

***Incorporating Indigenous Knowledge into the school science curriculum***

*by*

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## **Dedication**

This research is dedicated to my sons Rakheel and Kedhar and I hope it serves as an inspiration to them both in whatever they do.

## DECLARATION

I, Hemraj Dharampal, declare that this dissertation is my own and original work, and has not been submitted previously for any degree in any university.

A handwritten signature in black ink, appearing to read 'H. Dharampal', is written over a horizontal line.

Hemraj Dharampal (researcher)

## **ABSTRACT**

This case study explores a relatively new and stimulating method of incorporating indigenous knowledge into the school science curriculum through understanding the uses of indigenous medicinal plants.

For hundreds of years people have relied heavily on medicinal plants to cure and treat a variety of ailments. Knowing about these earlier forms of knowledge often formed a crucial aspect for survival especially when modern medicine was unavailable. Comparative studies on rural South African and Botswana communities have revealed that about 80 % of these communities still relied on indigenous herbal plant medicines to sustain their health needs (Ntsoane, 2000a).

This study recognises that indigenous knowledge has the potential to teach poorer African communities of these much-valued medicinal aspects through simple yet interesting ways. This study is based in the dynamics of a local South African school setting comprising of Asian and Zulu learners coming from different ethnic and cultural backgrounds.

Part of the strategy in this study is the use of a "*photo-voice*" technique that captures the learners' thoughts and ideas on indigenous knowledge. The students' interpretations are better explained and explored through a process of dialogue that I have used as a tool to explain how children learn, develop, relearn and change their complex understandings of indigenous knowledge.

## **PREFACE**

The work described in this dissertation was carried out in the School of Education, Durban, University of Kwazulu-Natal from December 2004 to September 2006 under the supervision of Dr Shakila Reddy (Supervisor).

This study represents original work by the author and has not otherwise been submitted in any form for any degree or diploma to any tertiary institution. Where use has been made of the work of others, it is duly acknowledged in the text.

Hemraj Dharampal

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## CHAPTER 1

### 1.1. INTRODUCTION

This case study explores a relatively new and stimulating method of incorporating indigenous knowledge in schools through the use of indigenous medicinal plants.

For hundreds of years people in the past have relied heavily on medicinal plants to cure or treat a variety of ailments. This so-called Indigenous Knowledge (IK) has through the years been replaced by Western scientific discoveries that have in some cases copied or improved on these early forms of knowledge. Knowing about these earlier forms of knowledge often formed a crucial aspect for survival especially when modern medicine was unavailable. Comparative studies on rural South African and Botswana communities have revealed that about 80 % of these people still relied on indigenous herbal plant medicines to sustain their health needs (Ntsoane, 2000a).

References to indigenous knowledge are appearing with growing frequency in international and local policies (see for e.g. Snively & Corsiglia 2001; Robottom 2003a) and in the popular and academic literature and also in research projects and funding proposals worldwide. In South Africa, for example, the Department of Environmental Affairs and Tourism has developed a national strategy to protect indigenous knowledge and a Bill has been drafted to “find innovative solutions to the commercialisation of indigenous knowledge” (Wynburg, 1998).

The significance of plants and its potential to treat diseases and illnesses have been documented for hundreds of years (Robottom 2003a). Indigenous knowledge of medicinal plants brings hope to thousands of people suffering from HIV/AIDS as scientists examine local indigenous plants in the hope of finding a potentially useful medicine that can help sufferers. The African continent has one of the highest numbers of sufferers of HIV/AIDS in the world (Coombe, 2003). Local communities have begun realising the potential that plants can have in assisting HIV/AIDS sufferers and have started a campaign in protecting certain herbal plant species from possible extinction due to over-usage. I will now discuss my personal reflections to outline some of the reasons as to why I think this study is important.

## 1.2. PERSONAL REFLECTION

My schooling experience in the study of science was for the most part misleading. I perceived science, as a collection of facts, often Western in nature, which did little to enhance the present knowledge base of communities in Africa. Much of our peoples cultural, historical, and indigenous ways of doing things were and are fast dwindling. Science education in the past thus did not promote much room for development and improving the quality of life. In my view in Africa applied science should be a tool for development. Its purpose should be to improve the “*quality of life*” of the continent’s people and to contribute to economic development. A characteristic of applied science is that it uses knowledge to solve problems in the immediate environment and community, whereas the characteristic of research science is to acquire new knowledge.

It is hoped that through this study on indigenous knowledge people from poorer African communities can begin using this knowledge to their advantage to solve their day-to-day problems and for the betterment of their lives.

## 1.3. RATIONALE FOR STUDY

This study views local indigenous knowledge as a crucial entity that could be useful especially in Africa considering the scourge of HIV/AIDS and other life threatening diseases as indigenous knowledge imparts useful survival strategies that could provide answers for the problems faced by people. Essentially the argument is that South Africans must be proud of their culture, religion and practices.

For example the Revised National Curriculum Statement for grades R-9 (School), Natural Sciences (Department of Education, South Africa, 2002), have already envisaged a teaching and learning milieu which recognises that the people of South Africa operate within a variety of learning styles as well as within “*culturally influenced perspectives*” including indigenous knowledge, which is to be a major part of the school curriculum in South Africa. It starts from the premise that all learners should have access to a “*meaningful science*” education, and that arbitrary selection

and rejection based on various kinds of biases should be avoided. The South African Department of Education therefore believes that meaningful education has to be learner-centred and help learners to understand not only scientific knowledge and how it is produced, but also the contextual environment and global issues that are intertwined with the learning.

More importantly, this study is necessary because of the growing global perception of the need to respond more adequately to environmental issues and risks and an accompanying linking of indigenous knowledge to conservation concerns (see e.g. UNESCO-UNEP, 1996). Indigenous knowledge has also developed as a concern in socio-political processes of democratisation where it has come to be seen as symbolic capital in and of Africa (Van Wyk *et al.* 1997).

In South Africa environmental policy guidelines drawn up by ruling party i.e. the African National Congress (ANC, 1992), called for *“a bias towards development of appropriate environmental awareness programmes for all sectors of society in order to reinforce the harmonious and traditional links with the environment”* pg. 2. Such political processes that call for a recognition of cultural roots are intertwined with post-colonial development initiatives where *“indigenous knowledge”* has become:

*“An orientating icon of the democratic process of relevance, localisation, participation, and learning amongst and from the other”* (ANC, Policy Document, South Africa, 1992, pg. 2).

#### 1.4. CRITICAL QUESTIONS

Two key critical questions assisted in framing this study:

- How can knowledge of local medicinal plants be used to educate learners on Indigenous Knowledge (IK)?
- What are learners’ perceptions of indigenous knowledge in the context of their daily lives and what is its significance to science education?

### **1.5. OUTLINE OF THE STUDY**

In this study learners will learn about indigenous knowledge by studying indigenous medicinal plants and their health related benefits.

To give direction and meaning to what is learnt in the classroom, learners will use photographs of indigenous medicinal plants to explain their perceptions of what “indigenous knowledge” means to them. I believe that pictures with well-chosen images can convey clear, simple images that can support work with learners even with low levels of formal literacy. The indigenous picture building games where learners collect photos of IK to make a chart and the “photo-talk” technique that I intend to use will enable learners to better understand the value of indigenous knowledge and these images will be used to stimulate discussions on issues of science and indigenous practices.

This research uses the non-positivist interpretive paradigm. The nature of information that is needed, i.e. personal knowledge about indigenous knowledge, presupposes expressions of feelings and experiences and some personal observation on my part, and does not fit well with the positivistic paradigm. This study will therefore adopt a type of research that necessitates a qualitative and quantitative approach to the collection, analysis and presentation of its data. Language, interaction and meaning making in African contexts have become important dimensions of environmental learning associated with this trend towards active learning. This study will therefore adopt the view that learning about environments should involve a balance of cultural induction and critical reflection.

Below is a brief description of what each of the remaining chapters contain:

## CHAPTER 2: LITERATURE REVIEW

Focuses on current and past indigenous studies. This review starts by defining indigenous knowledge and then links indigenous knowledge to the South African science curriculum and expectations. Indigenous knowledge and herbal medicines are then described and compared. The chapter also reviews the use of photographs and visual stimuli through the use of literature and on its influence or impact in this study.

## CHAPTER 3: THEORETICAL FRAMEWORK

The theoretical framework uses a constructivist explanation to lend support for this research through meaningful explanations on how children can learn.

## CHAPTER 4: RESEARCH METHODOLOGY

This chapter describes how quantitative and qualitative techniques are employed to obtain data to support this study. A brief analysis of the research style, the sample, data collection techniques and the use of children's interpretations in the research are discussed.

## CHAPTER 5: RESULTS AND DISCUSSION

This chapter presents selected extracts of the children's class-based discussions where children share with each other what they have learnt from the exercises on indigenous medicinal plants through their class-based dialogues. The results are presented using the children's photographs of indigenous medicinal plants. The questionnaire findings are presented together with discussions. The perceptions and views of the learners are later analysed using relevant literature.

## CHAPTER 6: ANALYSIS AND LIMITATIONS OF THIS STUDY

The findings from the previous chapter are analysed in more detail. The limitations of this study are also explained.

## CHAPTER 7: INSIGHTS AND SIGNIFICANCE OF THIS STUDY

A more detailed explanation is provided to cater for emerging views related to this study. The significance of this study is also explained.

### **The findings of this research could be useful to:**

- Curriculum development specialists involved in formulating environmental and indigenous knowledge awareness as it draws from its findings on perceptions of learners and allows for a critical reflective practice allowing for improvement in current practice. This allows humans to improve the overall quality of their lives.
- Educators of children in the intermediate phase of schooling, allowing teachers to adapt and change their content and teaching styles to suit the context in which they may teach.
- Authors of new science and environmental textbooks, who can now successfully incorporate IK into the science syllabus.
- Learners in the intermediate phase of schooling, allowing for more meaningful and “context – driven” knowledge applicable to the everyday lives of its learners.
- Myself as a science educator enabling me to reflect upon and improve on my current practice of teaching.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1. INTRODUCTION**

In a study of indigenous knowledge in schools a variety of factors come into being to ensure meaningful learning. This chapter aims to discuss some of these and related issues in the following order:

- Defining indigenous knowledge.
- The science curriculum and its link to indigenous knowledge.
- Indigenous knowledge and its link to herbal medicines.
- Teaching indigenous knowledge in the classroom
- The use of photographs to teach indigenous knowledge.

#### **2.2. DEFINING INDIGENOUS KNOWLEDGE**

Indigenous knowledge is local knowledge, derived from interactions between people and their environment, which is characteristic of all cultures (O'Donoghue & van Rensburg, 1995). It spans the entire range of human experience, including history, linguistics, politics, art and even economics (Ntsoane, 2000a). Ntsoane states that indigenous knowledge is a fusion of both traditional and local knowledge. He also adds heritage. In his definition Ntsoane defines "local knowledge" as that which is unique to a given culture or society, which often reflects the traditional expectations of that community.

For the purposes of this research I will use Ntsoane's (2000a) definition of indigenous knowledge because it is unique and suggests that such knowledge is specific to certain people and comes from within a community or a group of people, i.e. it is endogenous to a specific group of people.

This research focuses on the South African Zulu culture and on their indigenous ways of plant medicinal healing remedies as well as on the Indian ancient healing remedies (Ayurvedic healing), which are documented to have originated like the Zulu healing remedies hundreds if not thousands of years ago (Van Wyk *et al.*, 1997). It is important to note at the outset that although some of the indigenous knowledge used in this research is not local to the “African context” it will be used because it can still be argued to be in a way indigenous to some of the participants (Indians) despite the contextual differences. Thus the Indian communities in South Africa who initially originated from India have also carried their “indigenous ways” of healing with them. This knowledge also has useful applications to studies of indigenous knowledge despite its adopted “African” context.

