

**REVIEW AND DEVELOPMENT OF ENVIRONMENTAL  
INTERPRETATION RESOURCES TO FOSTER ENVIRONMENTAL  
LEARNING IN TWO KENYAN SCHOOLS**

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**ABEL BARASA ATITI      2003**

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**THESIS**

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**by**

**ABEL BARASA ATITI**

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## ABSTRACT

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This participatory action research study involved a group of teachers in transforming school grounds into interpretation resources. Approached from a critical perspective, it challenged the conventional top-down approaches to interpretation resources and materials development. Through a teacher-centred approach, a school-based ‘botanic garden’ and ‘arboretum’ were developed at Samaj and Kenya High respectively. Teachers were further actively engaged in developing a variety of interpretive materials that might engage learners in socially critical environmental education processes at the transformed sites.

A process in which educators from five non-formal education organisations shared their skills and knowledge on environmental interpretation with teachers preceded the development of interpretation resources and materials. Drawing on Latour (1999), I have applied the notion of *mobilising interpretive capital* when describing this process. Interpretive capital within the non-formal education sector was mobilised and made available through social interactions between teachers and non-formal educators. This occurred during workshops, organisational visits and critical reviews of a sample of interpretive materials. I provide insights into how the interpretive capital was mobilised and later drawn on by teachers during the development processes in their schools.

This study argues that mobilising interpretive capital with teachers through partnerships can enhance the transformation of school grounds to foster environmental learning. It shows how attempts to find solutions *with* teachers were made in response to pedagogical and curriculum tensions that arise around the implementation of environmental education processes in their schools. To provide orientation in environmental education processes in schools, analyses of socially critical environmental education processes and a review of theoretical perspectives on interpretation as an environmental education process are presented. I have viewed interpretation and environmental education as reciprocally necessary aspects for enabling the development of critical environmental literacy and action competence. To explain this view, the notion of *environmental interpretation and education processes* has been applied and

presented in this study.

Finally, practical outcomes of the study on transformation of school grounds, improved education practice, enhanced professional competencies amongst teachers, new interpretive materials in schools and the establishment of partnerships are examined.

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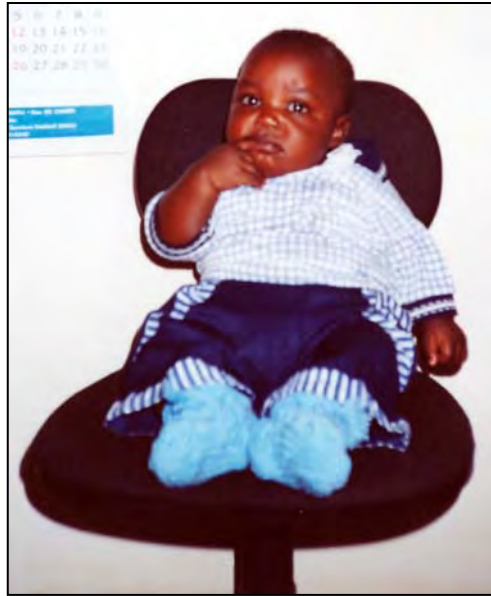
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**This work is dedicated to**



**Brian Were Barasa**

Our son who was born while I was designing this study  
and

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I encountered during my ‘research voyage’.

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## LIST OF ACRONYMS

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ABRI	African Butterfly Research Institute
AFEW	African Fund for Endangered Wildlife
AM	Analytic Memo
AWF	African Wildlife Foundation
BGCI	Botanic Gardens Conservation International
BGCS	Botanic Gardens Conservation Secretariat
DS	Data Set
EAEN	Eastern Africa Environmental Network
EE	Environmental Education
EEASA	Environmental Education Association of Southern Africa
EIE	Environmental Interpretation and Education
ICIPE	International Centre of Insect Physiology and Ecology
IGAD	Inter-Governmental Agency for Development
IMCE	Inter-Ministerial Committee on Environment
IUCN	International Conservation of Nature
KIE	Kenya Institute of Education
KNEC	Kenya National Examinations Council
KOEE	Kenya Organisation of Environmental Education
KUC	Kenyatta University College
KWS	Kenya Wildlife Service
LTL	Learning Through Landscapes
NEAP	National Environmental Action Plan
NEMA	National Environmental Management Authority
NES	National Environmental Secretariat
NGO	Non-Governmental Organisation
NMK	National Museums of Kenya
SADC	Southern Africa Development Community
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WCD	World Commission on Environment and Development
WCK	Wildlife Clubs of Kenya
WWF	World Wide Fund for Nature (formerly World Wildlife Fund)

## CHAPTER 1 AN ORIENTATION TO THE STUDY

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It takes an enormous amount of internal security to begin with the spirit of adventure, the spirit of discovery, the spirit of creativity. Without doubt, you have to leave the comfort zone of base camp and confront an entirely new and unknown wilderness. You have to become a trailblazer, a pathfinder. You open new possibilities, new territories, new continents, so that others can follow. (Covey 1992:263)

### 1.1 THE RESEARCH SETTING

Since 1997, the National Museums of Kenya (NMK) Nairobi Botanic Garden has been offering environmental education (and interpretation) programmes to a diverse audience. The priority groups for NMK have been school children and their teachers. As the practitioner responsible for implementing botanic garden-based environmental education programmes at the organisation, I have encountered a number of challenges. Key among them has been how to make available the resources, and to create botanic garden interpretive and educational experiences that may enable socially critical environmental educational processes. The few interpretive materials that I had developed for use at the botanic garden had not involved the participation of teachers (the main users) in their development. In addition, the number of schools seeking the support of NMK in developing interpretive opportunities on their own grounds has been growing. As the person directed to respond to such requests, I am expected to provide expertise and knowledge that I cannot always claim to have. It was as a result of this professional impasse that I designed this study in August 2000 with two schools in mind. The two schools, Samaj and Kenya High<sup>1</sup> had shown a keen interest in transforming sites within their grounds into interpretation resources.

To avoid the technocratic approach with which the schools had anticipated that I would respond, I re-conceptualised the requests with the aim of looking for solutions *with* the teachers and not *for* them or to be imposed *upon* them (Freire 1985). It was on this premise that I ‘voyaged’ (see section 1.4) into the hitherto unknown territory of environmental interpretation

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<sup>1</sup> Prior to this study, I had been working with Kenya High (a state-owned secondary girls’ school) to develop a nature trail in its school grounds. Teachers from Samaj School approached me for support in developing a ‘botanic garden’ modelled on NMK’s during the time I was designing the study. Samaj is a private school (with both primary and secondary sections) managed by a charitable trust. Both schools are situated in Nairobi (see sections 5.2 and 5.3).

resource development. This entailed confronting entirely new and unknown socially and historically constituted contexts within five non-formal education organisations where interpretation and materials are developed and used. The five are: Kenya Wildlife Services (KWS), Wildlife Clubs of Kenya (WCK), the Giraffe Centre, the African Butterfly Research Institute (Butterfly Centre) and my own work-place (NMK).

Undertaking this study required leaving the ‘comfort zones’ of conventional approaches to materials development as reflected in my previous education practice at NMK. This, as implied in the opening quotation (Covey 1992), required professional courage on my part. However, I anticipated socially transformative experiences to result from the critical orientation within which I located this study (see sections 3.2.1, 3.2.2). I envisaged the creation of new possibilities for enhancing critical and action-oriented environmental education in schools through the development of interpretation resources on their grounds. To achieve this, I considered contextual influences on the provision of environmental education processes in Kenyan schools when designing the study. Besides the lack of interpretation resources and materials to foster environmental learning, a number of constraints on the implementation of environmental education processes in schools were experienced (see section 2.2.2). These have contributed to a marginalisation of environmental education processes in Kenyan schools. The goals of this research are now described in order to indicate how it attempted to respond to this situation, but with a focus on only two schools.

## **1.2 DESCRIPTION OF RESEARCH GOALS AND FOCUS**

As outlined in the previous section, I was motivated to undertake this study to investigate the development of interpretation resources in schools through teacher participation. This focused on challenging conventional approaches to materials development in the non-formal education sector. It also entailed supporting schools to transform their grounds into sites for socially critical environmental education processes. The goals (as initially formulated in my research proposal) of this research were to:

- review how a sample of interpretive materials were developed and used within the non-formal education sector;

- using some of the information derived from the above to develop, through a participatory approach materials that engage learners and teachers in socially critical environmental education processes; and
- explore the understanding of interpretation as an environmental education process through a critically reflective inquiry process with teachers.

These initial aims were slightly changed during the course of the study to include a review and development of interpretation *resources*<sup>2</sup> in the non-formal education organisations and schools respectively. This was based on my realisation that it was not possible to develop interpretive materials without first developing sites where they could be used to engage learners in socially critical environmental education processes. The aims were further re-conceptualised by applying the concept of ‘mobilising interpretive capital’ derived from the works of two sociologists Pierre Bourdieu (1993,1998) and Bruno Latour (1999). This process of re-conceptualisation is elaborated on below.

### 1.2.1 Re-conceptualising research goals

Through a *theory of action*, Pierre Bourdieu (1993,1998) has provided cultural explanations for the role of education in society and for learner achievement. He argued that the major role of schools is in the cultural reproduction of skills, knowledge and social relations that are necessary for the functioning of educational systems. Bourdieu (1998) used the term *symbolic capital*<sup>3</sup> to refer to these forms of cultural reproduction. The concepts of ‘cultural capital’ and ‘interpretive capital’ (see also section 1.3.1) are applied in this report to refer to the symbolic capital reproduced in schools and non-formal education organisations respectively.

Bruno Latour (1999), a sociologist interested in the way in which science is constructed described in one of his *Essays on the reality of science studies*, how the scientific method is applied to create knowledge and establish ‘facts’. He called this process ‘mobilisation of the

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<sup>2</sup> Interpretation resources (for example, a nature trails and botanic gardens) refer to the sites that have been developed to enable environmental learning processes through encounters with real objects. Interpretive materials (for example, worksheets, brochures, trail leaflets) are the illustrative media designed to ‘mediate’ environmental learning at such sites (see also section 1.3.1).

<sup>3</sup> According to Bourdieu (1998:47) “Symbolic capital is any property (any form of capital whether physical, economic, cultural or social) when it is perceived by social agents endowed with categories of perception which cause them to know it and to recognise it, to give it value”.

world’, describing it as “... a matter of moving toward the world, making it mobile, bringing it to the site of controversy, keeping it engaged, and making it available for arguments” (Latour 1999:100). Although this study is not based on scientific principles for generating new knowledge, I found Latour’s social theory on the ‘situatedness of knowledge production’ relevant to my context. His focus on ‘mobilising the world’ illustrates that knowledge (in my case ‘interpretive capital’) is constructed, not only in interactions amongst human subjects, but through a mobilising of the non-human world. This entails the inscription of meaning ‘on the world’ through complex social processes. Within the framework of this study, interpretive capital was not only mobilised through social interactions, but also through interactions with (the non-human world) interpretation resources and materials.

