zebra. In response, to the educators question on the importance of indigenous knowledge in conservation of biodiversity, the learners explained how the traditional healer protect the indigenous plants that they use in making of traditional medicines by planting them in protected area when they take them from the forest.

### ***Educator Resources***

Resource was only used at the developmental stage of the lesson. The resource used is a worksheet with the case study. The worksheet was titled "conservation using traditional knowledge". It had notes and diagram. The notes explained how a man of San origin that works in the game reserves helps the researcher to track animals using his indigenous skills of understanding animal behaviour and foot prints. This San man as result of his indigenous skills and knowledge of animal behaviour and foot prints helps researchers in studying animal behaviour and hence has contributed to researches in areas like zoology. The diagram shows a man almost naked, holding a stick in the left hand while reading the animal foot prints on the soil

## **Manifestation and representation of indigenous knowledge in the Educator 2 lesson observation**

### ***Educator activities***

The educator and the learners are all Zulus. At the introductory stage of the lesson, the educator after the explanation of the terms biodiversity, natural resources and conservation, asked the learners their contributions in taking care of the resources found in their areas. At the developmental stage of the lesson, the educator questions the learners' knowledge on the practices of their fore fathers in conserving plants, animals and other resources found in their environment. The educator then read a story on the Zulu's indigenous knowledge of storing maize in hole dug in the grounds. The educator put the learners in groups of five and asked them to discuss some of their local knowledge that are used in conserving resources found in their environments. After the learners' discussion and presentation on some of the indigenous knowledge they use in conserving resources in their communities, the educator gave them a note on the Zulu's indigenous knowledge of storing maize in the holes dug in ground and the scientific way of storing maize in silos and asked them to compare the two in a table. The educator concluded the lesson by asking the learners to research on the indigenous ways of conserving one resource that is found in their communities. He as well told the learners that in the next lesson, they will focus on the scientific ways of conserving resources.

### ***Learners' activities***

The learners, in responses to the question on how they contribute in taking care of the resources made mention of the wise use of water, not cutting down trees and not hunting. Also two learners in response to the teachers question on how their fore fathers took care of resources said that their fore fathers did not hunt every animal and did not eat lots of plant. Two learners contributed to the educator's story on the Zulu indigenous knowledge of storing maize in grounds, saying that their grandmothers have told them about that. The learners in groups of fives discussed some of the local knowledge that the people in

their communities use in conserving resources in their environment. After the group discussion, three groups presented their points. The learners made mention of how the traditional healer go to the forest to isolate plants that are of medicinal values and plant them in protected areas to ensure continued existence of the plants. They also talked about how the children were not allowed to urinate in water with the consequences of turning into opposite sex. This idea of not urinating in water seems applicable to all the learners' communities. The learners compare the Zulu's indigenous knowledge of storing maize underground to the scientific ways of storing maize in silos.

### ***Resources***

The educator used only one worksheet at the developmental stage of the lesson. The worksheet has notes and diagrams. The notes explained two methods of storing maize. The Zulu indigenous knowledge of storing maize in holes dug underground and the scientific knowledge of storing maize in silos. The worksheet has two diagrams, one on the Zulu indigenous knowledge of storing maize and the scientific ways of storing maize in silos.

Summarising the data analysis of research question 3 which focuses on how the educator integrate indigenous knowledge in their teaching. Educator 1 first teaches the learners the scientific ideas of the concept before doing a lesson on the indigenous knowledge of conservation. Educator 2 started off by letting the learners explore the indigenous knowledge that their different communities use in conserving the resources found in their communities. It is apparent that there are no guide on what the educators should do and how they should do it when they integrate indigenous knowledge. The educators integrate indigenous knowledge based on their own understandings and thoughts of how and what should be taught. This is evident in the analysis of the educator 1 and educator 2 ways of integrating indigenous knowledge. Hence it becomes important to explore what informs the way the educators integrate indigenous knowledge in their teachings.

APPENDIX 16

**WHAT INFORMS THE EDUCATORS' INTEGRATION OF INDIGENOUS KNOWLEDGE IN THEIR TEACHING OF CONSERVATION OF BIODIVERSITY AND NATURAL RESOURCES?**

**Table 10: What informs the educators on their integration of indigenous knowledge?**

<p><b>What informs the way you integrate indigenous knowledge in your teaching of conservation of biodiversity and natural resources</b></p>	<p><b>Responses</b></p>
<p>Educator 1</p>	<p>I as an African, a Zulu. I have an understanding of African practices that are used in order to conserve or protect the resources. Secondly, the knowledge of the subject. The knowledge of the subject guides me in linking indigenous knowledge to biodiversity because I have the Life Sciences knowledge as an educator, Life Sciences educator and lastly am being guided by the Life Sciences policy which helps me a lot in linking indigenous knowledge and biodiversity.</p> <p><i>Further response</i></p> <p>Ok, in Zulu we have a number of practices that we use in order to conserve. We have various plants that we used for traditional healing. These plants are grown by the elderly and there are people in the community the Sangomas and the Inyangas which are responsible for growing specifically</p>

	<p>growing these plants so that they will make medicines and help the families, the Zulu families. I cannot say the names, the Zulu names but we have a few can be Iboza which provides healing to various sicknesses. So we have practices.</p>
Educator 2	<p>Ok, firstly I would say is because we where informed by the policy document. The policy document said so. Secondly, I will say that when I was doing my lesson plans I have realize that most of the things that are in the topic conservation of biodiversity are things that most indigenous groups are familiar with. Then I said to myself no, I think it will be better if you start with what they know with regards to their IKS. Then from there we move to biodiversity and conservation of biodiversity and I thought that will be easy for them to comprehend biodiversity because most the things that are discussed in biodiversity is the things that most learners know and some of them is just that they are ignorant that they don't come across them. So, If you bring a discussion in class with regards to IKS, this will automatically assist them when they come across biodiversity itself.</p>