Globally indigenous knowledge is meant to include agriculture, natural resources management, engineering, fishing and medicine. It is the latter (i.e. medicine) and how such knowledge of indigenous healing remedies and respect for plants that will form a basis for this research. Such local plant knowledge is of significance, and in most cases disrespect for such indigenous knowledge often ends up with disastrous effects especially when outsider knowledge is imposed without respect for local knowledge (Lansing & Kremer, 1995; Cashman, 1989).

Kaya & Maleka (1996) define indigenous knowledge (IK) as what the local community regards as authentic. Lalonde & Morin- Labatut (1993) support this when they argue that indigenous knowledge systems are not monolithic, because some elements are traditional and passed down from one-generation to another with little or no changes while others are subject to innovation and integration of foreign practices. Indigenous knowledge systems are in constant transformation.

Lalonde & Morin- Labatut (*ibid*) emphasise that such knowledge has value not only to cultures from where it originates, but also to the commercial needs of the outside world. More recently the definition of the term, ‘indigenous knowledge’ often stresses the need for knowledge production.

Indigenous knowledge production consists of characteristic elements of the traditional heritage developed and maintained by a community of individuals that reflects their



traditional expectations (Todaro, 1985; Ntsoane, 2000b). Indigenous knowledge is culture based and often practised in ways that are effective, efficient and functional in those communities that hold them. Apart from having some technical knowledge these communities often have non-technical knowledge of insights, wisdom, ideas, healing abilities and knowledge and often-innovative ideas (O'Donoghue, 1995). This step is now being seen as an Afro-optimistic approach and researchers are beginning to see that any definition of indigenous knowledge should respect the culture and rights of indigenous peoples (Ntsoane, 2000b).

### **2.3. THE SCIENCE CURRICULUM AND INDIGENOUS KNOWLEDGE**

Educators may often encounter many problems when trying to integrate indigenous knowledge into the school science curriculum (Pomeroy, 1994).

One of the major problems faced by science learners is that often they perceive “*science education*” as a “*foreign culture*” as it does not incorporate local practices and beliefs of the communities it serves (Maddock, 1981). Research in developing countries has identified problems experienced by students who have an indigenous “*traditional*” background and attempt to learn a subject matter grounded in Western culture (Pomeroy, 1994). Similar findings are found in reviews of First Nations research in science education (MacIvor, 1995; Nelson- Barber & Estrin, 1995).

Student’s feelings of “*foreignness*” to science stems from the fundamental differences between the cultures of Western science and their indigenous cultures (Aikenhead, 1997; Jegede, 1995a). Interestingly, many students in industrialised countries share this feeling of foreignness as well (Aikenhead, 1996; Costa, 1995).

It can therefore be argued that learning school science requires that some students be able to cross boundaries between the cultural context of their home, family and community and the cultural context of Western science (Duschl, 2001; George, 1995).

Cultural clashes between students' life-worlds and the world of Western science challenge science educators who embrace '*science for all*', and the clashes define an emerging priority for the 21<sup>st</sup> century i.e.:

*"to develop culturally sensitive curricula and teaching methods that reduce the foreignness felt by students"*( Snively & Corsiglia, 2001, pg. 6).

This research takes into consideration that students in this research come from different cultural backgrounds, comprising of Indian students from an Asian background and Black students from an African background. It is important to note that both groups although largely westernized, both still have their own unique indigenous cultures and knowledge that shaped their early childhood learning. For example both Black and Indian students believe that certain plants are of medicinal value and can be used to treat specific ailments e.g. toothache, acne, skin rashes or inflammation and similar simple remedies but what is important is that each ethnic group have their own specific remedies that is indigenous to their own culture i.e. they may have different views on medicinal plants and healing.

Cross-cultural studies (similar to this research) in non-Western settings often come to the conclusion that science should be an extension of a child's everyday upbringing and early development (George, 1988; Jegede, 1994; Ogawa, 1995).

For example, based on the idea that commonsense "science" for students in the Republic of Trinidad and Tobago was "street science", George (1992) and Prime (1994) designed and implemented ways of using indigenous resources to mediate a technology-based science experience.

Thus for example the Science-Technology-Society (STS) conceptualisation has come of age after about 23 years of research and development (Gallagher, 1971; Solomon & Aikenhead, 1994). Contrasted with traditional school science's singular view of the natural world from only a scientist's perspective (Aikenhead, 1994c), this student orientated multiple-vista conceptualisation of science education harmonizes with the cross-cultural approach to science education described above (Jegede, 1994).

In a way this research thus urges for appropriate action as it considers “*mixing*” indigenous knowledge with Western science to form a harmonious relationship.

#### 2.4. INDIGENOUS KNOWLEDGE AND HERBAL MEDICINES

Since the beginning of human civilization, people have used plants as medicines. Plants continue to be a major source of medicines, as they have been throughout human history (Rohrer, 1986).

Some medicinal plants, such as the opium poppy, have long been recognized and widely used, while others such as the Pacific yew, the original source for the cancer drug, “Taxol”, are relatively new arrivals to mainstream medicine. In addition to providing the basis for between 30 and 40 percent of today’s conventional drugs, the medicinal and curative properties plants are also employed in herbal supplements, botanicals, nutraceuticals and herbal brews.

Cunningham (1989) believes that children need to know the uses and medicinal properties of their local indigenous plants. Hutchings (1996) stresses that these plants have powerful healing properties and form a crucial role in overall development of a child. Learning about plants and their medicinal properties teach them to value and contribute to environmental awareness which is so much in need (Pujol, 1990). Locally many plants are used to make herbal medicines, which are sold commercially. Some of these herbal medicines include: *Devils Claw*; *Real Buchu*; *Bioforce* (a homeopathic medicine for acne and allergies).

Currently Western allopathic medicine, western herbalism, homeopathy, Ayurvedic medicine from India and traditional Chinese medicines coexist with indigenous African medicines (Shiva, 1996).

At the core of the issue however is education at schools and institutions as these are highly lacking (Redford, 1990; Alcorn, 1993; Redford & Stearman 1993a). More frequently indigenous wealth is often scoffed as being mere mythical fallacies about healing. This is because traditional cultures are characterised by low technology and

heterogeneity, while sustainable interactions within ecosystems are often based on necessity (Redford & Stearman, 1993b).

This research does not aim to suggest that either (modern or traditional) medical approaches are more superior than the other but aims to educate children on the aesthetic value of plants by using indigenous herbal remedies as a starting point to illuminate further interest in the subject.

Worldwide studies on plants and its relevance economically are fast growing (Rosenthal, 1996). In Africa more than 80 percent of the continent's population relies on plant-based medicines to meet their health care requirements. For the most part the plants used in traditional medicines are collected from the wild, and in many cases, demand exceeds supply. Over the last decade or so ethnobotany has assumed a scientific prominence previously denied it. It is endorsed by institutions with a high international profile (Kew, The Royal Geographical Society, WWF, UNESCO), has a market value placed upon it by foresters, agronomists, development advisors and pharmacologists, and has become pivotal in preserving the cultural identity and knowledge of indigenous peoples whose traditional way of life is under threat (Posey, 1989).

Much of the past literature on Indigenous Knowledge tend to focus on developments of protection of indigenous peoples rights, bioprospecting and indigenous wisdom with little emphasis on indigenising the present science curriculum (Robottom 2003a). However more recently there has been a redevelopment of the science curriculum in many of the worlds developed nations consistent with the ideology, "*science for all*". In indigenising the science curriculum in an African setting one should consider that students' understanding of the world is often viewed as a cultural phenomenon (Jegade, 1995a), and learning should be seen as culture acquisition (Wolcott, 1991), where culture means "an ordered system of meaning and symbols, in terms of which social interaction takes place" (Geertz, 1973, quoted in Cobern, 1991).

Thus we can speak about a Western culture, an Oriental culture, or an African culture because members of these groups share, in general, a system of meaning and symbols for the purpose of social interaction.

Presently, for example there is a great deal of interest among scholars in the arrangements, decisions and coalitions for the provision of an alternative health-care system that can assist the thousands of poor South Africans. There is a search for methods that can be employed where families will follow more healthy lifestyles and rely on natural plant- products to assist them in the simple day-to-day illnesses or even diseases. More recently HIV/AIDS research has shown that the medicinal properties of plants may provide answers to possible cures for HIV and other incurable ailments.

It has also been noted that in other studies that many traditional societies are undergoing a process of “diffusion and acculturation,” where “old” and “new” elements are recombined in ways that did not previously exist in either society (Nash, 1984; Darling, 1979).

## **2.5. TEACHING INDIGENOUS KNOWLEDGE IN THE CLASSROOM**

A recent study into science curriculum by researchers argues that Indigenous science should be included in classroom science but it also needs to be approached in a non-tokenistic way – informed and not dismissive in its status (Read & Rose, 2001). However, it could be approached in a different way, using an integrated / holistic approach, particularly in primary schools. Read & Rose, 2001 believe that in a study containing IK there are two main issues that need to be addressed:

- There is a lack of resource materials, which teachers can use, and a lack of appropriate professional development. This situation has improved slightly (e.g. Halling, 1999; Read & Rose, 2001) but further resource materials needs to be produced.
- Teachers need to be able to approach local indigenous people and use their knowledge as a resource in their classrooms.

It can also be argued that primary school teachers have the potential to become better teachers of indigenous science because they can integrate the learning over a range of

subjects – they can take a holistic / integrated approach to teaching similar to the indigenous people which they may already do through integrated and co-operative learning strategies (Mac Naughton, 2001c, 2001d).

## **2.6. THE USE OF PHOTOGRAPHS TO TEACH INDIGENOUS KNOWLEDGE**

Inherent to the nature of visual images e.g. photographs is the fact that pictures generally appeal to people of all ages and can thus be used in environmental learning situations at all levels of learning and with all categories of learners (Du Toit & Squazzin, 1999).

In trying to clarify the concept of “photo voice” used in this study I will use Beatty’s (1981) definition, Beatty explains that pictures tell a story in a language all on its own, they also provide a high level of interest through offering clarification and interpretation and they supply an immediacy of understanding not achievable by words alone.

Images help the viewer to visualise things, processes and ideas and help to make abstract concepts more concrete. Pictures also help to prevent and correct misconceptions. They help to focus attention and develop critical judgement. They offer a stimulus to further study, reading and research and offer the opportunity to clarify opinions, perspectives and values by eliciting debate and reflection. Visuals can also be used to stir the emotions and to evoke action. However the existing research on the introduction to the use of images in indigenous knowledge and environmental education learning has not explored a number of issues related to visual research (Mitchell, 1994; Beatty, 1981). These include research application possibilities such as “What kind of questions about the environment can be best explored through photography?” or “How does the use of photographs hinder or expand the role of the environmental researcher?” and learning experiences application like “What can be said about and with photographs?” or “How can photographs be used to develop narrative visual image?” Thus the existing literature

on the use of visual materials in the teaching of indigenous or environmental knowledge is seriously limited.

Chaplin (1994) states furthermore that pictures tend to impress themselves on us at a deep subconscious level and stay with us, influencing our thoughts and actions as much-if not more-than words do. When considering the inclusion of visual data-in whatever form-one should be cautioned not to do so just because one is enthralled by the medium or the technology central to the medium. The inclusion of visuals should contribute to and enhance understanding.