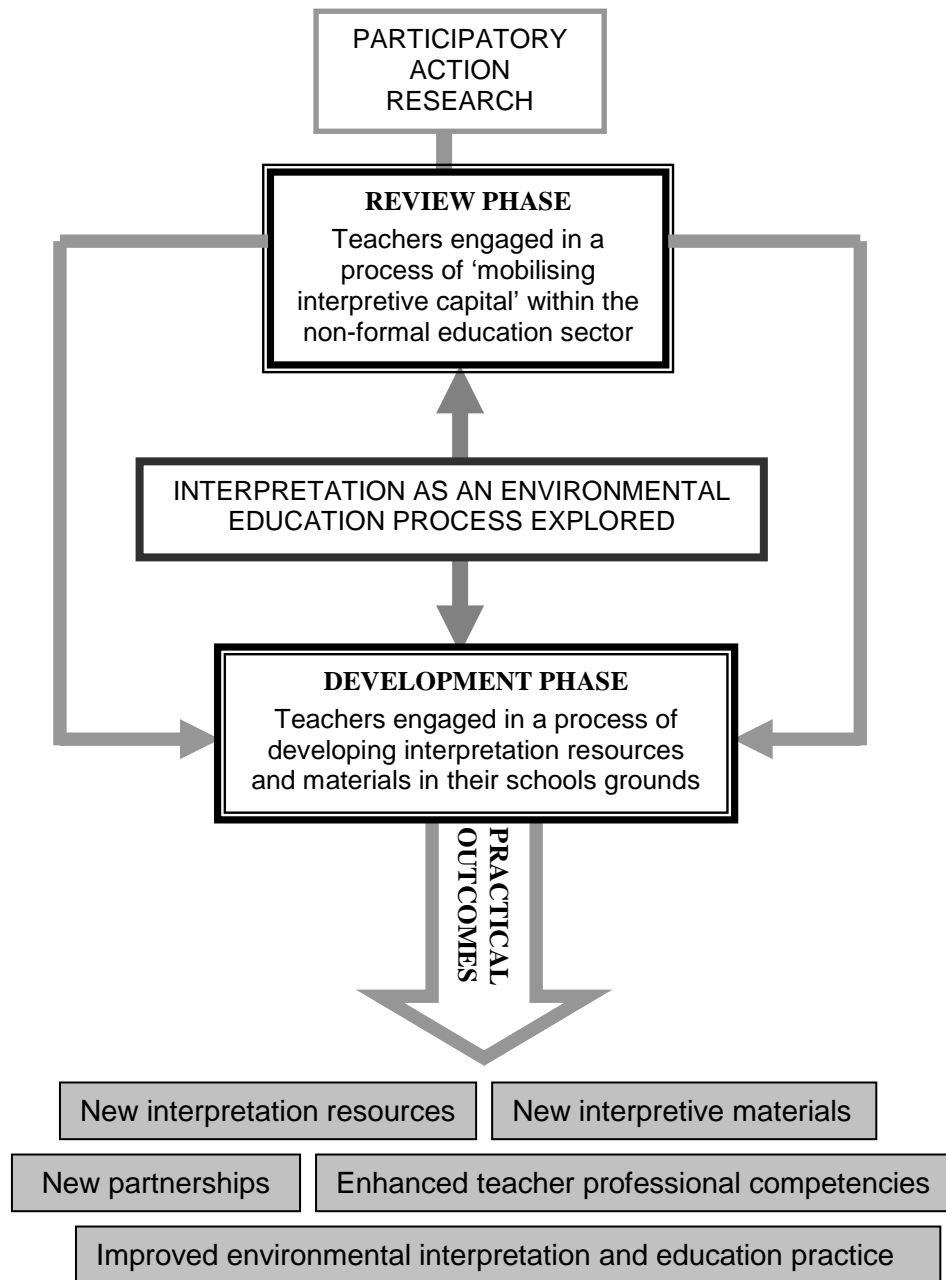
Drawing on both Bourdieu (1998) and Latour (1999), the concept of *mobilising interpretive capital* was derived. I have applied it widely in this research report to describe my research activities with teachers during review visits to five non-formal education organisations, as outlined in the first research goal (see previous section). I have also drawn on it when discussing the development of interpretation resources and materials in the two schools with teachers. To emphasise learners’ prior knowledge and experience in environmental learning, the concept of mobilising cultural capital for critical and action-oriented environmental education processes has been applied.

Having located the origin and explained the concepts of mobilising interpretive and cultural capital, I will now provide an overview of the critical inquiry process pertaining to the review and development of interpretation resources and materials with teachers. This overview involves two phases. Figure 1.1 depicts a summary of the research process and practical outcomes of the study.

### **1.2.2 Review phase: mobilising interpretive capital with teachers**

In collaboration with twelve teachers from Samaj and Kenya High (co-researchers), visits were made to non-formal education organisations (see section 1.1). Through our social interactions with educators in these organisations, interpretive capital that was later made available for the

transformation of school grounds was mobilised.



**Figure 1.1** An overview of the inquiry process

Interpretive capital was also mobilised through interactions with interpretation resources and materials that we found in the organisations. Workshops and focus group interviews provided forums for further processes of mobilising interpretive capital. Environmental education

methods and processes within the non-formal education sector were revealed through guided tours and informal discussions.

Samples of interpretive materials were collected and later critically reviewed to identify practices and key shaping ideas that informed their development and use. Specifically we established how different educational theories, curriculum orientations, environmental values and perspectives on the environment were reflected in the use and development of these materials. A few interpretation resources were also reviewed to determine how they were developed and used by school groups (see section 4.2.2). In the interests of the two schools, we focused on the interpretive planning and development of a nature trail (with Kenya High teachers) and a botanic garden (with Samaj teachers), as discussed in Chapter 5.

Data on our interactions with non-formal educators and interpretation resources was generated through a number of research techniques that included photographs and slides, document analysis, journal writing, taking of field notes and audio tape recording (see section 3.2.4).

### **1.2.3 Development phase: developing interpretation resources with teachers**

By drawing on the mobilised interpretive capital (as outlined above), teachers were engaged in developing interpretation resources and materials in their school grounds. Teachers from Samaj drew on the interpretive capital mobilised during review visits to the NMK Nairobi Botanic Garden to transform a site in their school grounds into a 'botanic garden'. Those from Kenya High applied interpretive capital related to the development of nature trails to initiate the transformation of a twenty-five acre forested section into an 'arboretum' with theme trails. Teachers from both schools drew on interpretive capital that was mobilised during reviews of interpretive materials and workshops to develop a variety of interpretive materials. These were aimed at engaging learners in socially critical environmental education processes in the school grounds. The development processes further drew on the interpretive capital that was mobilised in the schools as a result of my social interactions with teachers. These took place during a series of meetings (both focus groups and informal sessions) with the teachers in their schools (see sections 5.2.2, 5.3.2).

The review and development phases followed a participatory action research framework of formulating plans, acting and observing the development processes, reflecting on them, and then re-planning. Data generated during these self-reflective cycles was analysed by drawing on grounded theory (Glaser and Strauss 1967). Issues of rigour and validity were addressed through the use of critical friends and self-corrective techniques of triangulation, face validity, catalytic validity and construct validity (see section 3.4.2).

Located within a critical orientation to educational research (see section 3.2.2), the study viewed teachers as professionals with the capacity to set and achieve their own goals. As a result, teachers were engaged in critical reflection and action that enabled them to utilise theory and practice when mobilising interpretive capital for development processes. This enhanced their professional competencies in materials development, research and reflective thinking (see section 6.4). Other practical outcomes were also evident as a result of this critical educational research (see Figure 1.1; see also Chapter 6).

#### **1.2.4 Exploring a perspective of interpretation as an environmental education process**

Throughout these two phases, I explored with teachers a view of interpretation as an environmental education process, as outlined in my third research goal (see section 1.2; see also Figure 1.1). This entailed providing insights on how learners may construct meaning within interpretive settings, either through interactions with more knowledgeable adults, or through contact with ‘mediating’ interpretation resources and materials (see section 2.3.2). A number of sociological and educational perspectives have been drawn on to provide insights on this. On this basis, this study has endeavoured to broaden the theoretical base of interpretation as an educational process. This has been done by re-orienting interpretive experiences towards socially critical environmental education processes (see section 2.3.1). In this orientation, teachers and learners are viewed as active members of society who, through critical reflection and action may create just and democratic societies (Fien 1993). This requires a flexible curriculum and pedagogical planning that involves teachers and learners. An overview of the pedagogical dimensions of a socially critical approach to environmental education processes

has been provided (see section 2.3.1). This includes a focus on critical thinking, development of an environmental ethic and action competence. These have been synthesised into an integrated approach termed as ‘critical praxis’ (Freire 1996). An overview of environmental interpretation is now provided to contextualise this re-orientation.

### **1.3 AN OVERVIEW OF ENVIRONMENTAL INTERPRETATION**

Environmental interpretation has been variously defined as an educational activity (Tilden 1977), an approach to communication (Ham 1992), a management tool (Sharpe 1982) and a recreational activity (Knudson *et al.* 1995). However, the most widely quoted definition is that by Freeman Tilden (1977:8), who defined interpretation as:

An educational activity which aims to reveal meanings and relationships through the use of original objects, by first-hand experience, and by illustrative media, rather than simply to communicate information.

The focus of my research in developing interpretation resources and materials (illustrative media) with teachers is on actualising the educational potential of interpretation.

The history of environmental interpretation may be traced back to the early Greek and Roman philosophers (see Weaver 1982). If located within the context of sharing histories and information through storytelling (see section 2.3.2.1), interpretation may be regarded as one of the oldest practices. Within this context, the interactive mediated African folklore storytelling processes may be regarded as interpretive experiences in their own right. However, little research has been carried out to contextualise this within environmental interpretation as a practice.

Environmental interpretation is rooted in communication theory. It has been regarded as a communication technique by many authors (Ham 1992, Knudson *et al.* 1995, Veverka 1994, Sutherland 1996, Beck and Cable 1998). As a communication technique, it places the emphasis on ‘how’ to present environmental information rather than ‘why’ it should be presented. The practice of developing interpretive materials for use in museums and botanic gardens draws

heavily on communication and mass media theories. As a result, such materials are based on the transmitter-receiver model (Hooper-Greenhill 1994), the roots of which may be traced to a behaviouristic learning (Hungerford and Volk 1990). This explains why some writers (Howard 1998) associate interpretation with individual behaviour change, rather than social change. An information-led approach to environmental interpretation has been critiqued with regard to behaviour change (Uzzell 1998a, Wals *et al.* 1999). Globally, many botanic gardens are now re-orienting their interpretation programmes to incorporate a vision for more socially critical orientation (see section 2.4.1).

From a professional point of view, interpretation is still considered a new field. It is still under-theorised and few interpreters explicitly articulate theoretical assumptions that underpin their practice (Uzzell 1998a). The philosophical and theoretical foundation of interpretation is still based on the six principles<sup>4</sup> that Freeman Tilden (1977) presented forty-five years ago in his landmark book, *Interpreting Our Heritage*. Recently, Beck and Cable (1998) expanded and elaborated on these principles. My focus on developing interpretation resources in schools is linked to Tilden's (1977) sixth principle that advocates different approaches (from those for adults) when designing interpretive experiences for children.

This study's focus on environmental interpretation in schools was an attempt to respond to pedagogical and curriculum tensions associated with implementing environmental education processes in schools. This provided me with the challenge of drawing from two 'fields' that have been viewed as separate. I have argued for a re-orientation of environmental education processes through a language of critique and possibility (see section 2.3). This has been done by drawing on the pedagogical implications of socially critical approaches to environmental education processes and the potential of interpretation as an environmental education process through social construction of meaning. Many writers (Aldridge 1989, Mullins 1984,

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<sup>4</sup> Freeman Tilden put forward six guiding principles of interpretation that have been widely quoted (Tilden 1977:9). 1) Any interpretation that does not somehow relate what is being displayed or described to something within the personality of the visitor will be sterile. 2) Information, as such, is not interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information. 3) Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical, or architectural. Any art is in some degree teachable. 4) The chief aim of interpretation is not instruction, but provocation. 5) Interpretation should aim to present a whole rather than a part, and must address itself to the whole rather than any phase. 6) Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best it will require a separate programme (1977:9).

Ballantyne and Uzzell 1994, Howard 1998) have contrasted and compared interpretation with environmental education, by applying what I have regarded here as oppositional reasoning (see section 2.3.3). At NMK where I work, the tendency is to refer to educational programmes when talking about services to school groups and interpretive activities being those for tourists. This has tended to undermine the potential role of interpretation in enabling socially critical environmental education processes. At a broader level, interpretation in botanic gardens internationally has been used to refer to the provision of plant labels, interpretive signs, publications, guided tours, events and exhibitions (Sutherland 1996). As this study will illustrate, this practice, apart from drawing on communication principles, is also implicitly based on a number of educational principles (see section 2.3.1).

Keeping Tilden's (1977) widely adopted definition in mind; and considering its roots as a way to connect humans with the environment, interpretation has the potential of enabling critical environmental literacy and action competence amongst learners. This study has therefore not viewed interpretation and environmental education processes as separate fields. I have viewed them as reciprocally necessary aspects of enabling critical environmental literacy and action competence. The concept of *environmental interpretation and education processes*<sup>5</sup> (EIE) (see O'Donoghue 2001 pers. comm., Janse van Rensburg 2002) is applied to embrace this view. This concept will now be clarified along with others that have been used in the thesis.

### **1.3.1 Clarification of concepts**

A number of concepts have been used that require some clarification to enable a better understanding of the issues that I have raised and examined in the thesis. I clarify their usage within the context of this multi-faceted study. However, these clarifications are not to be regarded as definitions as the concepts may be used differently elsewhere.

#### **Arboretum**

In this study, I have used the term arboretum to refer to a collection of woody and herbaceous plants assembled for educational, recreational and conservation purposes. The 'arboretum'

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<sup>5</sup> I had earlier used the concept 'interpretive environmental education processes' (DS 1, see also Atiti 2001d and 2001e). This however tended to 'collapse' interpretation into environmental education (O'Donoghue 2001 pers. comm.). The concept 'environmental interpretation and education processes' (EIE) was first used in the SANParks EIE course (see Janse van Rensburg 2002).

being developed at Kenya High may perform these functions. Very few schools may have such collection of plants in one large area. In a global context, the term has been used to refer to an area where trees and shrubs are cultivated for scientific purposes. The description that I have provided below on botanic gardens has also been used to refer to arboreta.

### Action competence

This concept is applied to refer to the ability of learners to act in a critically informed and active way towards the improvement of the environment (Jensen and Schnack 1997). This ability is based on the possession of critical thinking skills and the capacity to clarify views on environmental issues. Schnack (1994: 187) summarised it as: "... a competence to *act*, and a *competence* to act". Every learner has a competence to act, but the capability to qualify (social) actions requires some education (*competence*). When learners are involved in active decision-making and action in schools their action competencies may be raised. Educating for action competence therefore becomes educating for responsibility.

### Botanic garden

This term is used in two different contexts, one being the NMK Nairobi Botanic Garden, and the other being the area we developed at one of the two schools (Samaj). In the former, it refers to an institution holding scientific collections of plants that have been documented and labelled, and is open to the public for education, scientific research, conservation and recreation (IUCN, BGCS and WWF 1989). However, not all botanic gardens may fulfil these functions. In the school context (Samaj), the term applies only in a limited sense. This is because the 'botanic garden' that was developed at Samaj differs from normal school gardens. And although it was modelled on the NMK one, its research and conservation functions may be minimal. I have categorised it as a community garden (see Wyse Jackson and Sutherland 2000).

### Critical environmental literacy

This is the ability of learners to actively discover significance and meaning in their local environment as a basis for developing an understanding that may contribute to social change through action (Stables 1998). This form of environmental literacy goes beyond the

understanding of the environment in its biophysical and social dimensions only.

### Critical praxis

Has been used to refer to a process that Freire (1996:15) termed as *conscientisation*. In this process, action and reflection are united during construction of meanings through social or cultural interactions. In the context of this study, critical praxis may occur when learners are actively engaged through real encounters with objects in local interpretive settings. As an integrated approach to socially critical environmental education processes, it involves inquiry-based learning, values education, ideology critique, community contact and social action (Fien 1993).

### Cultural capital

Refers to skills, knowledge and social relations that are acquired by learners in schools and other socio-cultural contexts (for example, family). As a form of symbolic capital, it is necessary for the functioning of educational systems.

### Environmental learning

I have used this concept to imply meaning making processes that occur when learners' cultural capital is mobilised either through interactions with peers, mediating interpretive materials, or more culturally knowledgeable others (for example, teachers, adults) in the outdoors. During meaning-making processes in the outdoors, learners draw on their cultural capital and available interpretive capital. This learning may not necessarily lead to critical environmental literacy and action competence in the learners.

### Environmental education processes

These refer to pedagogical and teaching processes aimed at enabling learners to acquire values, skills and knowledge that may inform their participation in protecting and improving their local environment. I have used this term to reflect the three perspectives of education *about, through and for* the environment (Fien 1993 and 1997). For these processes to be socially critical, learners are to be engaged in investigation, social critique, information finding, action taking and reporting with the aim of enabling them participate in social change. Thus, socially critical

environmental education processes, as discussed in this report, focus on enhancing critical thinking skills, action competence and the development of an environmental ethic in learners.

### Environmental interpretation

This involves educational activities that reveal meanings and relationships through the use of real objects and ‘mediating’ interpretive materials, to enable learners to critically reflect and act on those meanings (see Tilden 1977). This may be with assistance from a teacher or fellow learners.

### Environmental interpretation and education processes

This term describes acts of mobilising learners’ cultural capital in a local interpretive setting in order to engage them in investigation, social critique, information finding, action taking and reporting to participate in social change. I have used this term to reflect the reciprocity that exists between environmental interpretation and environmental education processes.

### Interpretation resource

For the purposes of this study, an interpretation resource may be regarded as a natural, cultural or historical site with objects, artefacts or landscapes, which are open to the public for recreational and educational purposes. Examples of such sites that were found during the review phase (see section 1.2.1) include a museum, a national park, a snake park, nature trails and a botanic garden. These resources provide opportunities to educate school groups through interpretation.

### Interpretive capital

This refers to the techniques, skills, knowledge, resources and materials that occur in different settings, including the non-formal education sector and schools. As a form of symbolic capital, it is necessary in enhancing environmental interpretation and education processes with school groups. I have also referred to this form of capital as ‘tools and skills of interpretation’ (Uzzell 1989). These include the communication and education principles that inform the practice of environmental interpretation, as well as knowledge of forms of interpretation. Interpretive capital is required by teachers and non-formal educators to enable them to design and develop

of interpretive materials that may engage learners in critical and action-oriented educational processes.

### Interpretive materials

These are materials designed to mobilise learners' cultural capital in order to critically engage them in reflection and action towards new ways of knowing. Examples of such materials include worksheets, interpretive signage, brochures, trail booklets, posters and interactive displays. The development of such materials draws on both communication and education perspectives.

### Mobilising interpretive capital

This concept has been applied to refer to processes in which 'tools and skills of interpretation' were made available for the development of interpretation resources and materials in schools with teachers. The mobilised interpretive capital was shared, reconstructed and then made available to be drawn upon by teachers during the transformation of their school grounds.

### 1.3.2 Issues on voice and style of presentation

Stanley and Wise (1983, cited in Blaxter *et al.* 1996:220) argued, "Research is a process which occurs through the medium of a person, the researcher is always and inevitably *in* the research". To avoid trying to convey an impression of distanced objectivity, I have written in the first person and widely used the pronoun 'we' to reflect the teachers (co-researchers) *in* the research. The recognition of subjective involvement is also reflected in the narrative form of the thesis. Narrative is a form aimed at providing a rich context in which to examine and report on the many issues that have been encountered. I have written the thesis with fellow environmental educators and interpreters in mind. A number of photographs and diagrams (I have regarded both as figures) have been used to capture the attention of the reader and reduce the dullness of over-engaging with the text.

This thesis is structured according to a sequence that starts with a comprehensive literature review followed with a methodological chapter and discussions are contained in subsequent

chapters (Lotz 1996). However, the first two chapters may be read as learning outcomes of the study. Some theoretical insights illuminated in Chapter 2 are research findings in their own right. Chapter 3 should not be regarded as a recipe for a participatory action research model. The methodology has been discussed as a process that involved critical reflection and collaborative action (Janse van Rensburg 1995a). Although a comprehensive literature review has been included in Chapter 2, more literature is identified as findings are discussed in the later chapters. In this respect, literature review was an ongoing process. My concluding chapter is not aimed at making concrete recommendations to the reader. Only tentative proposals are made that may open up new research possibilities. After the methodology chapter, the thesis is described in phases that examine the participatory action research cycles. These phases have been presented within a metaphorical framework that describes the possibilities of my research. In the next section, I provide an outline of the chapters as they unfold by portraying the research as a ‘voyage’.

#### **1.4 RESEARCH AS A VOYAGE**

The challenges and situation I studied emerged as a process of ‘voyaging across unexplored oceans’. The waters were never still, sometimes turbulent and deep and at other times calm with new possibilities. Throughout the voyage, the spirit of adventure and discovery was required. This sometimes took me to new continents that meant flying over oceans. The following diary entry confirms this. It also locates the genesis of my ‘voyage’ metaphor. This reflection was made when travelling to Stockholm, Sweden to attend a museum conference (see section 4.2.2.2).

I enjoyed the view of the countryside from my window seat. As we were crossing the North Sea, I spotted white streaming flashes in the water. They were motorboats ‘voyaging’ on water. I realised that the North Sea was an important waterway for Europe. ... The idea of calling my research a voyage struck my mind (Diary, 9 June 2001).

Many researchers have used metaphors to describe the research events as if they were ‘something else’ (for example, Janse van Rensburg 1995b, Lotz 1996, Heylings 1997). As Fairclough (1992:195) argued: “Metaphors structure the way we think and the way we act, and

our systems of knowledge and belief, in a pervasive and fundamental way”. They have been described as figures of speech that point to that which is not present (Cherryholmes 1988). I have used the ‘voyage’ metaphor here to draw attention to the richness and complexity of the study, as I may not completely or correctly represent it in this short report.

‘Voyaging into the unknown’ describes the findings of the first cycle of inquiry and also the first phase of the study. I have used it to describe my attempts to investigate the uncharted territory of environmental interpretation in a Kenyan context. This took place in (except for NMK) unknown social and historical contexts within which interpretation resources and materials were developed and used by school groups. Findings that emerged from this voyage of discovery were used to ‘change the tide’ in two schools. These are described as the findings from the second phase of the study that also doubles as the second cycle of inquiry. ‘Changing the tide’ best describes the shift from conventional top-down approaches of interpretation resources and materials development to a teacher-centred one. Beyond phases one and two, the practical outcomes of the study elicited feelings of confidence in me that have been portrayed as ‘finding the shores’. It was like discovering shores when you have been in turbulent waters for a long period!

The chapter that follows, Chapter 2, situates the contextual and theoretical framework in which this research voyage was made. An overview of environmental education processes in Kenya is narrated within the context of schools. Through a language of critique and possibility, a re-orientation of environmental education processes in schools is proposed. This proposition is presented through an analysis of the pedagogical dimensions of socially critical environmental education processes and a discussion of theoretical frames that provide insights into how meanings may be constructed within interpretive settings. The concept of ‘environmental interpretation and education processes’ is suggested. This departs from oppositional arguments that have tended to regard environmental interpretation and environmental education as separate fields (O’Donoghue 2001 pers. comm.). The role of botanic gardens in enabling ‘environmental interpretation and education processes’ as an integral part of the school curriculum is illuminated.

Chapter 2 proposes the development of interpretation resources and materials in schools through a teacher-centred approach as a move away from the top-down and centre-out approaches (O'Donoghue and Taylor 1988, Lotz 1996). In making this shift, an inquiry approach that may enhance professional competencies of teachers is presented. Through participatory action research, teachers can mobilise interpretive capital within the non-formal education sector and schools towards a re-conceptualisation of their grounds as sites for collaborative inquiry.

In Chapter 3, I describe the methodology underlying this study, the research process and how data was analysed. The methodological framework of the study is discussed with reference to a critical orientation to educational research. Although the idea of research was less a matter of data gathering, a detailed account of the research techniques that I employed is provided. The broad cycles of inquiry in the action research process are recounted, using the metaphorical language mentioned earlier. By drawing on grounded theory (Glaser and Strauss 1967, Arksey and Knight 1999) I explain how the data was analysed and interpreted. Emergent themes and the manner of their presentation in the rest of the thesis are displayed, along with data sources and data analysis in Figure 3.3.