Images in research should never be used as “fillers”, but should serve a purpose of supplementing or complementing research evidence or knowledge or as “stand-alone” data. As pointed out earlier images are powerful tools and they should be used responsibly and ethically.

I have noticed that teachers often tend to take for granted the dominance of the written text in almost all areas of knowledge. We even talk about “illustrations” and “descriptions” and then leave it to the written word to transmit the message. It would seem that any transmit their own meanings and show underlying relationships and messages. Accompanying visual material is regarded as being supplementary to the written word. However, visual materials- whether photographs, illustrations, pictures, cartoons or other forms of images tend to play a much more influential part in mediating understanding. However to fully exploit the contributions that pictures can make to enhance learning, one needs to develop a visual literacy-to become a “picture reader” rather than a “picture scanner”.

The theoretical framework underpinning this research and its relevance to education will now be discussed.

## CHAPTER 3

### THEORETICAL FRAMEWORK

#### 3.1. INTRODUCTION

From my teaching experiences as a science educator it was observed that children develop meaning on the basis of their interactions with elders, nature, and views of their peers. African children learn about their environment using prior knowledge situated within their non- Western world-view (O' Donoghue, 2001). Problems arise when they are asked to learn Western science and technology in schools together with western culture. Often a learner's understanding of any new meaning is strongly influenced and determined by prior knowledge that is in turn determined by cultural beliefs, traditions and customs governed by a world-view. More importantly, as such, African pupils construct their understanding of nature on a daily basis using their world-view as prior knowledge (Aikenhead, 1997). I therefore believe that constructivism lends itself to this research as it explains in some detail how learners perceive and learn new science concepts such as indigenous knowledge.

#### 3.2. CONSTRUCTIVISM AND TEACHING INDIGENOUS KNOWLEDGE

Constructivism – which underlies much of current thinking about science education and which forms the basis for this research – emerged from a convergence of three areas of research (Solomon, 1994). These are the theory of personal constructs (Kelly, 1955), the notion of “Children's Science” (Driver & Easley, 1978; Von Glaserfeld, 1989; Osborne, Bell & Gilbert, 1983), and the social construction of knowledge (Vygotsky, 1978; Wheatley, 1991; Cobb, 1989; Solomon, 1989). Conceptual change research has dominated constructivism and deals with the key role of students' prior knowledge and the reflection process of interpersonal negotiation of “*meaning*” in scientific knowledge.

Several interrelated points emerge from world-view, culture and science and technology learning. Firstly, meaning is affected by the viewpoint of a “*culture*”. Second, social interactions within the community define meaning. Third, although



meanings are socially determined, the individual uses an idiosyncratic pattern to construct meaning. Thus, when engaging in social interaction while attempting to make meaning personal, an individual experiences interplay between cognition and affect through a world-view that serves as an interpretive framework. The learner's understanding of any new meaning is strongly influenced and determined by "*prior knowledge*" that is in turn determined by cultural beliefs, traditions and customs governed by a world-view. If prior knowledge exists as a result of cultural beliefs and theories, then different groups are likely to have different prior knowledge (Driver & Erickson, 1983; Snively, 1989).

Cultural anthropologists and social constructivists have proposed a theory that knowledge is socially negotiated and that a learner's background and prior knowledge influences school achievement (Prawat, 1993). Thus more recently the call for recognition of a learner's socio-cultural background (Social Constructivism) in teaching science and technology has gathered support from many sources (Cobern, 1994b; Atwater, 1994; Jegede, 1995a; Ogunniyi, 1988b), and draws on the work of Piaget (1970) and Vygotsky (1978) which pointed out that all learning takes place in a social context. Social Constructivism forms an important aspect in this study and will now be discussed in more detail.

In Africa, day-to-day interactions and explanations of natural occurrences are influenced within the socio-cultural environment by philosophical and religious beliefs, a theory of causality, taboos and superstitions. These beliefs impact on the attitudes, thoughts and behaviours of pupils as they learn and understand science, indigenous practices and technology and apply their meanings.

It can be argued that African pupils construct their understanding of nature on a daily basis using their world-view as prior knowledge (Aikenhead, 1996, 1997). Children develop meaning on the basis of their interactions with elders, nature, and views of their peers. African children learn about their environment using prior knowledge situated within their non- Western world-view. Problems arise when they are asked to learn Western science and technology in school together with western culture.

Prior knowledge situated within the African world-view becomes a handicap when a Western world-view is used as a framework for learning science and technology. The learner experiences mental perturbations and cognition is impeded. What we therefore regard as learning by the African child is an accumulation of information compartmentalised in mental schema to be used during examinations or when issues of indigenous knowledge are raised. Most problems arise when the ethos, values and morals of the two communities clash in science and technology classrooms.

Driver *et al.* (1994) therefore succinctly assert that:

*“learning science in the classroom involves children entering a new community of discourse, a new culture”, pg.7.*

It is like entering a conversation midstream and expecting to contribute to it when you neither know the rules nor are well informed about the issue being discussed. In the case of African learners (Black and Indian in this research), the prior knowledge they bring into a discussion is not often in consonance with the philosophy, orientation and knowledge base of the issue being discussed.

According to Dau (2001) good communication techniques are essential for successful learning. In developing countries good communication is often considered as “giving confidence” to indigenous communities in modern methods (Western science-based technology), as they have confidence in their “traditions”. In the early 1980s, some scholars, mainly anthropologists, developed a counter-proposition centred on the notion of Indigenous Knowledge Systems (IKS). The main idea of the IKS programme is that the development process should use indigenous technological knowledge and encourage indigenous participation by blending traditional and modern technologies.

Such a view of the “blending” of knowledge arose from the convergence model of communication (Rogers & Kincaid, 1981). It considered “communication” as a progressive, never ending process because absolute understanding between participants cannot be reached. This is as a result of the inherent uncertainty of information creation and exchange. In other words, communication implies a

relationship, i.e., mutual acknowledgement of the existence and condition of the “other” as an active subject, who can no longer be considered as a passive receiver. This concept of “blending” may raise the question of the difference in status of these two kinds (traditional and modern) of technologies (Rogers & Kincaid, 1981).

This difference in status concerns, firstly, the type of “rationality” of these knowledge systems. In order to blend, the indigenous technology (in this study –that of herbal remedies) has to face the accusation of “irrationality”. Often, the introduction of a new technology occurs when a traditional one has been accused of no longer adapting to modern conditions. The weakness of this accusation is that traditional technology is often embedded in system of representations (social, cultural, economical) that cannot be analysed from the “supposed” neutral point of view of Western science (Rogers & Kincaid, 1981). We see the problem of defining indigenous rationality, or who is indigenous, as a special case in the problem of understanding the user in the diffusion process. For the purposes of this research I will consider that the people (in this case, children), are the ultimate users of the extension models based on the diffuse tradition. According to the Indigenous Knowledge System (IKS) perspective, Indigenous Knowledge is not only useful (that is, of practical use) for development purposes, but also fundamental to any development process.

On the basis of the above discourse I can thus assert that what is needed in a constructive approach is for educators to try to inculcate an “indigenous practice” among its learners.

## CHAPTER 4

### RESEARCH METHODOLOGY

#### 4.1. INTRODUCTION

This research employs both qualitative and quantitative techniques as part of its research methodology.

It is essentially a case study of one South African primary school. The unit of study was grade 6 learners coming from two very different cultures (Zulu and Asian) each having their own rich indigenous knowledge. Each culture has its own indigenous knowledge, which is used in their day-to-day lives.

Most of the learners often have difficulty when learning in English, which is the medium of instruction in that school; as such visual material (pictures and photos of indigenous medicinal plants and actual plant specimens) will be used to assist in lesson explanations.

This case study was conducted in 2004 and data was collected during the period June 2005 to November 2005. I was the only researcher involved in this study. This research has in its method attempted to describe and interpret a human phenomenon, often in words of selected individual or informants. This is a characteristic of naturalistic or qualitative research (Morse, 1991; Guba & Lincoln, 1985, 1994).

Hitchcock & Hughes (1995) point out that the researcher should be integrally involved in the case and that case studies blend a description of relevant events with an analysis of them. As in this case study a few relevant events are necessary to make this research plausible. My intention was to reflect and draw meaning using class-based interpretations and questionnaires (open - ended and structured questions in a dialogical form) - this also ensured actual involvement by me as researcher.

Advantages of a case study, according to Cohen & Manion (2000), is that it can generate data that is strong in reality, catch unique features that otherwise may be lost in larger scale research and contribute to an archive of material sufficiently rich to

admit subsequent reinterpretation. Guba & Lincoln (1981) also share similar opinions on this point.

Nisbet & Watt (1984) do however point out that the subjective nature of a case study raises problems of respectability and legitimacy as given the uniqueness of situations. Case studies are thus selective and prone to problems of observer bias despite attempts to address reflexivity. Cohen & Manion (2000) also point out that whilst one of the strengths of teachers conducting research in their own schools is that they already know a lot about the school, staff and learners, such familiarity can be a drawback as things may be taken for granted that ought to be held in question. In this research to avoid such problems I was consistent throughout as I often questioned learners to obtain a clearer understanding on their perceptions of IK especially in cases where I was not to sure of learners interpretations and discussions.

Cohen & Manion (ibid) do however argue that despite these difficulties, case studies have gained popularity in response to the antipathy among researchers towards the statistical-experimental paradigm and have been widely used in educational research.

#### **4.2. POPULATION SIZE AND SAMPLING TECHNIQUE**

The population of learners *initially* constituted of 50 Zulu-speaking learners and 85 Indian learners from three classes that I taught (grades 6A, 6B, and 6C). The classes bore some similarity in that they were all co-educational, multi-cultural and the learners were of mixed ability.

The sampling technique that was used is *stratified random sampling* to make the sample size smaller and more manageable. The reason for adopting this strategy is because I believe that a more accurate analysis of findings could be obtained from a smaller sample during class-based dialogues and observation. The principle of stratified random sampling was adopted. It involved dividing the initial population into different groups, called strata, so that each element of the population belongs to only one stratum (Kahn & Cannell, 1967).

Then, within each stratum, simple random sampling was performed. This prevented a decrease in quality of the sample and ensured a lack in bias when selecting possible participants (Cohen & Mannion, 2000). In selecting the participants randomly each participant's name was written on identical pieces of paper and put into a box. From the possible 135 participants (*initial sample*) only the first 95 of the possible 135 were chosen for the research. The *actual sample size* for this research was therefore 95.

The reason for selecting Black (mostly Zulu-speaking) and Indian (English-speaking) learners is because I have noticed through my teaching experience that generally these learners have a rich indigenous and cultural heritage that they bring into the classroom situation, which is far too often neglected in studies due to disrespect of such knowledge which is considered non-scientific and of little value.

It must be borne in mind that Indian children in the same school also have valuable "indigenous knowledge" from their culture, e.g. plant healing remedies that have been carried out for hundreds if not thousands of years often using simple home remedies with much scientific value e.g. Ayurvedic plant healing remedies (Feldman 2001; Anaya 1996). For the purpose of this research I therefore intended to share such indigenous knowledge from both customs i.e. the Zulu and Indian - speaking custom, to the learners, as this knowledge is well documented and readily available but often not studied in schools (Thornberry, 2002). Although English was the medium of instruction in all classes selected in this study, it was not the home language of 50 of the 95 learners. English was not the home language of 50 of the 95 learners (52.63%) of the study and I encouraged learners to discuss their learning in the vernacular most suitable to them. Fellow pupils who were fluent in both English and in Zulu later interpreted this knowledge to the rest of the learners. This data was analysed for valuable information on learner perceptions of IK.