Chapter 4 is a portrayal of findings from the review phase (first cycle of inquiry) of the study as 'voyaging into the unknown'. Their discussion is located within Latour's (1999) social theory on 'situatedness of knowledge production'. A focus on 'mobilising interpretive capital' as described here, illustrates that "skills and tools of interpretation" (Uzzell 1989:9) may be shared with teachers to enhance their professional competencies. This was achieved through social interactions between teachers, non-formal educators and myself, during workshops and critical reviews of interpretive materials. Themes that emerged from critical reviews of materials are examined to further provide insights into interpretive materials development processes. A number of environmental interpretation and education methods were encountered in the organisations visited. These are described in this chapter using the three approaches of mediated, self-mediated and critical praxis-oriented methods. This chapter ends with some reflections on this phase (one) of the study, in which the mobilised interpretive capital is synthesised.

Within a metaphoric framing of ‘changing the tide’, Chapter 5 presents two case studies of a teacher-centred approach to interpretation resource and materials development. These are findings from the second cycle of inquiry (phase two) in the participatory action research process. A detailed account of how teachers were engaged in developing interpretation resources and materials by drawing on the interpretive capital mobilised during the review phase is provided. The two cases are presented as examples of contextualising curriculum activities with teachers. In the first case study, I examine how teachers from Samaj were engaged in a process of transforming a section in their school grounds into a ‘botanic garden’. Interpretive materials that may engage learners in critical and action-oriented environmental education processes were also developed. The second case focuses on the development of a theme trail at a site designated as a school-based ‘arboretum’ at Kenya High. Teachers from the school were also involved in developing interpretive materials for use on the theme trail that emerged. Throughout this chapter, the potential role of interpretation as a way of enabling socially critical environmental education processes in the two schools is highlighted.

In Chapter 6, I share and discuss some of the practical outcomes of this study in the form of conclusions and recommendations. These outcomes are discussed within the metaphorical framework of ‘finding the shores’ and are a manifestation critical educational research. They include the transformation of school grounds; improved environmental interpretation and education practice; improved professional competencies amongst teachers; new interpretive materials in schools and the establishment of partnerships. Recommendations that are synthesised in this chapter are aimed at opening up new possibilities for further research. They are not meant to be drawn upon prescriptively, but for reflection and further action.

## CHAPTER 2      CONTEXTUAL AND THEORETICAL FRAMEWORK OF THE STUDY

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The social world embraces me like a point. But this point is *a point of view*, the principle of a view adopted from a point located in social space, a *perspective* which is defined, in its form and contents, by the objective position from which it is adopted. The social space is indeed the first and the last reality, since it still commands the representations that the social agents can have of it. (Bourdieu 1998:13)

### 2.1      INTRODUCTION

In this chapter I situate the contextual and theoretical framework within which a review and development of interpretation resources to foster environmental learning in two Kenyan schools was undertaken. Drawing on the works of Bourdieu (1998) I apply the notions of ‘cultural capital’ and ‘interpretive capital’ as dimensions of symbolic capital that occur in the formal and non-formal education sectors respectively (see sections 1.2.1, 1.3.1). As constituents of social space implied in the above quotation, both formal and non-formal education institutions are social agents that play a significant role in the reproduction of symbolic capital. To this end, the status of formal and non-formal environmental education processes in Kenya within an historically constituted context is briefly narrated (see section 2.2.1). Curriculum and teaching tensions that are experienced by teachers in enabling socially critical environmental education processes in schools are highlighted.

By combining “... the language of critique with the language of possibility” (Giroux, in Freire 1985:xii; see section 2.3 below) I propose a re-orientation of environmental education processes in schools. I do this by first providing an overview of a socially critical orientation to environmental education processes (see section 2.3.1). I then critically examine interpretation as an environmental education process by drawing on a number of theoretical frames to provide some insights into how learners may construct meanings within interpretive settings (see section 2.3.2). A shift towards ‘environmental interpretation and education processes’ in a bid to bridge the gap between interpretation and environmental education within the realms of

the educational functions of the botanic gardens is articulated (see section 2.3.3). In view of this shift, I discuss the role of the botanic gardens in enabling ‘environmental interpretation and education processes’ as an integral part of the school curriculum (see section 2.4). Efforts being made by the NMK Nairobi Botanic Garden to work with schools to realise this are briefly shared (see section 2.4.3). To build on this, I offer the development of interpretation resources and materials to foster environmental learning in schools through a teacher-centred approach (see section 2.5.1) as opposed to a top-down and centre-out strategy (O’Donoghue and Taylor 1988, Lotz 1996). Central to this is the need to increase teacher critical reflexivity by enhancing their professional competencies (see section 2.5.2). This may be possible through a process of *mobilising interpretive capital* within the non-formal education sector and school grounds (see section 2.5.3). Fundamentally, teachers are regarded as reflective practitioners who have significant contributions to make to education theory and practice, and the transformation of school grounds as sites for environmental learning (see Chapter 5).

## **2.2 AN OVERVIEW OF ENVIRONMENTAL EDUCATION PROCESSES IN KENYA**

To provide an overview of formal and non-formal curriculum practices influencing environmental education processes in Kenya, I draw on my own experiences as a former schoolteacher and as an environmental education practitioner at the National Museums of Kenya. I also draw on Habermas’ (1972) theory of ‘knowledge-constitutive interests’ that explains how fundamental human interests influence the construction of knowledge of curriculum practices and the environment (Grundy 1987, Huckle 1993). Habermas (1962) identified three cognitive interests as technical, practical and emancipatory. He argued that:

The approach of the empirical-analytic sciences incorporates a *technical* cognitive interest; that of the historical-hermeneutic sciences incorporates a *practical* one; and the approach of critically oriented sciences incorporates the emancipatory *cognitive* interest (p. 308).

These interests are reflected in the way curriculum designs for environmental education processes are socially constructed. Environmental education processes designed according to the objectives model (Grundy 1987) are informed by a technical interest and focus on the

management of the environment, with particular emphasis on changing human behaviour (Huckle 1993, Wals *et al.* 1999). This focus has been labelled education *about* the environment (Fien 1993 and 1997) and emphasises the teaching of facts, concepts and generalisations about environmental patterns, processes and problems (Huckle 1993). On the other hand, environmental education processes informed by a practical interest centre on individuals, their actions and the meanings that underpin them. This is because the hermeneutic sciences advance understanding and social harmony by aiding "... our appreciation of our environment and one another" (Huckle 1993:47). Examples of environmental education processes informed by practical cognitive interests are education for environmental awareness and interpretation (see section 2.3.2.). They focus on a perspective of education *through* the environment (Fien 1993 and 1997) in which the environment is used as a medium for the teaching of personal values, cooperation and ethics (Huckle 1993). The emancipatory interest is concerned with the "... ability of individuals and groups to take control of their own lives in autonomous and responsible ways" (Grundy 1987:20) and environmental education processes based on this knowledge interest allows learners to decide for themselves when and how to take action for the environment. They do this by drawing on their own critical analyses of the issues being investigated (Wals *et al.* 1999). This study is oriented towards this knowledge interest within a perspective on 'education *for* the environment' (Stevenson 1987, Fien 1993; see also sections 2.3.1, 3.2.2).

### **2.2.1 Historical shaping influences**

Geographically, Kenya occurs within eastern Africa and lies between Lake Victoria and the coastal waters of the Indian Ocean. It is almost bisected horizontally by the Equator and has a great diversity of landforms that range from the glaciated peaks of Mount Kenya to the coastal plains. The country has a population of 28.7 million people (Government of Kenya 2001) and a rich biodiversity. Some of the major environmental problems that need to be addressed include: desertification, droughts, pollution, soil erosion, loss of biodiversity, HIV-AIDS, floods and social injustices (IGAD 1999). Since its independence in 1963, the country has been advocating environmental management practices as articulated in various policy statements, government directives, sessional papers and development plans (for example, Government of

Kenya 1999). Before independence, the worldwide promotion of nature and outdoor study that was aimed at developing in individuals an understanding and appreciation of the biophysical environment (Stevenson 1987) greatly influenced environmental management practices. The conservation movement later introduced a concern for the protection and management of wildlife through national parks and game reserves. This saw the creation of the Nairobi National Park in 1946 (NMK and KWS 2002) and the formation of the Wildlife Clubs of Kenya in 1968 (WCK 2002). Other national parks and game reserves were later created with the aim of preserving biodiversity. Environmental education processes tended to focus on the management and control of the environment with the emphasis on providing knowledge about the environment (Huckle 1993, Wals *et al.* 1999).

Following the United Nations Conference on the Human Environment, held in Stockholm in 1972, and the subsequent establishment of the United Nations Environment Programme (UNEP) in Nairobi, a number of significant events at international, regional and national levels have taken place (KUC 1980, IGAD 1999). These, to some degree, have influenced and shaped the formulation of strategies and programmes on the provision of environmental education processes in the country. The recommendations of the Stockholm Conference, together with other meetings such as those held at Belgrade in 1975, Brazzaville in 1976, Tbilisi in 1977, the All African Universities Workshop in Nairobi in 1978 and the Kenya National Symposium in 1979, helped Kenya to identify her position on the enhancement of environmental education processes within a global framework (see KUC 1980, Government of Kenya 1999). In 1974, the National Environmental Secretariat (NES) was established to coordinate all matters pertaining to the environment in the country (UNEP 1987), later an Inter-Ministerial Committee on Environment (IMCE) was established under the auspices of NES. Through the IMCE, the gap that existed between NES and government ministries was bridged. The National Environmental Action Plan (NEAP) Report NES produced in 1994 provided not only a strategy for achieving sustainable development in Kenya, but also formed a basis for translating *Agenda 21* (see Government of Kenya 1994). As a result, a growing realisation among all ministries about the necessity of environmental protection and conservation emerged.

Many government bodies are now involved in environmental matters including environmental protection, environmental utilisation and human settlement. Non-governmental organisations are also playing a key role in the conservation of the environment (Government of Kenya 1994, IGAD 1999, Karembu 2002). In 1987, the first ever report on the state of the environment was prepared by NES in collaboration with the United Nations Environmental Programme (UNEP 1987). The aim of this report was to increase the awareness of the decision-makers at all levels and the Kenyan public at large about the interrelationships between their activities and aspirations for better living and the environment. In this report, the environment was viewed as economic capital to be drawn on and exploited. This reflects a technical interest that focuses on the control and management of the environment (Huckle 1993), a view that this study has challenged through its socially critical orientation to education processes (see section 2.3.1).

An Environmental Education Committee that was formed in 1977 at the then Kenyatta University College, provided a basis for many of the formative activities associated with developments in environmental education processes in the country (KUC 1980, Lindhe *et al.* 1993). During the same year, the Ministry of Education prepared guidelines in consultation with the Kenya Institute of Education (KIE) for the incorporation of environmental education processes into the curriculum that existed at that time. An environmental science panel was created and became responsible for providing guidelines and approaches to the incorporation of environmental education processes in various teaching topics. In consequence, environmental education processes became associated with science disciplines. To a great extent, this discipline-centred approach has implied a fragmentation of knowledge that is consistent with the specialised nature of technological processes in the wider society (Robottom 1987, Fien 1993, Huckle 1993). This has promoted the dominant technocratic scientific worldview in schools and the association of environmental education processes with the science curriculum (see section 2.2.2).

In 1981, the current structure of an '8-4-4' education system, that is, eight years of primary, four of secondary and four of university education was introduced. This replaced a previous structure of '7-4-2-3', that is, seven years of primary, four years of ordinary secondary level,

two years of advanced secondary level and three years of university education. This change in the structure was necessitated by the need for a curriculum with a practical orientation. In spite of this, the new system remained a "... model of educational change that served to reinforce and reproduce rather than reconstruct key features of school or formal education" (Robottom 1987:92). In the previous education system, schools had been encouraged to incorporate all environmental dimensions – social, biophysical, economic and political into their teaching areas through pupil-centred teaching methodologies like case studies, project work, community activities, field courses and debates (KUC 1980, Lindhe *et al.* 1993).

Although the need to make environmental education processes an integral part of both the formal and non-formal curricula was made explicit in *Sessional Paper No. 6 of 1988* (see Government of Kenya 1988), little has been done at classroom level, beyond a discipline-based approach to the teaching of environmental education processes (mentioned above). The current education system has turned out to be more exam-oriented and content based with an increased workload for both learners and teachers (Karembu 2002). This leaves little room for socially critical approaches to environmental education processes. The school curriculum thus appears not to have been sufficiently effectively implemented to be able to take account of the complex, interdisciplinary character of environmental education processes (Huckle 1993, Fien 1993, Fien and Tilbury 2002). Consequently, the education process has become part of the dilemma confronting the teaching of environmental education processes in Kenya as elsewhere (see Sterling 1996, Hopkins and Mckeown 2002). A need to re-appraise curriculum development strategies and teacher education programmes is evident. This study addresses some elements of enhancing teacher professional competencies by a focusing on participatory materials development (see section 2.5.2). The present curriculum review that is aimed at reducing workload and subject content for learners is a move in this direction (Omwoyo 2002 pers. comm.). Other than that, the Ministry of Education has yet to develop guidelines for teachers on how environmental education processes can be enhanced in schools beyond the current discipline-centred approach. This approach places more emphasis on learning *from* and *about* the environment, than on learning *for* the environment (see Robottom 1987, Fien 1993 and 1997, Huckle 1993, Job 1996). Teachers have yet to be re-trained, as recommended by a number of reports (for example IGAD 1999, Lindhe *et al.* 1993). This technical and practical

approach to the teaching of environmental education processes in the words of Freire (1998:44) cannot facilitate “... critical and dialectic thinking; rather it stimulates naïve thinking”, hence the socially critical orientation to environmental education processes that I have used in this study (see section 2.3.1).

At the regional level, an Inter-Governmental Authority on Development (IGAD) was set up in 1986 to tackle environmental and developmental issues within the east African region. Various strategies for addressing these issues were set up, including the incorporation of environmental concerns into the school curriculum. Increasing public awareness of environment and the promotion of training has also been given particular emphasis (IGAD 1999). Nevertheless, it seems that little has been achieved on the ground in realising these strategies (Karembu 2002). A workshop conducted by IGAD in 1996 to review the findings of the sub-regional report on environmental education processes underscored the need to use a participatory interactive methodology in the teaching of holistic, problem-oriented and action-oriented environmental education processes. Such an approach will no doubt enable learners to participate in decision-making on how to take action *for* the environment (see Huckle 1993, Fien 1993 and 1997, Tilbury 2002 in press). Internationally, the United Nations Conference on Environment and Development (see UNCED 1993), held in Rio de Janeiro in 1992, has been catalytic in making Kenya review its environmental education and management policies. In the Sessional Paper No.6 of 1999 on Environment and Development (Government of Kenya 1999) the importance of environmental education processes was explicitly stated:

Environmental education, both formal and non-formal, is vital to changing people’s attitude to appreciate environmental concerns. A long-term education programme focussing on all levels of environmental education and society is desirable (p. 92).

This paper was developed to set up comprehensive policy guidelines for achieving sustainable development and also in response to the increasing concerns regarding the effects of development on the environment. Following this, the Environmental Management and Coordination Act of 1999 was enacted to provide for the establishment of an appropriate legal and institutional framework for the management of the environment (Government of Kenya 2000). The National Environmental Management Authority (NEMA) came into being in 2002

as a result of this act. This has further committed the government to developing a national strategy on environmental education processes. Prior to the establishment of NEMA, implementation of environmental policies was disjointed, as no comprehensive environmental legislation existed.

### **2.2.2 Status of environmental education processes**

Schools and non-formal education organisations in Kenya, as elsewhere, are regarded as reproductive sites for the provision of the “... knowledge, skills and social relations necessary for the functioning of the capitalist economy and dominant society” (Giroux, in Freire 1985:xi). These skills, knowledge and social relations are what Bourdieu (1998) termed symbolic capital (see section 1.2.1). ‘Cultural capital’ reproduced in schools and socio-historical contexts and ‘interpretive capital’ that exists in non-formal education organisations in Kenya (and elsewhere) can be mobilised to provide “... tools for critical thinking and transformation action” (Giroux, in Freire 1985:xi) through environmental education processes. Therefore, both schools and non-formal education organisations play a significant role in the reproduction and distribution of symbolic capital and consequently influence the structuring of *social space*<sup>6</sup>. Even though it is evident that learners acquire useful skills and knowledge in schools and non-formal education organisations, it is not obvious to them that these skills and this knowledge are a form of ‘capital’ (Schultz 1977). It is the responsibility of the Ministry of Education to ensure that ‘cultural capital’ reproduced in schools is mobilised to realise the aims of formal education. To achieve this, the Ministry, through the Kenya Institute of Education (KIE), produces curriculum guidelines in the form of syllabi (for example, KNEC 2002). In these syllabi, environmental issues are implicitly integrated into some ‘carrier subjects’ (Wanaswa 1993).

Nevertheless, the notion of ‘carrier subjects’ has ramifications of relegating environmental education processes to a ‘thing’ that can only be moved around by certain subjects in terms of content. A process-based approach has yet to take root (see Greenall Gough 1997) and Karembu (2002) observed that environmental literacy in learners is still low. Although several

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<sup>6</sup> I have used the concept ‘social space’ to refer to the overall conception of a social world. Sets of distinct and co-existing positions occur in the social world and are occupied on the basis of the kind of symbolic capital one possesses. The social space of learners in schools is connected with struggles for cultural capital within them (Bourdieu 1993, 1998).

government statements have been made, in line with international environmental education policy (for example, Government of Kenya 1999), the Ministry of Education has developed no comprehensive policy on the provision of environmental education processes in both formal and non-formal education (Wanaswa *et al* 1993, IGAD 1999). As a result, organisations and institutions dealing with environmental education processes are not coordinated to share information and facilities (IGAD 1999). This lack of a clear comprehensive policy on environmental education processes at the Ministerial level implies that environmental education has yet to be officially adopted as an integral part of the school curriculum. This, coupled with a lack of adequate materials to support these processes in schools, has continued to contribute to the prevailing low levels of environmental literacy in learners (Karembu 2002). In addition, teachers appear not to understand the nature and scope of environmental education processes, which many view as an additional burden in the already overloaded curriculum and as only relevant in the science curriculum (see section 2.2.1).

A review report from the Inter-Governmental Authority on Development (IGAD 1999) confirmed that there is ineffective pre-service and in-service training for Kenyan teachers in environmental education processes and resource materials development. The focus of this study on involving teachers in the development of interpretation resources and materials for socially critical environmental education processes in the school curriculum (see section 2.5.1) is my attempt to address some of these constraints. On the other hand, a number of tertiary institutions are involved in the promotion of environmental awareness and training for teachers (Wanaswa *et al* 1993). The importance of teacher education programmes has been emphasised as the basis for effective implementation of environmental education methods and processes (see UNESCO 1980, KUC 1980, Stevenson 1987, Huckle 1996, Hopkins and Mckeown 2002). In Kenya, all the five public universities offer modules on environmental education (IGAD 1999, Karembu 2002) although with more emphasis on environmental studies at a postgraduate level. Since 1986, a unit on environmental education has been included in the training of primary school teachers (Wanaswa *et al.* 1993). In-service training in environmental education is usually offered in terms of seminars, workshops and field courses for teachers and non-formal educators. These are used to increase awareness, improve extension services, sensitise the participants to environmental issues and strengthen institutional capabilities in the

provision of environmental education processes. Such in-service training is, however, often implemented through technocratic approaches that fail to take into account the educational and environmental problems that arise in particular settings (Robottom 1987, Huckle 1996). Therefore, institutional constraints that shape educational practices remain unresolved.

Non-governmental organisations (NGOs), different government ministries and departments, women and youth groups, and the private sector all play a major role in providing non-formal education programmes to schools and the general public (Government of Kenya 1994, IGAD 1999, Wanaswa *et al.* 1993). At the NGO level, the Environmental Liaison Centre, an international NGO, provides environmental awareness and training amongst local non-governmental organisations through its publications and workshops. The African Wildlife Foundation (AWF) assists and supports government institutions and individuals in the management and conservation of wildlife. The Eastern Africa Environmental Network (EAEN), through its annual conferences, provides environmental networking and communication in the region (Manu 2001). Government departments like the National Museums of Kenya (see section 2.4.3) and Kenya Wildlife Service provide various environmental education programmes to school groups. The non-formal education sector is involved in the development and distribution of materials to support environmental education processes in schools (see Karembu 2002). Many of these are produced "... in the form of booklets and posters that are attractive and of benefit to schools and colleges" (Wanaswa *et al.* 1993:76). However, the impact of materials that have been developed in a technocratic manner has been questioned (see Robottom 1987, O'Donoghue and Taylor 1988). My challenge to the prevailing technocratic practice in materials development (see section 2.5.1) forms a major part of the results of this study (see section 5.2 and 5.3).

### **2.3 RE-ORIENTING ENVIRONMENTAL EDUCATION PROCESSES IN SCHOOLS THROUGH A LANGUAGE OF CRITIQUE AND POSSIBILITY**

To address some of the curriculum and teaching constraints outlined in the previous sections, this study combines "... the language of critique with that of possibility" (Giroux, in Freire 1985:xii) to suggest a re-orientation of environmental education processes in schools through

interpretive experiences that foster socially critical education interactions. Underlying the language of critique is my argument that schools should shift from the current technocratic approach to the teaching of environmental education processes (Robottom 1987, Fien 1993 and 1997) to approaches that are more socially critical and action-oriented. This embodies analyses that characterise a socially critical orientation to environmental education processes (see Robottom 1987, Huckle 1993, Greenall Gough and Robottom 1993, Fien 1993 and 1998). On the other hand, the proposition that school grounds can be transformed into interpretation resources to foster environmental learning in real encounter experiences (see section 2.5.3) is embedded in a language of possibility. This language recognises the significance of meaning-making processes in interpretation acts. The language of critique and that of possibility suggested here are rooted in different sociological perspectives on reality and social change. The language of critique as expressed in a socially critical orientation to education is situated within critical theories of social change (see section 3.2.2). On the other hand, the language of possibility as articulated in interpretive meaning-making processes, draws substantially from the hermeneutic sciences. Nevertheless, as Bourdieu (1998) noted:

... the deepest logic of the social world can be grasped only if one plunges into the particularity of the empirical reality, historically located and dated, but with the objective of constructing it as a special case of what is possible (p. 2).

In exploring the historically located and empirical reality of these propositions in this study, I endeavour to describe a 'special case of what is possible'. This involves considering both the interpretive hermeneutic processes of meaning-making, and critical theories of social change, as these relate to environmental education processes in schools. The interpretive hermeneutic processes of meaning-making may occur as interpretive capital is mobilised in school grounds by teachers and partners involved in the study.

This approach not only provides theoretical distinction in this work, but also provides a basis for enabling the transformation of school grounds into sites that can potentially foster critical environmental education processes (see sections 5.2.4, 5.3.4). I will first discuss a socially critical orientation to environmental education processes.

### 2.3.1 A socially critical orientation to environmental education processes

Environmental education processes are a response to the current global socio-environmental crisis (Di Chiro 1987, Fien 1993, Lotz 1996). Globally, the origins of environmental education processes can be traced to the promotion of nature and outdoor study and later to the conservation movement (Stevenson 1987; see also Robottom 1987, Janse van Rensburg 1995b and Lotz 1996 for historical analyses). Environment has been described as a social construct and, as Di Chiro (1987:25) contends, it should be understood as the “... conceptual interactions between our physical surroundings and the social, political and economic forces that organise us into the context of these surroundings”. The environmental crisis manifests in society as problems that have come about as a result of societal practices and organisation and Di Chiro (1987:26) noted that, in response to this crisis, environmental education processes should aim “... to educate *for* [emphasis mine] the environment with a problem-solving orientation” (see also Fien 1993, Tilbury 2002 in press). She identified *conservative* and *radical reform* approaches as broad ideological shifts that have occurred within the environmental movement towards efforts to respond to the environmental crisis. These have influenced environmental education processes. The conservative approach tends to maintain the status quo rather than transform the economic and political order by drawing on scientism and political conservatism as a basis for resolving environmental problems. Such a technocratic approach in schools tends to promote “... passive consumerism in both environmental problem solving and educational problem solving” (Robottom 1985:85).