Limiting the **sample size** to 95 participants is expected to ensure greater group participation and sharing of indigenous knowledge during discussions and as I was the children's science educator, this ensured greater response and sufficient rapport with the learners. Cohen & Mannion (2000, pg.10) point out that "small scale research often uses non-probability samples because, despite the disadvantages that arise from their non-representativeness, they are far less complicated to set up, and considerably

less expensive, and prove perfectly adequate where researchers do not intend to generalize their findings beyond the sample in question”.

#### **4.3. INFORMED CONSENT**

Prior to the data collection procedure, all parents/guardians were informed about their child’s participation in the study and of the purpose, method and uses of the study. Those children that did not wish to form part of the study group were eliminated. I also explained to the parents/guardians that the findings of the study would be made public, and all participants would be guaranteed anonymity. I indicated that participation was voluntary and would therefore not affect their class assessments. Cohen & Mannion (2000) point out that whilst respondents might be strongly encouraged to participate in research, the decision whether to become involved and when to withdraw is entirely theirs. I therefore informed those pupils that were unwilling to participate to eliminate themselves from the study prior to commencing the actual study.

#### **4.4. STRATEGIES FOR DATA COLLECTION**

In order to obtain relevant data to explore learners’ perceptions of the nature of science triangulation was adopted in this study. Different data collection methods were used to “map out” more fully the complexity of learners’ perceptions of the nature of science. The data collection methods (instruments) used in this study included:

- A questionnaire that contains a chart style depiction containing photographs of the uses of selected indigenous medicinal plants together with questions that will determine how different learners perceive IK.
- A dialogue between teacher (researcher) and learners to extract relevant information on learners’ perceptions about the uses of indigenous medicinal plants (class-based activity).

- The use of pictures or photographs that learners used as a tool to try to explain the uses of indigenous medicinal plants (class-based activity).

It has been noted from my teaching experiences that pictures can be effective in obtaining responses as children often find them non-threatening and interesting.

Two main types of questions were used in this research questionnaire (refer to appendix A): open-ended (unstructured) and structured. Open-ended questions were used to elicit responses where students are free to express their own personal opinions or feelings. An example of such a question includes: Do you feel that indigenous knowledge is useful to you? Structured questions were also used in the questionnaire, which indicate a specific range of possible answers. In some instances learners were required to choose between only two possible alternative answers i.e. “Yes or No” or “Agree or Disagree”. The reason for doing this was to ensure that all learners despite problems of comprehension with questions at least responded to these simple questions.

The photographic activity was used to collect qualitative data to address the key question: What are learners’ perceptions of indigenous knowledge in the context of their daily lives. Settlege (2000) notes that:

*“Contrary to the adage that a picture tells a thousand words, a photograph alone discloses little meaning until the child reflects on the picture by writing his/her feelings or responding verbally as in an interview”*5(2) pg. 5.

The wealth and quality of the data gathered by such dialogue depends on the skill of the researcher (Miller, 1991; Mason & Bramble, 1978), and the confidence they are capable of awakening in respondents as well as on the type of questions they ask. Miller (1991) therefore suggests that especially in children encouraging questions are very important and at the correct time. Mason & Bramble (1978) also states that especially with children a useful knowledge base is important when they are asked to collect information. Therefore prior to collection of indigenous pictures of medicinal



plants or medicines the children were exposed to a few examples of such pictures so as to guide them in their collection.

A crucial aspect of this study will be to interpret how children (grade 6 learners) perceive the indigenous knowledge that has been taught to them. In order to better understand the children's perceptions I decided to use a technique comprising of a variety of short questions which the children were asked during the course of my classroom teaching on indigenous knowledge and after learners' presentations on how they interpret photos that contain indigenous medicinal plants depicting their healing properties. From my teaching experience I have observed that most children tend to have a short attention span unless meaningfully occupied. This research has adopted a method of teaching involving short questions and answers which will help me as researcher to collect more valuable data on the learners understanding of indigenous knowledge. This technique will also assist in triangulation techniques and to check for inconsistencies in findings.

Forcese & Richer (1973) state that this method of inquiry can be highly effective especially amongst younger learners (12-13 years). This will allow a two-way response allowing for personal experiences and learner expressions from the children on their perceptions of indigenous knowledge. The teacher (researcher) played the role of educator and facilitator to initiate responses and expressions during the entire class discussions. This was done through the use of visual stimuli (see Appendix C: *Chart on indigenous medicinal or 'muti'<sup>1</sup> plants*). The 'muti' plants are used by local *sangomas*<sup>2</sup> during healing practises or rituals and are also used by *inyangas*<sup>3</sup> for a variety of ailments. The children would be asked a variety of questions pertaining to indigenous knowledge and their perceptions of what they have learnt during the entire process. These responses would be recorded using a tape recorder and later analysed to find if there are similarities or differences in learner interpretations of IK.

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<sup>1</sup> A traditional Zulu term for a medicinal plant.

<sup>2</sup> A traditional healer or practitioner in Zulu culture.

<sup>3</sup> A traditional healer that uses plant ingredients for healing purposes.

#### 4.5. NATURE OF SCIENCE QUESTIONNAIRE

##### A) FIRST PILOT QUESTIONNAIRE

I initially elected to use a semi-structured questionnaire entitled "*Learners' perceptions of Indigenous Knowledge*" (refer to Appendix C). The questionnaire seemed ideal as an effective instrument for eliciting learners' perceptions of indigenous knowledge, and I decided to use four questions. As an aside to eliciting learners' perceptions of indigenous knowledge, I also included a further question pertaining to effectiveness of photographs so as to explore the findings of Beatty (1981), who indicates that to fully exploit the contributions that pictures can make to enhance learning, one needs to develop a visual literacy- to become a "picture reader" rather than a "picture scanner". The picture needs to be examined thoroughly and thoughtfully paying attention to attributing meaning, becoming aware of and probing impressions, relationships, ethical and aesthetic considerations, analysing and drawing inferences and responding through action, judgement or reason (Du Toit & Squazzin, 1999).

I elected to pilot the questionnaire with the learners who were in the sample selected for the study. The pilot questionnaire was therefore administered to 25 Grade 6 learners of mixed ability whom I taught. According to the educator who administered the questionnaire, the learners took about 30 minutes to complete the questionnaire. I found the learners' responses to the "perception of indigenous knowledge" questions in the pilot questionnaire difficult to interpret as the learners' answers were vague and bore little resemblance to the expected responses. Also learners were not well equipped to interpret some of the photographs presented to them (Refer to Appendix B). The possible reason for the inability of the students to answer the questionnaire is probably due to a poor prior knowledge base on indigenous knowledge and related topics. Cohen & Mannion (2000) express, "*if a genuinely open-ended question is being asked, it is perhaps unlikely that responses will bear such a degree of similarity to each other to enable them to be aggregated too tightly for purposes of research interpretation*", pg.10. Therefore it seemed appropriate that the "*perceptions of indigenous knowledge*" from the pilot science questionnaire used needed to have

more structured questions with possible alternatives from which the learners can choose. This will be better suited to this research, as it will enable me to draw similarities and differences from the findings of the results. Also students had to be subjected to some concepts of indigenous knowledge through class-based discussions prior to answering the research questionnaire.

## **B) SECOND PILOT QUESTIONNAIRE**

Based on the difficulties that had been experienced with the analysis of the semi-structured pilot questionnaire, I elected to design my own structured questionnaire in which learners would be able to indicate agreement or disagreement with statements pertaining to perceptions of indigenous knowledge (IK) and the use of photographs (refer to Appendix A). I chose to include statements pertaining to indigenous knowledge and the interactions during the learning process. The reason for the clustering of statements into these two areas was to facilitate an analysis at two levels:

- \* Firstly to ascertain if learners held similar or different perceptions of IK shared by the scientific community (Collins *et al*, 2001) and as expressed in Curriculum 2005 (South Africa) and:

- \* Secondly to facilitate a comparison with the perceptions of indigenous knowledge as expressed in the learners' photographs of indigenous medicinal plants as present in the context of their daily lives.

The second pilot questionnaire therefore comprised of pictures and visual stimuli to stimulate responses. Once again I chose to pilot the questionnaire with the learners in the sample selected for my study. **95 students** (grade 6 learners of mixed ability classes) were given the questionnaires. The learners were given 45 minutes to complete the questionnaire. I then conducted and recorded a whole group discussion for each questionnaire statement. I deliberately steered the discussion in such a way that learners had the opportunity to comment on each one of the questionnaire statements. I transcribed the whole group discussion and then used the transcript to compare learner's comments with the questionnaire responses. This enabled me to

check for validity and to correct errors in the questionnaires due to a lack of understanding considering that some of the learners found English difficult to interpret.

### **C) QUESTIONNAIRE-RESPONSE RATE**

I administered the questionnaire during class time and of the 95 selected participants through stratified sampling, all 95 participants successfully completed the questionnaire. These 95 questionnaires were used for analysis in the results of this research to determine students' responses to perceptions of IK. In this research the purpose of the questionnaire was to determine the nature of the learners' responses and their differing points of views. Hannagan (1982) writes: "Statistics is concerned with the systematic collection of numerical data and its interpretation" (p. 1). However, as Hannagan argues, numerical data are not facts in themselves; it is only when they are interpreted that they become relevant to discussions and that statistics merely provide a method of systematically summarizing some aspects of the complexities of human behaviour. This analysis was central to the interpretation of the quantitative questionnaire data. The second analysis i.e. classroom interpretations of photographs of IK was used to support/reject the findings of this first and to gather more "hidden" and relevant data to assist my interpretations.

## **4.6. PHOTOGRAPHS OF INDIGENOUS PLANTS**

### **A) Instructions for taking photographs**

Ideally each learner should have been issued with a camera, but only 20 disposable cameras were available for the study. This meant each learner was required to share cameras. Learners were allowed to keep the camera with them for a period of 2 days after which another student will borrow it. Each camera had 27 exposures. I met with each class for about 30 minutes to discuss the taking of the photographs. During this time I explained how the disposable camera worked and verbally instructed the learners to: "Take photographs of plants around you that can be used for healing a variety of ailments e.g. skin rashes / infections; stomach cramps/pains/ headaches;

sprains and swellings and of plants that are known to have other medicinal healing abilities”. I indicated that learners were not to take photographs within the science classrooms, and that the photographs should be within the context of their daily lives (in their home /surroundings). I also indicated that there were no “wrong” or “right” photographs.

I explained to the learners that the purpose of the photograph was to help educate on indigenous knowledge and this photograph would be theirs to keep (Refer to Appendix C).

The science curriculum theme used was: *The Learner and his Environment*. This theme encouraged learners to be viewed as an integral part of their environment and that they should not be seen as separate entities (Department of Education: *National Environment Education Programme*, 2000). I believe the inclusion of “*learner*” in this environmental education research is critical to this research as it suggests that people are an integral part of the environment and a web of existence and sustainability is thus created in this way (EECI, 1998).

For these reasons I encouraged the learners that while taking photographs they should try to include themselves as part of the “*picture*” as they cannot be “divorced” from this learning process. I also indicated that completing a report sheet was a crucial aspect of the activity and each photograph should be accompanied by a written description and explanation of why the photograph represented indigenous knowledge. The verbal instructions were reiterated on an instruction sheet issued to each learner.