On the other hand, a radical reform approach that advocates a socially critical orientation to education aims to transform the economic and political order by treating environmental crises as signs of social injustice within a political system (see Huckle 1993 and 1996, Tilbury 2002 in press). Schools, teachers and learners are viewed as active members of society who, through critical reflection and action, may create just and democratic societies (Greenall Gough 1993, Fien 1993). Learners and teachers are expected to share responsibility in planning tasks and teachers are expected to adopt an open, inquiry-based teaching style that emphasises learning in the community (*ibid*).

Although socially critical aims for environmental education processes have been advanced since the UNESCO-UNEP Conference that was held at Tbilisi in 1972 (see Robottom 1987, Greenall Gough and Robottom 1993, Fien 1993 and 1998) the contemporary practice in most schools in Kenya still reflects a technocratic approach (see section 2.2.2). I will examine this as an example of the inconsistencies between the problem-solving and action-oriented goals of socially critical environmental education processes (radical reformist discourse) and the acquisition of environmental knowledge and awareness (technocratic discourses) in school programmes (Stevenson 1987, Greenall Gough 1997). Robottom (1987:85) made the following observations as regards pedagogical and curriculum tensions between schooling and the enhancement of socially critical environmental education processes (see also Stevenson 1987, Fien 1993):

...[EE] aspires to be interdisciplinary, but the conventional school curriculum is strongly disciplinary; it entails outdoor education, but school rules and regulations impose constraints on out-of-classroom activities; it is a form of inquiry teaching, but structures and relationships in schools tend to reproduce more didactic forms of instruction; it is interested in inquiries that are critical, involving critiques of environmental situations, but schooling tends to be more interested in vocational or liberal education.

While these perspectives are almost fifteen years old, they still characterise environmental education processes in Kenya (see previous section). Radical reformists of environmental education processes (Di Chiro 1987, Robottom 1987, Huckle 1993, Fien 1993, Wals *et al.* 1999) have challenged technocratic approaches to environmental education processes that are dominant in schools. For example, Robottom (1987:85) has argued that environmental education processes should adopt an approach that is *critical* and *participatory*. Di Chiro (1987:41) saw the need for environmental education processes "... to engage in a social critique of environmental problems". However, schools face a great challenge in making critical reflection and action a fundamental part of their environmental education processes. This is because historically, schools were not intended to develop "... critical thinkers, social inquirers and problem solvers, or active participants in environmental decision making" (Di Chiro 1987:73). Schools have generally been viewed as reproductive sites for 'cultural capital' (see Apple 1982, Giroux 1985, Bourdieu 1999; see also section 1.2.1). Their practices have been shaped by the state to reflect the interests of capitalist rationality through selective grants,

certification policies and legal powers (Giroux 1985), yet critical environmental education processes are concerned with values that support social justice (Stevenson 1987, Fien 1993 and 1998, Tilbury 1995, Fien and Tilbury 1998 and 2002).

Many authors have viewed education and teaching as political practices (see Freire 1985, Di Chiro 1987, Robottom 1987, Huckle 1996, Popkewitz 1984 and 1999). Teachers who attempt to teach environmental education processes are involved in negotiating and practising curricula that maintain the *status quo* and reproduce its accompanying set of social values and ideologies (Di Chiro 1987, Huckle 1991 and 1996). Furthermore, curriculum and pedagogical practices found in schools generally reflect teacher-centred orientations, and teachers' work with learners is defined by demands of exam systems. These examinations take place in private artificial situations often far removed from real life situations. There is thus a need to create conditions for a teaching-learning environment in schools that can enable socially critical perspectives to environmental education processes. This, however, requires a social theory that significantly addresses the curriculum and pedagogical tensions that arise around the implementation of socially critical environmental education processes in schools (see section 3.2.2).

Drawing on critical theories, I now examine some of the pedagogical issues associated with socially critical environmental education processes (Fien 1993 and 1994, Jensen and Schnack 1994 and 1997, Fien and Tilbury 1998 and 2002). These include critical thinking, development of an environmental ethic and action competence.

#### *2.3.1.1 A focus on critical thinking*

A pedagogical focus on critical thinking within socially critical environmental education processes may be described as follows:

Teaching and learning are intended to be cooperative processes of inquiry and action on real environmental issues. Such an inquiry process demands that students actively engage in critical or complex thinking about real problems. The development of knowledge, skills and values is not only directed towards action, but emerges in the context of preparing for (i.e. the inquiry) and taking action ... A function of knowledge in environmental education is immediate use for the social value of a sustainable and emancipated quality of life (Stevenson 1987:75).

Socially critical environmental education processes aim to foster the development of a critical environmental consciousness (Fien 1993) in learners. According to Giddens (1979, cited in Fien 1994:28), critical consciousness involves the reflective knowledge which learners “are able to express at the level of discourse”. It can be developed through an understanding of the central beliefs of ecosocialist environmentalism<sup>7</sup>. These include particular views on the environment as a social construction, the nature of environmental politics, the nature and causes of environmental problems and solutions to environmental problems (Fien 1993).

Fien (1994) identified three components of critical thinking that may be involved in the development of a critical environmental consciousness. The first one entails the development of skills of enquiry and problem solving. This is usually based on deductive and inductive thinking. A second component involves the development of a more reflective reference frame than most classroom thinking allows, and the third component engages the capacity to explore and imagine alternatives (see also Fien and Tilbury 1998). It has been argued that integrating futures thinking components into environmental education processes can enable learners to envision probable and possible alternative futures (Tilbury 1995, Fien and Tilbury 1998). Envisioning probable and possible alternative futures has the potential of opening up learners’ minds to the historical, economic and socio-political contexts of environmental issues and risks (Fien 1994).

#### *2.3.1.2 The development of an environmental ethic*

Central to socially critical environmental education processes is the development of capacity to clarify and debate views on environmental issues (Greenall Gough and Robottom 1993, Fien 1993 and 1994). Decisions by learners to participate in environmental change are not stimulated by knowledge alone (Fien and Tilbury 1998). Rather, they are also dependent on personal motivations and a sense of responsibility. Such personal motivations and a sense of responsibility may result from the development of a personal environmental ethic that was made explicit by the 1980 *World Conservation Strategy* (IUCN, UNEP and WWF 1980: section 13) when it argued:

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<sup>7</sup> According to Fien (1993), ecosocialist environmentalism refers to an environmental ideology that advocates the radical transformation of Western society and its economic base in existing global patterns of production and consumption. It sees the environment as “... capable of sustaining natural systems, economic development and just human societies, provided the social conditions of production and consumption reflect socially useful goals and democratic processes” (*ibid* p.28).

A new ethic, embracing plants and animals as well as people is required for human societies to live in harmony with the natural world on which they depend for survival and well being. The long-term task of environmental education [processes] is to foster or reinforce attitudes and behaviours compatible with this new ethic.

Ten years later, *Caring for the Earth* (IUCN, UNEP and WWF 1991) proposed a world ethic<sup>8</sup> of living sustainably (see also Fien and Tilbury 1998:21 for analyses on values) upon which critical environmental education processes may be developed. More recently, the Earth Charter articulates a broad-based framework for global ethics (McKeown 2002). The Earth Charter is a synthesis of values, principles and aspirations involving respect and care for the community of life; ecological integrity; social and economic justice; and democracy, non-violence and peace (*ibid.*)

An approach to values education has however, been critiqued by Huckle (1983) who perceived values education as a form of psychoanalysis and an excuse to change the individual learner, rather than the structures of the school or wider society. Wals *et al.* (1999) further pointed out that values cannot be ethically or pedagogically imposed. Thus, environmental education processes should provide situations in which all learners feel free to discuss and make explicit their values (*ibid.*). At the same time, an approach that links environmental concern to “... wider political agendas” (Huckle 1983:61) is required. Such approaches may enable learners to develop an understanding of and skills in political literacy for active participation in the political processes of democracy and social change (Fien 1994). This is what Jensen and Schnack (1997) termed as action competence. I discuss it in the section that follows.

### 2.3.1.3 Action competence

The development of critical thinking skills and an environmental ethic form the basis for action competence (environmental citizenship). According to Jensen and Schnack (1997:175):

The concept of action competence includes the capacity to be able to act, now and in the future, and to be responsible for one’s actions. In other words, action competence is not identical to acting, nor can action competence be described/explained by describing the actions performed. However, it is reasonable to believe that performing actions (in a school context) helps to develop action competence.

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<sup>8</sup> This ethic contains two sets of values on: *ecological sustainability* (interdependence, biodiversity, living lightly on earth and interspecies equity) and *social justice* (basic human rights, inter-generational equity, human rights and participation).

For learners in schools to be able to act in a critically informed and active way (Tilbury 1995), they require understandings, values and skills of political literacy (Fien 1993). Political literacy is therefore, key to the development of action competence in learners. Within schools, learners may be involved in active decision-making and action to improve environmental quality in a number of ways. These may range from personal lifestyle adjustments to the resolution of environmental problems. To realise this, some action skills are necessary. Hungerford, Peyton and Wilke (1980) identified three key environmental action skills that may be drawn on. These are: evaluating and deciding upon an appropriate form of action such as persuasion, consumerism, political action, legal action or eco-management (see also Fien and Tilbury 1998 and 2002); the development and implementation of plans and the evaluation of action.

The three pedagogical aspects of socially critical environmental education processes that I have outlined above may be synthesised into an integrated approach known as ‘critical praxis’ (Freire 1996). According to Fien (1994, see also Huckle 1991), critical praxis involves inquiry-based learning, values education, ideology critique, community contact and social action. Within this framework, teachers in schools can involve their learners in collaborative and engaging community projects that may lead to a critical perspective on society (Greenall Gough and Robottom 1993).

From the foregoing, it is evident that socially critical approaches to environmental education processes require a flexible curriculum and pedagogical planning. This may allow learners to actively engage in critical or complex thinking about real problems through co-operative processes of inquiry. I propose that this can be partly realised through a re-conceptualisation of school grounds as interpretation resources (see section 2.5) that enable *critical environmental literacy*<sup>9</sup> (Stables 1998) and action competence. According to Stables (*ibid.*), critical environmental literacy is the ability of learners to actively discover the significance and meaning of their local environment to them and others, in order to develop an understanding of how to contribute to social change through action. As suggested earlier (see section 2.3), a re-conceptualisation of school grounds as interpretation resources is embedded in a language of

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<sup>9</sup> Stables (1998) further identified two other types of environmental literacies as follows: *Functional*: ability to understand ecological facts and to understand the environment in biophysical terms; and *Cultural*: ability to comprehend the cultural significance of natural images and to be able to grasp the social dimensions of the environment (*ibid.*).

possibility that recognises the significance of meaning-making processes in interpretive experiences. I examine in this in the next section.

### 2.3.2 Interpretation as an environmental education process

The origins of interpretation go deep into recorded history and Weaver (1982) has traced it back to the Greek and Roman philosophers before 600 BC (see also Milne 1996). The fields of religion, philosophy, the natural sciences, education, literature and arts, among others, have shaped interpretation practice, as we know it today. Three centuries before Freeman Tilden presented his six principles (see section 1.3), John Amos Comenius (1592-1670), regarded as one of the most notable practitioners and exponents of nature and science education and interpretive methodology (Weaver 1982), taught the value of relating an object to the experiences of learners. He advocated a different approach when teaching children and learners. This perspective relates to Tilden's sixth principle (see section 1.3). Enos Mills, one of the first people to use the term 'interpret' to describe nature-guiding activities, presented various philosophical principles<sup>10</sup> in *Adventures of a Nature Guide and Essays in Interpretation* in 1920 (Beck and Cable 1998, see also Knudson 1995 *et al.*). The guiding principles of Mills and Tilden (1977) are strikingly similar (see section 1.3).