#### **B) Response rate of disposable cameras and report sheets**

When learners returned the cameras, I requested the completed report sheet. Some learners had lost the report sheet by the time they took their photographs e.g. science, so I issued another report sheet and the learner completed it while I waited. This slowed down the data collection process. Learners were also asked to write a short reflection about the photographic activity on the report sheet. A total of 95 report sheets were issued and 93 returned. With the exception of the two learners that did

not return their report sheet, all respondents indicated that they enjoyed the activity – this probably contributed to the high response rate. The 2 outstanding report sheets were later filled and returned by the learners. My request that learner’s photograph themselves within the indigenous context that they portrayed was primarily to enable me to match photographs with the report sheets. It also served as an unexpected incentive for learners to return the cameras as most learners wanted to see (and keep) the photograph they had taken of themselves- (Refer to Appendix E for a collection of some of the participants (learners) photographs.

The 60 images of indigenous medicinal plants generated in this study were essentially pieces of “art” open to individual interpretation and I found, as Settlege (2000) had indicated, without knowing the photographers intent, the underlying science was virtually impossible to ascertain. Settlege (2000) had also indicated that learner interpretations are crucial to the data collection process, as I have claimed that some of the learners in this study had initially either not returned the report sheet, or had provided inadequate written reports of their photographs. I conducted tape-recorded class-based discussions and dialogue with 10 learners that had taken quality photographs of science. During these interviews the learners would positively identify their photographic prints and briefly discuss each photograph with me and with the class. These discussions lasted about six minutes each. The tape-recorded interpretations were then transcribed and compared with the learners report sheet.

## CHAPTER 5

### RESULTS AND DISCUSSION

#### 5.1. INTRODUCTION

In the presentation of the results I will first discuss the findings from my class-based activities i.e. class-based discussions and learner photographic interpretations (photos of indigenous medicinal plants depicting their uses) and later explain my findings from the questionnaire.

**Two key critical questions assisted in framing this study:**

- a) How can knowledge of local medicinal plants be used to educate learners on Indigenous Knowledge (IK)?
- b) What are learners' perceptions of indigenous knowledge in the context of their daily lives and what is its significance to science education?

#### 5.2. PHOTOGRAPHIC INTERPRETATIONS OF INDIGENOUS KNOWLEDGE

From the class based activities involving learners I as researcher have noticed that learners were eager to learn new information containing indigenous knowledge. Pupils were eager to discuss what their photographs were representing and on how their own culture uses indigenous knowledge for their daily health uses. This activity where learners explained in their own words what their photographs meant to them and how it is related to indigenous knowledge was very interesting.

**From the class-based discussions it was observed that:**

- Learners began to name indigenous plants in their own mother- tongue.
- Learners began sharing useful health-related uses of indigenous medicinal plants through use of their own cultural terminology, which often names and describes these plants.

- Learners often recognised plants that they have previously used at home when called by their indigenous names that their forefathers have used.
- Learners were excited to explain how their grandparents or parents often made medicinal concoctions at home using a medicinal plant that they have recognized in the photograph.

**Table 5.1: Some examples of indigenous plants with their traditional names (Zulu/ Xhosa) and uses.** (Note: the examples of medicinal plants quoted below were selected from a list of over 50 other medicinal plants studied by the learners).

Scientific name	Common name	Zulu/Xhosa name	Indigenous uses
<i>Aloe arborescens</i>	Krantz Aloe	inkalane	Popular garden plant, used on wounds, has anticancer, anti-inflammatory properties (Green, 1988).
<i>Scilla natalensis</i>	Bloulangkop	Inguduza	Used externally on wounds, sprains and fractures. Taken orally to treat tumours, but large dosages can be fatal. (Bryant, 1966).
<i>Hypoxis hemerocallidae</i>	African potato	Inkomfe (Zulu)	Tubers are boiled to treat arthritis, HIV/AIDS and cancer (Green, 1988).



I also observed that the learners were eager to present their knowledge on a specific indigenous plant. The above table (Table No.1) depicts some examples of the types of indigenous medicinal plants that the learners commented about in front of their peers (Refer to Appendix F for more examples of plants discussed by learners in this study). The learners explained in most cases with the use of actual plant specimens and photographs how “their” specific medicinal plant has been of use to their family or families or to them. The learners explained in step-by-step procedures (with much enthusiasm) on how their chosen plant could be used to treat a variety of health ailments from simple toothache to more complex problems such as arthritis and skin rashes. From Table No.1 above some of the learners explained for example how they were forced by their parents to drink a bitter mixture containing Aloe plant extracts (sap) that their grandparents have called “*inkalane*” which in Zulu literally means “*bitter*”. This plant extract has been used for hundreds of years to treat ailments such as toothaches and also skin rashes and infections as it contains anti-inflammatory ingredients in its sap, which is extracted and often applied to a wound (Green, 1988). Some of the children also had the opportunity through this study to probe even further and collected more recent information pertaining to indigenous medicinal plants. These learners often learnt about how HIV/AIDS is threatening to destroy large populations of people in Africa and across the globe. The learners in question often spoke on how attempts are being made to use indigenous knowledge in partnership with modern Western science and probably discover a cure for this much-dreaded disease.

With regards to HIV/AIDS the learners often mentioned the name of the African Potato (*Hypoxis sp.*), which has proven medicinal properties and perhaps could be used to assist the suffering that is associated with the HIV/AIDS disease (Green, 1988). I have purposefully illustrated only a few of the more appropriate photographs that depict some type of indigenous medicinal plant (Refer to photographs No. 1 and 3 below which the learners have used to try and explain how their chosen medicinal plant can be of use to people and to them). Photograph No. 3 for example depicts a learner showing off a local medicinal plant that has been used for hundred of years by Indians (Asians) not only as a medicinal plant but also as a plant that has been

worshipped in the Indian scriptures for its properties and variety of uses in treating health-related problems. The learner also stated that this plant is also used frequently in *Ayurvedic* preparations using natural, herbal remedies to treat a variety of bodily ailments. The learner in Photograph No. 3 provided his own photograph and stated that this plant grows abundantly in a nearby land close to his home and also in his garden. The children collected a total of 60 photographs depicting medicinal uses of some indigenous medicinal plant. I believe that the 60 photographs depicting medicinal uses of plants generated in this research were essentially pieces of “*art*” as they were open to individual interpretation and serve in their sepia expressiveness as poignant narratives of what is science in the eyes of the child. In this presentation I will explain briefly how these photos served as a “*catalyst*” that fuelled classroom debate around the issue of uses of medicinal indigenous plants. Some of the more interesting photos and essential parts of the discussions are explained below:

Photograph No.1: A learner displayed the following photograph depicting the uses of *Aloe vera*.



What was clear in these photographs was an array of “*ideas*” of how children best try to encapsulate the idea of indigenous knowledge to their teacher and peers. Some of the photos depicted children participating in environmental awareness initiatives, some revealed medicinal healing plants used in the home, commercial medicinal

plants and children touching, smelling or observing indigenous medicinal plants in their natural habitats.

The photographs portrayed to me from an educational sense the urgency of the need to protect and recognise the importance of such plant species and also of the need to protect indigenous “ways of knowing”. While many of these photographs are rich visual texts in and of themselves, they also served as prompts to discussions that were recorded. For example the child that presented photograph No. 1 to the class said to the class during his presentation that:

*“Plants and medicine are needed for human survival and have been used by my people for hundreds of years. I took this picture of indigenous medicinal plants as it shows how important plants and conservation are to us all” (Rowan, 12 yrs, Grade 6).* The child stated further:

*“when I cut the fleshy leaf of this plant into two pieces, I was surprised, it gave of so much of a thick, green-coloured liquid. This liquid healed my skin rashes and insect bites as it formed a protective layer on my skin. Maybe the skin absorbed some of this but I’m not really sure”.*

The qualitative aspects in this research seek to find meaning of children’s interpretations. Interpretations are a secondary account (Schutz, 1973) and should involve expansion analysis (Cicourel, 1980) where some key example of data, often-qualitative data such as a key story or passage from a conversation is used to explain “how” the conceptual or theoretical processes of interest operate in the data display.

In the class based discussions the children used the photographs as entry points, then, the children engaged in visual and spoken dialogue, and they commented on how their pictures (and their situations) were similar and on how they were different from their peers:

- *“we need to protect our heritage which is the way we always did things in the past –it may help us to solve future problems. For example HIV/AIDS has no cure but some people are using Inkomfe (traditional Zulu name for the African potato- Hypoxis sp.), which they say can help” (Zanele, 13yrs, Grade 6).*

- *“children are our future leaders, so we need to educate children to start appreciating indigenous practices or these will be lost to Western lifestyles” (Suhail, 12yrs).*
- *“Teachers can just speak to children about HIV/AIDS and show them right from wrong even through the study of indigenous medicinal plants. Children will learn about indigenous cures and practises by simply talking” (Nicholas, 12yrs).*

When the children came to talk about the commonalities of their pictures of indigenous knowledge and plants, there were three points that were raised several times: These are:

- a) How can the study of people and indigenous plant medicines help me to solve my day to day problems of health e.g. skin rashes, sore throats, snake bites, bee stings, stomach cramps, toothaches etc?
- b) Why is my culture so different /similar from yours and what makes it so special?
- c) How can my culture use medicinal plants and how do we relate to these plants by name or colour or use of their fruits/flowers /roots or leaves for survival?

Photograph No. 2: Learners using indigenous knowledge to construct projects (part of a class-based initiative to spread awareness of indigenous knowledge).



Talking about how each picture was special to them each child explained the health-related uses of “*their*” plant. Each child expressed with enthusiasm and great expression on how their cultures were “*unique*” and how they viewed indigenous medicines. For example some of the children commented about the need to allow learners to become more useful citizens through practical activities between teachers and learners (photograph No.2) as important because: “learners began in this research to understand that plants are indeed “*useful*” and can be used for a variety of health-related uses”.

What was evident in the discussions is that most of the children did in some way or another use indigenous healing medicines and that they seemed highly convinced most likely from their parents that their medicinal plant cure was indeed effective. Moreover the act of getting parents to assist their children in the photograph taking was a method that seemed useful as it assisted the learning process by getting more people involved and by arousing more interest in the topic of indigenous plants and conservation issues.

- “*I tasted the extract that my mum squeezed from the leaves of Inkalane (traditional name for Aloe sp.). It was so bitter but she forced it down my*

*throat saying that it was useful for my nagging cough” (Jabulani, 13yrs, Grade 6).*

- *“We visit the inyanga (traditional Zulu medicinal herbalist) regularly as he is like our doctor. He has many plant medicines that he uses for all our problems. He sometimes burns these plants or uses their roots or bulbs that helps us when we are ill” (Simpfiwe, 12yrs).*
- *“I now know the bulbs of these plants must be boiled and you must drink the water while it is still very hot” (Kedhar, 12yrs).*

Many of the children in this research began to realise the need to protect indigenous plants in their own “unique” ways. The students began to realise that medicinal indigenous plants are important and that it is important for treating illnesses and diseases. While some of them lamented on how certain plants were so “abundant” in the past as compared to now when plants are becoming extinct- some of the students began to realise that “it was our responsibility” to protect indigenous knowledge.

Photograph No.3: A learner discovers the indigenous medicinal uses of *Oscimum sp.*



### 5.3. THE INTERPRETIVE PROCESS

The use of pictures and photographs of medicinal plants proved highly effective to me as a researcher and teacher. The children were eager to learn using pictures and especially through the use of their own photographs.

I believe that as broad as this body of work on indigenous knowledge is, and indeed, as illuminating and inspiring as it has been, the work that I have found particularly useful in taking visual methodologies such as photo-voice to a point where they can contribute to “finding solutions” has been in studies that talk about “working with” the photographs, or “working with” the images. The photos work best, I think, when the participants are engaged in selecting, commenting on and deciding on how their views can best be represented visually. This work goes far beyond photo-elicitation and positions picture-taking within a broader framework of narrative and display. Here I have found useful works on memory and photography (see for e.g. Mitchell & Weber, 1999; Spence, 1995) working with family albums (Spence, 1995) and works with visual texts to create a new text through staging and representation using arts-based media tools.

Drawing on the rich body of work on “working with a single photograph” in this research, I have found that visual work can have a greater impact when the photographers themselves are involved in using close reading techniques. This could be as simple as having participants select particular images over others and explaining to their group the choices as they did in producing photo-posters where the children tried to depict the importance of indigenous knowledge (see for e.g. Appendices B and D).

Other researchers, when working with a single photograph, have also shown that photo interpretation techniques are essential in making research data valuable and meaningful to the entire research (see for e.g. Mitchell & Larkin, 2004).

I have also found that it is important to have participants “involved” in working out the display techniques such as producing “in school” exhibitions such as the photo narratives that each child was asked to produce, but also in determining the nature of

public exhibitions (Refer to class-effort photographs and charts: Appendices B and D).

As noted above, each child participating in this research had his/her own ideas on how best to display their work to the class. Even the practical issues of whether the pictures would be framed and mounted under glass became a concern in this research when I discussed the significance of this research to the school stakeholders and participants. It was noted that from research of this nature it would be important to display the posters on Indigenous medicinal plants as often research neglects those that need such information (the participants). It was noted that there was no suitable place to have a permanent exhibition and that glass could be a danger in public space. In working closely with participants this way, I hoped to ward off a potential criticism of this kind of work in development contexts, where it is the researcher (who analyses the photos) who most benefits from the research and not the participants who merely “*snap the picture*”.

In this research, during the course of lesson presentations on the theme of “*The learner and the Environment*” the topic entitled: “The uses of indigenous medicinal plants” was used to accumulate student responses that were recorded through use of a tape recorder and assessed to make meaning for the purposes of analysis. The class-based discussions were unstructured however the researcher/teacher has used specific questions to elicit students’ responses towards attaining their meaning of indigenous knowledge.

The above accounts were thus classroom based and involved teacher /pupil interaction through the use of charts and photographs of medicinal plants (Refer to Appendices B and D), where the teacher (researcher) was a facilitator to the entire learning process. Actual student accounts and questions are presented below and later discussed:

From the accounts of the class discussions (see Appendix F) it can be observed that children’s initial perception of IK was that it was “primitive ways of surviving”. Children found these discussions interesting and many of them could relate to it from either having watched television or from their grandparents or from visiting traditional healers or watching elders in the community. Children knew that such



knowledge of medicinal plants was valuable but seemed to share the notion that this knowledge was for the old and that it is of little use to the younger people. Denise (grade 6 Asian learner: 12yrs) expresses this notion in the dialogue below when she states that: *“Young people cannot be medicinal healers”*. What Denise was probably trying to emphasise is that IK takes time to learn and as Ntsoane (2000a) expresses that indigenous knowledge often has in it the “cultural expectations of the community” that it serves. The sad reality of these discussions is the view that seems common to all of the children: i.e. that indigenous knowledge is for the “old” and not for the younger generation. Some of the children however recognized the need to learn such indigenous survival techniques that use medicinal plants.

As such this research through the use of dialogue and interactions tries to share an indigenous wealth or knowledge by bringing it to the “forefront” of class-based discussions on nature conservation and demonstrating to the children in this way the need for exposing such indigenous knowledge to make it useful to everyone concerned. As such part of the classroom discussion on children’s interpretations of indigenous knowledge revealed that children began in their own “little ways” trying to make meaning of what they have learnt.

#### **5.4. QUESTIONNAIRE FINDINGS AND ANALYSIS**

I will now discuss the findings from my research questionnaire. It is important to note at the outset that the questionnaire was aimed at finding out more about the learners perceptions of indigenous knowledge and on how they perceive the use of photographs as a method of learning about indigenous knowledge.

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The questionnaire findings are interpreted within the context of the existing literature. These findings are discussed below:

**Question No. 1.1, based on learners' responses towards their perceptions on lessons of indigenous knowledge revealed the following:**

A relatively high percentage i.e. 35 of the 95 learners/participants indicated that indigenous knowledge is "*not useful to me*" (option C).

When I questioned some of the participants so as to obtain possible reasons for this response I began to discover that a large percentage of students although coming from a poor economic background still relied heavily on Western or commercial medicines and that these students often failed to draw a "link" between indigenous or traditional medicines and Western medicines.

48 of the 95 learners chose option A for question 1.1. This stated that indigenous knowledge was "*interesting*" to them. 12 of the 95 learners chose option B that stated that indigenous knowledge were "*useful*" to them. After analysing these statistics and from questioning some of the participants I discovered that students often confused the words "*interesting*" with "*useful*". However eventually most of the learners understood the differences between the two words as one pupil stated that: "*I find the knowledge on the African Potato plant very interesting as it tries to help millions of my people dying from HIV/AIDS. But because I don't have HIV/AIDS it is of little or no use to me*".

(It is important to note that I as researcher have purposefully used these two words i.e. "*interesting*" and "*useful*" to ascertain if the learners could distinguish between them). These findings are similar to that of Cunningham who observed that learners start to learn new concepts in indigenous science by initially applying their own meanings (Cunningham, 1992).

**On the question (question No. 1.2) as to whether the children learnt anything about indigenous knowledge:** All of the learners/participants indicated that they did learn something from the lessons on indigenous medicinal plants by indicating 'yes' in the questionnaire instead of 'no' towards their response. This response was indicative of the eagerness that the children displayed towards completion of tasks

e.g. photograph –taking and discussions. Eagerness to learn could be indicative of meaningful learning (Cunningham, 1993).

**Question No. 1.3 based on the activities used to educate the children on indigenous knowledge during the learning process revealed that:**

Of the three activities exposed to the participants: 80 of the 95 of them enjoyed the activity of “*photograph taking*” followed by 11 participants that enjoyed “*talking about medicinal plants*” and only 4 participants enjoyed “*sticking pictures*” to make a chart about medicinal plants. Beatty (1981) states that pictures tend to impress themselves on us at a deep subconscious level and stay with us, influencing our thought and actions as much or if not more than words do (Chaplin 1994), and this is evident by the favourable response on the use of photographs to teach indigenous knowledge as opposed to other methods.

**To get a better understanding of how learners interpret indigenous knowledge, Question No. 1.4 based on the learner’s “description” of what they think indigenous knowledge is (after being taught and given activities on IK) revealed:**

That most (80 of the 95 learners) understood indigenous knowledge as ‘*peoples way of surviving*’. 13 of the learners understood it to mean ‘*peoples culture*’, while only 2 of the learners indicated that indigenous knowledge is about ‘*finding new ways of surviving*’. The latter response probably indicates that some children have a “fixed” interpretation of the nature of science i.e. they sometimes cannot view science as a dynamic entity undergoing continuous change (Smith, 1975). Thus as teachers it is essential that we stress on such implications on the ever-changing nature of science and scientific reasoning.

In summary a study like this can therefore allow educators to gain alternative perspectives on situations (see for example Baird & Mitchell, 1986; Baird & Northfield, 1992), allowing for a “*reflective practice*”(see for e.g. MacNaughton 2001d) of teaching and learning and on new ways of finding meaning to what is taught. For example recent studies have indicated that teacher education in many countries that in the “traditional” approaches to teacher preparation, the notion of integration of theory and practice is largely ignored, which impacts programs’

effectiveness (Korthagen, 2001; Korthagen & Kessels, 1999). This can impact on “*reflective practice*” in teaching, which can suggest ways of helping teachers teach better (see, e.g., Clandinin & Connelly, 1995).

Reflecting on how children respond to new knowledge forms the hallmark of “*good teaching*” and thus of reflective practice (Darder, 2002; Dau, 2001). Teaching children to appreciate other peoples knowledge and cultures allows for educators to “*critically reflect*” on their practice through a process of questioning how power operates in the processes of teaching and learning (Wroe & Halsall, 2001) and then using that knowledge (in this study i.e. indigenous knowledge) to transform oppressive and inequitable teaching and learning practices. Thus this research opens up new perspectives for critical pedagogy in science teaching and learning in schools.

**Question No. 2.1 revealed that:** only few (43 of the 95) of the participants could name an indigenous medicinal plant unaided by their parents or teachers. (Perhaps therefore this finding reveals the need for more indigenous studies in South African schools).

**Question No 2.2 revealed that:** 84 of the 95 learners were of the opinion that medicinal plants taught them a lot about indigenous knowledge because now they have learnt to appreciate other people’s knowledge and culture (option B). 11 of the learners indicated that they now know that plants can be used as medicines (Option A). These findings are significant as I began to observe that the participants wanted to learn more about the other learners’ cultures and beliefs and on the medicinal uses of plants. Previously this was not the case among the learners.

**Question No.2.3 on learners’ perceptions on the use of photographs to teach on indigenous knowledge of medicinal plants (see questionnaire- appendix A) revealed:**

86 of the 95 learners found the use of photographs as useful towards learning IK. This finding is similar to Egan’s (1998) study on children’s learning, Egan points out that children in the age group of grade 6 learners (12-13 years) fall in the “*romantic phase*” of learning and visual stimulus and pictures impress much on their senses. Few (9) of the learners stated that the pictures were not useful for learning IK. I later

discovered that these learners were unable to fully interpret pictures perhaps because of their inexperience in this activity. Also these learners came from relatively underprivileged communities and do not have access to cameras at home.

Such problems of a social, contextual nature surfaced and perhaps can be useful indicators on things to consider in future research of this nature and in similar settings where students come from underprivileged backgrounds.

From the results above it should be noted that the relationship between the school and the world in which it is located, the world of the child's home and the community should be an object of curriculum theorising and empirical study of the curriculum (Egan, 1986). As such the use of dialogue could have in this research, assisted learners to foreground their voices in learning and helps in eliminating "silences" that otherwise might have existed.

What can be concluded is that the images/photographs as depicted above helped the learners to visualise things, process ideas and helped them to make abstract concepts more concrete (Egan, 1992). Pictures also helped the learners to prevent and correct misconceptions in their interpretations. This helped to focus attention and develop critical judgement.

The photos work best, I think, when the participants are engaged in selecting, commenting on and deciding on how their views can best be represented visually. This work goes far beyond photo-elicitation and positions picture-taking within a broader framework of narrative and display. Here I have found useful works on memory and photography and works with visual texts (see for e.g. Mitchell, 1994) to create a new text through staging and representation using arts-based media tools. Findings such as these can thus have important implications for classroom practice and curriculum design. It can be observed that students understand quite clearly that plants can be of medicinal value. The ability whereby students recognize plants as being of a potential use to people is significant as it is a reflection that students began to understand the underlying theme of respect and conservation of indigenous knowledge.

## CHAPTER 6

### ANALYSIS AND LIMITATIONS OF THIS STUDY

#### 6.1. ANALYSIS OF FINDINGS

The findings of this study are significant as I believe it lends some support to the claims of Settlage (2000) that learners' understanding of the nature of indigenous science is inadequate. Further research of South African learners' perceptions of indigenous knowledge would probably provide an indication of whether the findings of this study are only true of the learners at this school.

This study also lends some support to the claims of Reddy (1998), Solomon (1999), and Rogan (2003) that putting curriculum theory into classroom practice (pedagogy) always proves more difficult than it sounds. Despite attempts to include the study of indigenous knowledge into present science curricula, such attempts to encourage meaningful learning are still at an early stage of practice (Aikenhead, 1997; Jegede, 1995a) as no proper curriculum guidelines and content material guiding the 'approach' currently exists (Rogan, 2003).