The focus of this study on developing interpretation resources and materials within schools (see section 2.5) is an attempt to focus interpretation for schoolchildren within their own settings. In this context, interpretation may be regarded as environmental education processes that can enable learners to socially construct meanings through interactions with teachers, peers or interpretive materials in the school grounds (Tilden 1977, Curthoys and Cuthbertson 2002; see also section 1.3). It is not simply communicating environmental information (Tilden 1977, Ham 1992). Rather, it involves processes of communicating knowledge that are designed to stimulate an interest and excitement in learners for the subject being interpreted (Irwin and Milne 2000). This may foster environmental learning in schools. Through interpretation, learners' cultural capital can be mobilised with the intention of challenging them to examine their attitudes and actions in respect of social, environmental and moral issues, thus stimulating

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<sup>10</sup> Mills' philosophical principles on nature guiding focused on: discussing facts; appealing to the imagination and reason; giving flesh and blood to cold facts; making life stories for inanimate objects; dealing with principles rather than isolated information; and giving biographies rather than classifications (Knudson *et al.*). These seem parallel to Tilden's (1977) six principles that I highlighted in section 1.3.

socially critical learning interactions (Fien 1993, Greenall Gough and Robottom 1993, Huckle 1996, Ballantyne 1998).

Interpretation resources and materials developed in school grounds have the potential to make environmental information easily accessible to all learners (Irwin and Milne 2000). Such information may encourage discussion, stimulate new ideas and inspire learners to find out more through real encounter experiences (Honig 2000, Curthoys and Cuthbertson 2002). In addition, school grounds as *interpretation resources for inquiry* can effectively be utilised for teaching environmental education processes across the school curriculum by teachers. I use the term *inquiry* as implied by Wells (2000:121) to indicate a "... stance towards experiences and ideas – a willingness to wonder, to ask questions and to seek to understand by collaborating with others in an attempt to make answers to them". At the same time, the aim of inquiry is not 'knowledge for its own sake'. Rather, it is the disposition and ability to use the understanding critically in ways that social and education actions for change can consider social critique. This may enable learners to act knowledgeably and responsibly "*for the environment*" (see Greenall Gough and Robottom 1993, Fien 1993, Fien and Tilbury 2002).

Promoting school grounds as sites for inquiry has the potential to provide a way of overcoming the separation in practice, as well as in theory, between 'classroom' knowledge that is usually acquired didactically and 'action-knowledge' (Wells 2000). To actualise this potential, interpretive materials and experiences that enable learners to find their own personal meaning through critical reflection are necessary (Uzzell 1998a). This requires an understanding of interpretation as educational processes of meaning-making and critical reflection. To do this, I draw from a number of theoretical frames (LeCompte and Preissle 1992) to illuminate how learners may construct meanings within interpretive settings. These frameworks include perspectives on communication techniques (Ham 1992, Veverka 1994), perspectives from social psychology (Berger and Luckmann 1966, Vygotsky 1981, Charon 2001) and critical pedagogy (Fay 1987, Freire 1996). Interpreters and teachers can use insights from these theoretical frames to structure interpretive learning experiences in their contexts to foster environmental learning. In my review of the literature on interpretation as an education process, I have concluded that interpretation, as an education process has been under-theorised.

Uzzell (1998a) has also pointed out that very few interpreters have articulated the theoretical assumptions underlying their practice. This study is an endeavour to broaden the theoretical base of interpretation as an education process by re-orienting interpretation interactions towards socially critical environmental education processes. It is a re-orientation that will mark a shift from viewing interpretation as a leisure activity for non-captive audiences in non-formal interpretive sites (see Ham 1992, Howard 1998) to one that articulates the potential of interpretation as a way of fostering critical environmental education processes in schools.

To provide perspective on this shift, I will first highlight the communicative approach to interpretation, as reflected in the techniques for developing exhibitions and interpretive publications (see Sharpe 1982, Ham 1992).

#### *2.3.2.1 Interpretation as a communication technique*

The practice of developing interpretive materials for use in heritage sites, museums, botanic gardens and zoos draws heavily on communication and mass media theories (see Ham 1992, Hooper-Greenhill 1994, Veverka 1994, Dierking 1998). Characteristically, these materials are based on the transmitter-receiver model (Hooper-Greenhill 1994), the roots of which can be traced to a behaviouristic approach to environmental learning (Hungerford and Volk 1990). Such an information-led approach to environmental education has been found not to always lead to a behaviour change in learners (Uzzell 1998a). Hooper-Greenhill (1994) has regarded mass communication systems as ‘unnatural’ forms of communication. These forms operate at a distance and often in the absence of the two parties necessary before communication may occur (*ibid.*).

A number of interpreters have, however, pointed out fundamental differences between interpretation and information transmission. For example, in his second principle (see section 1.3), Tilden (1977:9) argued that information is not interpretation but is revelation based upon information. Although interpretation includes information, the two are entirely different things. Later Sam (1992) identified four qualities of interpretation as *enjoyable, relevant, organised* and *thematic*, to distinguish it from other forms of information transfer. He went on to provide tips on how to capture learners’ attention and also on how to develop various interpretive

materials. Beck and Cable (1998) underscored the need for interpreters to be skilled in communication and knowledge in natural and cultural history. This may enable interpreters to make their interpretive messages "... *interesting* to capture attention, *meaningful* so that [learners] care and *compelling* so that [learners] no longer think or act the same after hearing them" (*ibid.* 16). When using the outdoors for interpretation, teachers should therefore not teach their learners in the same way that they teach them within the classrooms (see section 2.3.1). Rather they should present facts about subject content curriculum in a straightforward, understandable and engaging manner (*ibid.*). Facts should only be used when they help the learners understand and appreciate what the teachers are trying to show or explain (Ham 1992). Teachers should thus work with learners to convey the meaning of the school curriculum in the context of existing cultural and natural features within the school grounds. On this basis, interpretation within school grounds becomes an educational activity that aims to reveal meanings about environmental links to the school curriculum through various media by drawing on effective communication techniques (see Ham 1992, Veverka 1994, Beck and Cable 1998).

While Ham and others have shown us to how to communicate environmental messages in meaningful, relevant and interesting ways, in my view they do not offer a coherent theoretical framework on which to base this communicative approach to interpretation. This view is also shared with Uzzell (1998a: 12) who argued: "Interpretation is, I suggest, stuck in a rut where the how has become more important than the why".

In contrast to this view, some articulated theories do exist that explain communicative approaches to interpretation through storytelling as reflected in the work of Strauss (1996). In discussing the characteristics that make interpretation different from other ways of communicating, Tilden (1977) was able to associate it with storytelling experiences. According to Strauss (1996:49) a storytelling experience is "... an internal field trip where the meadow is brought into the heart of the listener rather than the listener brought into the meadow – with hopes that the heart will follow". She claimed that storytelling is distinct from information giving, as it demands introspection and self-reflection from the presenter, weaves together beauty and truth; creates relationships and translates content or information into images. Unlike

information giving, story telling can create a deeper relationship between the tellers and their unknown or forgotten selves and in this way create relationships with a wider audience. Furthermore, while informational speech compartmentalises content, story speech creates a relationship between segmented parts and then moves towards a greater idea or new way of seeing. She contended that when using stories to inspire learners to a lifelong interest in the environment, interpreters and educators must tell their stories with love, wisdom and devotion to truth. The strength of storytelling as a successful communication form for interpretation lies in its accessibility to audiences of various learning styles.

Through storytelling, Strauss (1996:33) has pointed out that one is able to combine three artistic expressions that include "... the literary, visual and musical". As a literary art, storytelling shapes interpretive messages that are presented as narratives to create meaning or describe an environmental problem. Since storytelling swims in the medium of sound, it is already a musical art, but in order to make it visual, teachers as interpreters are expected not to tell their learners what they want to tell them. They should show them what they want to tell them. In this genre of interpretation theorising, teachers are seen to be familiar with the practice of effective communication techniques and hence should strive to create meaningful and provocative stories (Beck and Cable 1998) about their subjects through the outdoors.

#### *2.3.2.2 Interpretation as a process of socially constructing meaning*

The general theme I address in this section concerns how the social construction of meanings forms the fabric of environmental learning in interpretive settings. According to Dierking (1998), learners in interpretive settings bring in their own social experiences and interact with others or interpretive materials to find their own meanings. Successful meaning-making occurs when the learners are able to actively engage in environmental learning experiences based on the object being interpreted. Dierking's (*ibid.*) central argument is that practically all such meaning-making processes are either directly or indirectly socially mediated. She recognised that interactions that occur between learners and the interpretive media are an important aspect in meaning-making processes. During such interactions, learners bring their own social experiences, emotions and environmental values into play. She saw the interaction that occurs between learners and the interpretive media (either personal or non-personal) as an important

factor in fostering environmental learning.

To be in a better position to develop interpretation resources and materials in schools that enhance environmental learning, an understanding of the role of the social construction of meaning would thus seem necessary. To provide a theoretical foundation for this understanding and further build on Dierking's (1998) argument, I draw on theories of the 'social construction of reality', symbolic interactionism and social constructivism as exemplified in the works of Alfred Schutz (see Berger and Luckmann 1966), George Herbert Mead (see Woods 1992, Plummer 1996, Charon 2001) and Lev Vygotsky (1981) respectively.

Alfred Schutz is regarded as the theoretical 'father' of the theory of 'social construction of reality' that Berger and Luckman (1966) publicised in a wider context. This theory has its origins in the philosophy of phenomenology as set out by Edmund Husserl (see Schutz 1967). For Alfred Schutz (Schutz and Luckmann 1974), learners confront a world already rich in meaning, intentionality, symbolism and interpretation. Not only do they observe a pre-interpreted reality, but their forms of thought are also derived from common sense. Schutz thus viewed reality as a commonly shared taken-for-granted lived world and experience. He recognised that there is no one reality, but multiple realities that are embedded in particular contexts. These contexts are further distinguished into 'provinces of meaning' with each composing an own set of meanings and relevances for action. From this perspective, learners draw on cultural capital derived from classroom settings and their *social habitus*<sup>11</sup> (Bourdieu 1993) to make meaning in interpretive learning experiences in the outdoors. The meanings derived from these experiences appear as "... finite provinces of meaning" (Berger and Luckmann 1966:24) that reflect knowledge based on different subjects taught in the school and associated 'culturally embedded' knowledge.

Within this theoretical framing of interpretation as educational process, learners are engaged in meaning making. They socially construct knowledge through interaction with others, the environment and through the use of original objects. As they interact, shifts may occur from the classroom to outdoor experiences to produce a change in their consciousness. In this

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<sup>11</sup> The concept of *social habitus* is used here to refer to a set of dispositions, lifestyles and values and expectations of particular social groups (Bourdieu 1993). A particular *habitus* is developed through culture and experience, it is linked to capital in that some *habitus* (for example, intelligence) act as multipliers of various kinds of capital (*ibid.*).

framing, environmental learning happens because of the inter-subjective nature of the social life that occurs within school settings and the social *habitus*.

Symbolic interactionism as a social theory is associated with the early twentieth-century social psychologist George Herbert Mead. As a theory, it was popularised in the 1940s and 1950s by Herbert Blumer (see Woods 1992, Plummer 1996, Charon 2001). According to Woods (1992:338), Herbert Blumer put forward three central principles that underpin symbolic interactionism: human beings act on the basis of the meanings that things have for them; this ascription of meaning to objects through symbols is a continuous process and meaning ascription is a product of social interaction in human society. Applied as an educational perspective, symbolic interactionism is relevant to the concerns of understanding interpretive learning experiences in school contexts. Drawing on Woods (1992), Plummer (1996) and Charon (2001) I can argue that ascribing meaning in outdoor interpretive experiences in schools is an interactive process in which a number of symbols are at play. These symbols include objects being interpreted, interpretive texts and language used by teachers. The symbols assume their meaning according to the ways in which learners and teachers construct them in joint actions. Thus interpretive experiences of learners within an interpretation resource in a school are constituted through the symbolic interactions of the 'self' and 'others' where the self is a process built out of encounters and endowed with shifting meanings. The social groups of learners and teachers in these settings are ceaselessly involved in negotiating meaning by interacting with the environment. I will now turn to the relevance of a Vygotskian social constructivist theory (Vygotsky 1981) as a way of further exploring the framing of interpretation as a process of socially constructing meaning.