Furthermore, whilst some attempts were made to implement Curriculum 2005 at this school and to introduce indigenous aspects of knowledge into all learning areas the content laden previous curriculum still prevailed. This study is a grassroots account of attempts to implement Curriculum 2005 and indigenous aspects of learning in a school that is still adapting to curriculum change.

The findings from this study indicated that learners in Grade 6 appear to hold certain perceptions of indigenous knowledge but that this knowledge remains "*dormant*" or of no use. Perhaps what is needed at schools is to encourage more frequent studies on aspects of indigenous knowledge so as to stimulate thought and discussion on this topic.

The common factor in this study was the educator – I taught each class and to the best of my knowledge shared my views of the nature of indigenous knowledge. The inclusion of a lengthy Grade 6 unit of learning that explicitly dealt with ‘indigenous knowledge’ and did appear to positively impact on learners’ perceptions of science as these learners’ produced excellent photographs depicting indigenous knowledge through the use of medicinal plants. These findings lend support to the claims of Driver (1989) and Sutton (1989) that learning science should involve an explicit initiation into the culture of science.

The findings of this study also support the claims of Driver (1983), that it is as important to consider and understand learners’ “*own ideas*” as it is to present “*new ideas*” Driver (1989) and that although educators may intend to introduce learners to certain ideas, it is in the end the learners who have to think through and make sense of the experience themselves.

The findings of this study provide some evidence to suggest that activities designed for the study of indigenous knowledge needs to be formally and thoughtfully planned. Thus this study is a relatively new focus for South African science education.

## **6.2. LIMITATIONS OF THIS STUDY**

One of the core reasons for me undertaking this study was to gain meaningful learner perceptions on indigenous knowledge. I believe that a larger sample size may produce different findings. I purposefully selected a smaller sample size to ensure a closer interaction between researcher and the participants so as to elicit learner responses. I am of the opinion that this would not have been possible had I chosen a larger sample size because the method of allowing learners to share their ideas and thoughts on indigenous knowledge was often a lengthy procedure.

The fact that I was the researcher and educator of the participants may have led me to be biased in my presentation of some of the findings, as I am familiar with the learners. I however have as far as possible not interfered with my actual findings and reported all data as I observed or recorded it.



## CHAPTER 7

### INSIGHTS AND SIGNIFICANCE OF THIS STUDY

#### 7.1. INSIGHTS OF THIS STUDY

At the core of this study and one of the reasons for me undertaking this research is my belief for the need for reflective practice, and more importantly critical reflection in teaching and learning.

Reflective practice does not just happen automatically. It arises as educators actively build and transform their pedagogical knowledge. It requires educators to take control of their own learning and meaning making about being educators, about education and about pedagogy and it implies that they know how to drive innovation in their classrooms. To this extent, reflective practice is a means to discover and transform an individual's understanding and practices.

One can therefore argue that a particular theoretical position underpins this research. At its core is the conception of a dialectical relationship between society and individuals. This suggests the existence of a constant interplay of social forces and individual actions. On one hand, the decisions and actions which people make and take in their lives are constrained by social structures and by the historical processes, which brought about such structures. On the other hand, each individual has a unique sense of self, derived from her or his personal history or biography. Sets of these understandings, which endure over time, form the basis of cultures. Thus there are various factors in constant interplay in the classroom and this affects pedagogy.

This study on indigenous knowledge and of indigenous practices thus focuses on knowledge derived and assimilated from communities that have a long drawn history of neglect and disregard. As such this study reflects on the imbalances of the past ideologies that often marginalized indigenous knowledge and practices that have in some cases been drawn to the point of extinction. Habermas (1987) therefore sees

both the process of ideology critique and the knowledge it produces (critical knowledge) as essential to social and political emancipation.

## 7.2 SIGNIFICANCE OF THIS STUDY

I will assess this study by firstly looking at its significance to research and then to pedagogy and then look at its significance to visual methodology and indigenous knowledge as a system. As far as research is concerned, this study is important as it sheds light on findings of other researchers that agree that meaningful learning should be learner oriented and should include aspects of study that consider the learners home background and prior knowledge (see for e.g. Aikenhead 1994c).

This study is important to classroom practice, as I believe it makes provision for educators to be more dynamic in their classroom presentations of their science lessons. The use of indigenous knowledge is a relatively new area of study and I have noticed that learners tend to be curious and interested in this knowledge. This assists the learning process.

In this study the use of a visual methodology proved highly effective in mediating understanding of concepts of indigenous knowledge. Learners in the study began to use their sensory skills (i.e. touch/feel/see/smell) as they were introduced to new medicinal plants. The local species of the plant *Ocimum sanctum* for example that formed part of the photographic discussions and interpretations were rather interesting, as a large percentage of the children discussed how they have used the leaves, seeds or stems of this plant for some healing purpose in their lives. By this continuous sharing and discussion on how these plants can heal and be useful, children began to learn even more about IK and through linking indigenous knowledge to the social aspects that include aspects of the children's lives the learners began in little ways to view IK more as a system of knowledge.

Such methods as adopted in this study of allowing learners to bring in their day-to-day aspects of living into the classroom are important. Learners often find this type of information stimulating and interesting. Perhaps the visual methodology that was adopted also allowed the learners to link their Western knowledge to their Indigenous

knowledge. This study was therefore useful as it allowed for more meaningful learning that considered the learners' background and social context.

## **CONCLUSION**

This study has been a grassroots account of attempts to implement Curriculum 2005 and indigenous aspects of learning in a school that is still adapting to curriculum change.

From the findings in this research it should be noted that the relationship between the school and the world in which it is located, and the world of the child's home and the community should be an object of curriculum theorising and empirical study of the curriculum (Egan, 1986). The use of effective dialogues in this research has assisted learners to foreground their voices in learning and also helped them in eliminating "silences" that otherwise might have existed.

The common factor in this study was the educator – I taught each class and to the best of my knowledge shared my views of the nature of indigenous knowledge. The inclusion of a lengthy Grade 6 unit of learning that explicitly dealt with 'indigenous knowledge' and did appear to positively impact on learners' perceptions of science as these learners' produced excellent photographs depicting indigenous knowledge through the use of medicinal plants.

The images/photographs as depicted above helped the learners to visualise things, process ideas and helped them to make abstract concepts more concrete. Pictures also probably helped to prevent and correct misconceptions in learner's interpretations. They helped to focus attention and develop critical judgement.

The photos worked best, I think, when the participants were engaged in selecting, commenting on and deciding on how their views could best be represented visually. This work goes far beyond photo-elicitation and positions picture-taking within a broader framework of narrative and display. Here I have found useful works on

memory and photography and works with visual texts (see for e.g. Mitchell, 1994) especially useful to me for the understanding of how children interpret pictures.

Findings such as these can thus have important implications for classroom practice and curriculum design. It has been observed that students understand quite clearly that plants can be of medicinal value. The ability whereby students began to recognize plants, as being of a potential use to people is significant as it is a reflection that students began to understand the underlying theme of respect and conservation of indigenous knowledge.

The data from this study demonstrates the need for the incorporation of indigenous knowledge into future school science curricula and also that learners construct and make meaning of science more easily when taught about concepts that arise from their own social background or context.

In South Africa and perhaps across the world this system of indigenous knowledge represents a country's wealth as it provides opportunities for education, scientific and medical discoveries and a host of other social factors.

The photo-voice technique that was used proved useful for learning indigenous knowledge as children found hidden "messages" in their pictures that acted as a catalyst to the learning process enabling meaningful interpretations, which may otherwise have been difficult to achieve.

More importantly, this study like many other studies on often marginalized or neglected topics can begin to bring a start into critical reflection into educational practises. This study reflects on the imbalances of the past ideologies that have often marginalized indigenous knowledge and practices that have in some cases been drawn to the point of extinction. Habermas (1987) therefore sees both the process of ideology critique and the knowledge it produces (critical knowledge) as essential to social and political emancipation. By sharing ideas and knowledge on medicinal plants this research can thus offer educators new and insightful perspectives to enhance their teaching so that scientific knowledge can become more relevant and meaningful to all.

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## APPENDIX A

Appendix A

## QUESTIONNAIRE

## 1. PLANTS CAN BE USED AS MEDICINES

For hundreds of years our ancestors have used plants to cure their health problems. After learning about medicinal plants in your class and from your photographs answer these easy questions

NAME: \_\_\_\_\_ GRADE: \_\_\_\_\_ DATE: \_\_\_\_\_

Please note:

1. THIS IS NOT A TEST
2. THERE ARE NO RIGHT OR WRONG ANSWERS TO THE QUESTIONS I AM ONLY INTERESTED IN YOUR IDEAS OR PERCEPTIONS
3. THIS IS A RESEARCH QUESTIONNAIRE

1.1 I found the lessons on indigenous medicinal plants:

- a) Interesting
- b) Useful
- c) Not useful to me



1.2 Did you learn anything about medicinal plants?

- a) Yes
- b) No

1.3 Which activity about indigenous plants did you like best?

- a) Taking a photograph of a medicinal plant and picture collecting
- b) Sticking pictures to make a chart of medicinal plants with their uses
- c) Talking about medicinal plants
- d) None of the above

1.4 Which of the following best describes indigenous knowledge?

- a) It is about people's culture
- b) It is about people's way of surviving and doing things as they did in the past
- c) It is about finding ways of surviving

The aloo plant:  
(ikhaia in Xhosa, bimar-  
aalwyn in Afrikaans)



Questionnaire: page 2.

2.1. Can you name any indigenous medicinal plant?

---

2.2. What do you think IK (indigenous knowledge) has taught you? Underline your answer.

- A) That plants can be used as medicines
- B) To appreciate other people's knowledge and culture
- C) Both A and B above

2.3 What do you think about the use of photographs to teach indigenous knowledge?

- A) Useful for learning indigenous knowledge
- B) Not useful for learning indigenous knowledge

**APPENDIX B****FIRST PILOT QUESTIONNAIRE: LEARNERS PERCEPTIONS ABOUT  
INDIGENOUS KNOWLEDGE**

*ANSWER THE FOLLOWING QUESTIONS BASED ON INDIGENOUS KNOWLEDGE. KINDLY NOTE THAT THIS QUESTIONNAIRE FORMS PART OF A PILOT QUESTIONNAIRE FOR RESEARCH PURPOSES AND IS NOT A TEST. THE PURPOSE OF THE QUESTIONNAIRE IS TO DETERMINE YOUR PRIOR KNOWLEDGE AND PERCEPTIONS ON ISSUES PERTAINING TO INDIGENOUS KNOWLEDGE.*

Name \_\_\_\_\_

Grade \_\_\_\_\_

**QUESTION 1:**

1.1 DID YOU LEARN ABOUT INDIGENOUS KNOWLEDGE IN YOUR PREVIOUS YEARS OF SCHOOLING? \_\_\_\_\_

1.2 IF YOU ANSWERED YES TO 1.1 ABOVE THEN EXPLAIN WHAT DID YOU LEARN ABOUT INDIGENOUS KNOWLEDGE? \_\_\_\_\_

1.3 DO YOU THINK THAT PICTURES OF INDIGENOUS KNOWLEDGE CAN BE USEFUL TO SCIENCE TEACHING AND LEARNING? (REFER TO APPENDIX B FOR PICTURES). EXPLAIN

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1.4 WHICH OF THE FOLLOWING BEST DESCRIBES THE POSSIBLE USES OF INDIGENOUS KNOWLEDGE TO PEOPLE? UNDERLINE YOUR ANSWER.

A) PEOPLE CAN USE PLANT MEDICINES TO FIND CURES FOR TREATING HIV/AIDS.

B) PEOPLE CAN USE INDIGENOUS KNOWLEDGE TO TEACH CHILDREN OF THEIR HERITAGE OR PAST.

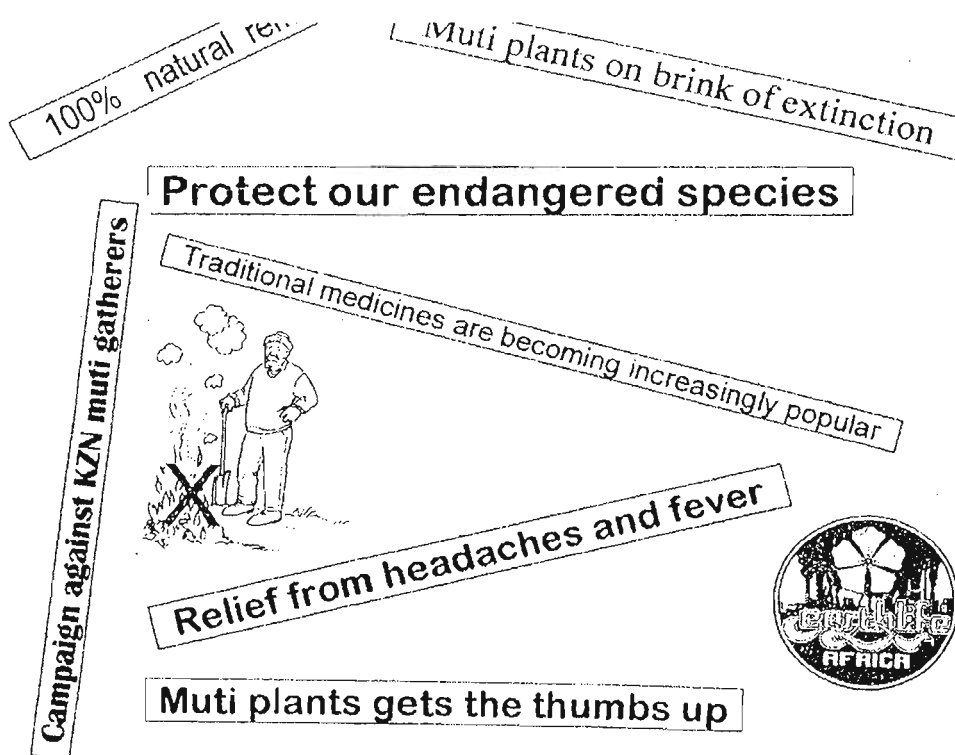
C) INDIGENOUS KNOWLEDGE ALLOWS PEOPLE TO APPRECIATE OTHER PEOPLES CULTURES

D) NONE OF THE ABOVE



**APPENDIX C:**

**A SELECTION OF LEARNERS EFFORTS THAT WERE USED IN CLASS DISCUSSIONS (learners tried to incorporate indigenous knowledge into the school science curriculum in a variety of ways)**



Some of the many photographs that were taken out by the learners during their study of indigenous knowledge at their school. (Note: The learners tried in a variety of ways to portray how indigenous knowledge of medicinal plants can be saved for future generations. Learners gave each of their photographs a title (Refer to pictures below):

1. "Saving our planet"



2. "Indigenous muti (medicinal) plants"



3. "Year - 2050"



4. "Successful seeds"



**APPENDIX D: Classification of indigenous medicinal plants into 3 groups based on their specific uses (refer to the tables below)**

TABLE 1.1: Some examples of general medicines (indigenous examples) that were studied by the learners:

Scientific name of plant	Common name/ active ingredient	Zulu/Xhosa name	Indigenous Uses
<i>Aloe ferox</i>	Cape aloes Contains anthraquinones	<i>Umhlaba</i>	Applied topically to herpes and shingles, cures conjunctivitis (Pujol, 1990)
<i>Xysmalobium undulatum</i>	bitterwortel	<i>Ishongwe</i>	Powdered roots taken for diarrhoea, dysentery, fever, colds (Bryant, 1966)
<i>Siphonochilus aethiopicus</i>	Wild ginger	<i>Indungulo</i>	Has a sesquiterpenoid ingredient used to treat coughs, colds, asthma (Bryant, 1966).
<i>Artemesia afra</i>	Wild wormwood	Umhlonyane	Dried leaves and stems are used as infusions to treat coughs, asthma, wheezing. Is one of the oldest and most commonly used indigenous medicine in Africa.

Examples of some medicinal uses that people can use plant extracts for include: insect bites; skin infections and rashes; stomach cramps; diarrhoea, fevers or high temperatures; arthritic pains; swelling of the joints etc.

#### **b) Natural Tonic Plants:**

The use of tonics is well established in traditional medicine in Southern Africa, and is perhaps exemplified by the widespread use of a large variety of ‘strengthening’ plant combinations known as *imbizas* in South Africa are believed to play a role in health and vigour.

Locally the plant infusions or decoctions are used as purifying ritual emetics known as “*ukhuphalaza*” or “*ukughabha*” and cleansing enemas known as “*ukuchata*”, are also considered to have a profound tonic effect on the body (Cawston, 1933).

The potential of natural tonics for maintaining and supporting health is starting to be appreciated by modern allopathic medicine, mainly as a result of scientific investigations into the activities, pharmacology and chemistry of some well known adaptogenic plants, including ginseng, American ginseng (*Panax quinquefolium*), Siberian ginseng (*Eleutherococcus senticosus*) and Indian Ginseng (*Withania somnifera*). The most profound adaptogens from South Africa are *Sutherlandia* species. Supported by formal clinical studies, affordable natural tonics could play an important role in improving quality of life in patients with cancer, tuberculosis, HIV/AIDS and other serious health conditions. In spite of their common use and broad utility, tonics should be used responsibly in appropriate doses, and for a defined duration.

**Table 1.2: Some examples of tonic medicinal plants (indigenous examples) that were studied by the learners:**

Scientific name	Common name	Zulu/Xhosa name	Indigenous uses
<i>Sutherlandia frutescens</i>	Cancer bush	kankerbossie	Cancer (prevention and treatment); rheumatism; gastritis; peptic ulcers; urinary infections, (Green, 1988). also active compounds shown to prevent wasting in HIV/ AIDS patients.
<i>Harpagophytum procumbens</i>	Devil's claw	<i>Sengaparile</i> (Tswana)	Contains phytosterols and iridoids that are anti-inflammatory agents. Used for arthritis, muscle and joint pains. (Brady, 1981).
<i>Hypoxis hemerocallidae</i>	African potato	<i>Inkomfe</i> (Zulu)	Tubers boiled and used by healers in tinctures to treat arthritis; wasting in cancer and HIV/AIDS (Green, 1988).

### c) WOUNDS, BURNS AND SKIN CONDITIONS

Some of the plant medicines used in treating wounds and burns have been used by our forefathers for thousands of years. One of these plants is *Centella asiatica*. Indigenous tribes and communities probably knew that it contains healing mucilage, which provides a mechanical barrier and also keeps the wound from drying out, and many are likely to have anti-inflammatory, antibacterial and antifungal activities as well.

One of the most studied wound- healing plants is *Centella asiatica*, and here the wound healing activity is due to the facilitated development of normal connective tissue. This process includes stimulating an increase in the development of blood vessels in the affected area, an increase in the formation of tissue structural components, and an increase in the keratinisation process (Crooks & Rosenthal 1994).

**Table 1.3: Some examples of indigenous medicinal plants used for wounds, burns and skin conditions:**

Scientific name	Common name	Zulu/Xhosa name	Indigenous uses
<i>Aloe arborescens</i>	Krantz Aloe	inkalane	Popular garden plant, used on wounds, has anticancer, anti-inflammatory properties (Green, 1988).
<i>Scilla natalensis</i>	Bloulangkop	Inguduza	Used externally on wounds, sprains and fractures. Taken orally to treat tumours, but large dosages can be fatal.

**APPENDIX E:****CLASS-BASED DIALOGUE ON INDIGENOUS PLANTS**

**Teacher:** *This is an interesting looking plant. What is the name of your plant?*

**Student (Zondi, a Zulu student):** *Iloqi (Zulu traditional name) is what we call it.*

**Teacher:** *Where did you find this plant?*

**Student:** *I found it growing in a field near my house.*

**Teacher:** *Why did you choose this plant?*

**Student:** *My mother uses this plant when I am ill. She grinds the leaves carefully and extracts the juices. This she inserts into my ear to cure earaches and infections. But she has warned me not to use this plant on myself as she alone knows how much to mix and how strong to make the medicine. This plant can also be used to treat headaches but it must be used in small amounts.*

**Teacher:** *Why must it be used in small amounts?*

**Student:** *Too much can be dangerous. This is what my mum told me, as it is very powerful. One day I fell and sprained my ankle, it was swollen, my mum applied this plant and the swelling went away. But we are told never to eat the seeds of this plant as it is called “mad seeds” and it can make you behave abnormally.*

**Teacher:** *How can you tell if a plant is poisonous or if it is safe to use as a medicine?*

**Lebo (a Zulu student):** *I know. My grandfather taught me that most plants that are “milky” or have a white sap can be poisonous and can cause eye or skin irritations and you must not use these.*

**Teacher:** Yes, that is true, but how can you be sure that a plant is safe to use?

**Thobeka (a Zulu speaking student):** I think you can never be sure and that you must always ask someone.

**Teacher:** Whom should you ask then if you're not sure?

**Thobeka:** Maybe the old people.

**Teacher:** OK, that's better, but why ask the old people?

**Thobeka:** Well you see sir, the old people learn from their parents and they have tried these medicines before, so that's why they know best.

**Teacher:** That's better, so what you're saying is that indigenous knowledge on plant medicines is learnt by trial and error?

**Thobeka:** Yes that's what I meant to say.

**Teacher:** *The real name of this plant is Datura spp., and Zondi is correct when she says that this plant is often used by traditional healers to cure headaches; ear aches; sprains and inflammations, but you must be careful as this plant can also be very poisonous so do not try and use it by yourself. It can be a poisonous plant and you should not use it on your own or without asking. You have another picture of the same plant that some of your friends took out at school. Can you show us this picture?*

**Thobeka:** Yes here is the picture (showing picture to entire class)-refer to picture below.



**PHOTOGRAPH NO 1:**

A student examining the medicinal leaves of *Ocimum sanctum* i.e. “Thulsi ” (Indian common name) Family: Lamiaceae



**Teacher:** *This plant is very green and leafy and has a strong “mint-like” scent. Where did you collect this plant and why did you choose it?*

**Student (Rakbeel):** *I saw this plant growing next to a nearby stream. I sometimes pluck the leaves for my mum as she uses it in prayer and also for making a cough mixture. The leaves have a mint-like smell and are very rich in oils.*

**Teacher:** *Can you explain to the class exactly how your mother makes a cough mixture with this plant?*

**Student:** *Yes, she takes the young leaves usually growing at the tips and grinds them on a stone to extract the liquid. She then collects the “juices” and mixes it with honey. She then warms it in a metal container and cools it. It must then be swallowed while still hot. This helped me to cure my sore throat, I have used it and it works.*

**Teacher:** *Yes this is a common plant that is often used by Indians to cure infections and sore throats. It is believed to be a sacred plant amongst the Hindu's who also use it in prayer.*