Vygotskian social constructivist theory provides perspective on knowledge and learning and describes how learners come to know (Ball 2000, see also Lee 2000). Within this theoretical framework, knowledge is temporary, developmental, internally constructed and socially and culturally mediated. According to Wertsch (1985; see also Finlay and Faith, in Shor and Freire 1987; Ball, Wells, Smagorinsky and O'Donnel-Allen, in Lee and Smagorinsky 2000), three themes underlie a Vygotskian social constructivist theoretical perspective. First, individual internal activity can be understood as it is situated in a broader social, historical, and

developmental context. This notion seems especially important when considering the role of interpretation resources and materials in fostering critical environmental literacy and action competence. In this theoretical framing, environmental learning is inherently social, and historical and contextual, even when the interpreter is not physically present. Second, environmental learning is facilitated through the assistance of more knowledgeable members of the community. Here, I introduce the concept of ‘zone of proximal development’ that Vygotsky (1978:86) defined as

... [The] distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers.

Consequently, the development of critical environmental literacy and action competence in learners through interpretation resources can be altered by mediated interactions with more knowledgeable teachers and peers, within their zone of proximal development. This may be in the form of inputs from classroom teachings, from theoretical readings or from discussions and interactions with fellow learners. Therefore, interpretation resources and materials would create social contexts for environmental learning through a mobilisation of cultural capital. Such environmental learning (which involves encounters in the outdoors) is often activity-based. It occurs with the support of teachers as more knowledgeable ‘others’ and with peers, as captured here:

In joint activity, [learners] contribute to the solution of emergent problems and difficulties according to their current ability to do so; at the same time, they provide support and assistance for each other in the interests of achieving the goals of their activity as these emerge in the situation (Wells 2000:56).

Environmental knowledge is not simply handed down from teacher to learner; rather appropriation of meaning is reciprocal and environmental learning occurs within a mutually constructive process. The third theme that underlies the Vygotskian social constructivist theoretical perspective relates to the concept of ‘mediation’ that Moll (2000) argued to be a central tenet of Vygotsky’s theorising. According to Vygotsky (1981), signs and tools mediate human action and the use of primary psychological tools such as language within a socio-cultural environment predominates the way learners make meaning. In the context of outdoor

interpretive settings, learners interact with environments through mediational means that include interpretive materials, objects and language. This may result in learners gaining environmental literacy and competencies to take action (respond to environmental issues and risks). The use of language in mediation processes involves interplay between the learner and interpreter (educator). In view of the fact that speech is also inscribed in the interpretive materials, language then becomes the primary medium for learning, meaning-making and cultural transmission and transformation (Lee and Smagorinsky 2000:2).

The degree to which an interpretive experience is perceptible, distinct and formulated depends on the degree to which it is socially located (see Volosinov 1996). The immediate environmental situation (embedded in socio-historical contexts) and learner interactions often determine the form and style of interpretation. Each learner's inner world and thought has its stabilised cultural capital that comprises the knowledge learned in the classroom and in cultural (socio-historical) settings. When this cultural capital is mobilised either through interpretive materials or interpreter, the environmental message being communicated becomes a bridge between the learner and the interpreter or materials. It becomes a shared territory in which meaning may be constructed.

These theoretical perspectives provide insights, which may enhance the design of meaningful interpretive experiences in schools. In the next section I argue that these interpretive experiences could also involve a concern for critical reflection and action taking. A view of interpretation as a process of critical praxis is explored.

### *2.3.2.3 Interpretation as a process of critical praxis*

I have found Freirean pedagogical principles on critical praxis and dialogism (Shor and Freire 1987, Freire 1996) relevant to an understanding of interpretation as an environmental education process. I locate them in Paulo Freire's work on the study of education oriented to the world's oppressed classes (Freire 1972 and 1996). Drawing from this work, Grundy (1987, see also Fien 1993) summarised constitutive elements of critical praxis as a process of uniting action and reflection in a real world where meanings are socially constructed through social or cultural interactions (see sections 1.3.1 and 2.3.2.2 above). Freire (1996:15) called this process

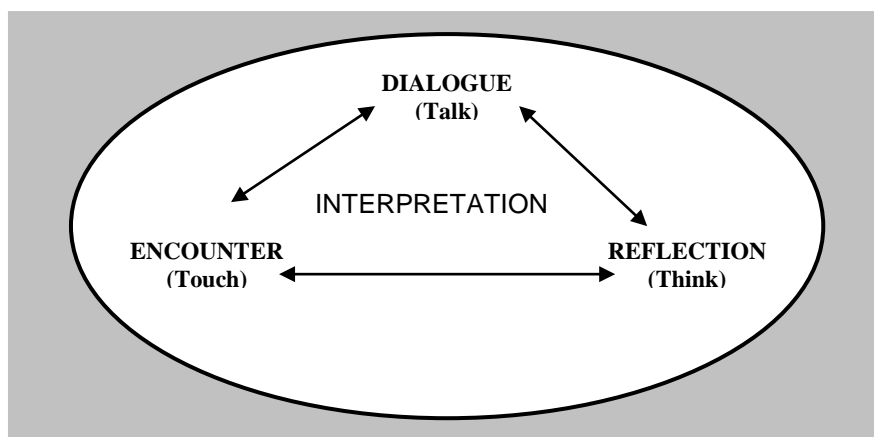
*conscientisation*, which implies "... learning to perceive social, political, and economic contradictions, and to take action against the oppressive elements of reality".

In the context of this study, interpretation as a process of critical praxis will entail the active engagement of learners through real encounters with objects in local interpretive settings as "... an educational means towards the goals of social transformation" (Fien 1994:48). Such active engagement presents opportunities for a dialogue between learners, educators and the real objects. As Freire (1996: 69) argued, "Dialogue is the encounter between [learners], mediated by the world, in order to name the world". It is the encounter in which the united reflection and action (praxis) of the learners are mobilised for social transformation.

As in Vygotskian social constructivism discussed in the previous section, Freirean pedagogical principles emphasise the importance of the interaction between people and cultural elements in moving from inner speech to written language. These principles reflect a form of critical theory (see section 3.2.2), the philosophy that critical pedagogy takes as its point of reference. Critical theory is a reflection on the relation between individual and learner. Its central anthropological contention is that everyone has a real interest in a rational and reasonably organised society. Critical reflection cannot be learned through mechanical transference, from a speaking, active interpreter or a mediating sign that 'deposits' knowledge into subdued learners (Freire 1998), as often happens in many of the non-formal interpretive centres (see Ham 1992, Hooper-Greenhill 1994). Limiting learning to the meaning revelation of an object (Tilden 1977) can be a mind-narrowing process (Freire 1998). While learners are enabled to interact with more culturally knowledgeable persons, objects and interpretive materials to make meaning (see section 2.3.2.3), in many cases, they are not challenged to engage critically with the interpretation acts, or to engage in action which will result in further meaning-making processes. To some extent, this reduces the educational potential of interpretation to the transfer of the concept of the object to learners who are not required to critically reflect on it or to engage in further meaning-making processes further through action taking (critical praxis). I now apply the Freirean pedagogical principle of "dialogism" (Shor and Freire 1987:99) to provide some insights into interpretation as a process of knowing through critical praxis.

According to Freire (1985:55), an act of knowing is “... a synthesis between the educator’s maximally systematised knowing and the learner’s minimally systematised knowing”. This synthesis, he claimed, is achieved through dialogue. By applying dialogue as a methodology of interpretation, I argue that teachers may together with learners reflect on what they know and do not know through encounters with real objects in the outdoors. Depending on their levels of critical environmental consciousness (see section 2.3.1.1), they may act critically to transform reality through problem posing. Such problem posing involves challenge, discontinuity and change that can lead to critical environmental education processes. Interpretation as an act to mobilise learners’ cultural capital through educational and interpretive experiences within school grounds may thus become “... a problem posing illumination which criticises itself and challenges [learners’] thinking rather than a delivery of pre-packaged information passed out verbally” (Shor and Freire 1987:40).

To be acts of knowing, educational and interpretive experiences require a relationship of authentic dialogue among teachers and learners since “... true dialogue unites subjects together in the cognition of a knowable object, which mediates between them” (Shor and Freire 1987:99). In this regard, environmental learning in the outdoors can be an opportunity for learners to know that interpretive experiences are human acts that can enable reflection and action. Hence interpretation as a process of critical praxis involves dialectical moments that involve action, reflection upon action and new action (see Figure 2.1 below).



**Figure 2.1** Model of environmental learning processes

Source: O’Donoghue and Janse van Rensburg (1995:7).

As Figure 2.1 above illustrates, environmental learning in the outdoors involves interacting processes of reflection, encounter, and dialogue within a context of action (O'Donoghue and Janse van Rensburg 1995, see also Lotz-Sisitka 2001a). As Freire (1998: 64) put it: "... reflection-true-reflection leads to action". On the other hand, when the situation calls for action, that action will constitute an authentic praxis only if its consequences become the object of critical reflection".

As an event calling forth the critical reflection of learners and teachers, interpretation as a knowing process can provide the dynamics required for transforming reality. For example, when learners encounter an object in the outdoors mediated by interpretive signage, a process of knowing is initiated. The interpretive signage here will represent what Freire (1985) called an 'existential situation' to the learners. The learners first gain distance from the interpretive signage that mediates between them and the interpreted object. Critical processes of knowing are then engaged as the learners' experience of the situation in the environmental setting is mobilised. However, these acts of knowing may only be reached if the interpretive signage and interactions with educator (or peers) are able to engage the learners in the "... constant problematising of their existential situations" (Freire 1985:56). Developing such engaging interpretive materials and interactions, should thus be approached through the learners' understanding of the relationship between language and society, between the use of words and the structure and history of their reality. In this study, the development of interpretation resources and materials has therefore employed themes that focus on the environment. These themes were chosen by the teachers within their teaching subjects and their experiences of learners' realities, with a view to creating opportunities for learners to engage in critical educational processes (see sections 5.2.3, 5.3.3). The intention is to enable learners to adopt a critical view, thereby engaging an attitude of questioning, doubt, investigation and a will to illuminate and challenge the environment in which they exist.

### **2.3.3 Environmental interpretation and education processes**

Many writers (Aldridge 1989, Mullins 1984, Ballantyne and Uzzell 1994, Howard 1998) have

contrasted and compared environmental interpretation with environmental education (see also section 1.3). Some of them (for example, Aldridge 1989) have even argued that, apart from their objectives, the two areas have little in common. Although it is possible to locate their differences in terms of type of audiences, purpose of activities and approaches (Ballantyne and Uzzell 1994; see also Table 2.1 below), there remains a lot in common (Sharpe 1992).

**Table 2.1** Perceived differences between interpretation and environmental education

	<b>Environmental interpretation</b>	<b>Environmental education</b>
<b>Practitioners</b>	Interpreters, exhibition designers, scriptwriters, volunteers, education officers, rangers, interpretive trainers, archaeologists, academics.	Schoolteachers, education officers, and teacher educators.
<b>Content</b>	Information about people, places, activities and objects, interpretation of meanings.	Understanding of environmental concepts, acquisition of environmental skills, integration of environmental knowledge, attitudes and behaviour.
<b>Audience</b>	Recreational volunteers – tourists, residents, wide age range.	Educational conscripts – schoolchildren, student groups, adult/continuing groups.
<b>Purpose</b>	Recreation/entertainment, profit, site conservation.	Develop environmental literacy; fulfil curriculum.
<b>Educational settings</b>	Interpretive centres, historic houses, archaeological sites, urban and countryside sites, national parks.	Schools, field study centres, interpretive centres.
<b>Time</b>	Whenever people engage in recreational or tourism activity, limited time involvement.	Timetabled periods, school trips, preparation and follow-up to visit.
<b>Approaches</b>	Provocation, didactic and informal education multi-media techniques.	Instruction, heuristic and didactic techniques.

**Source:** Adapted from Ballantyne and Uzzell (1994: 114)

Arguments that emphasise differences between environmental interpretation and environmental education have continued to present them as two separate fields. They have also, to some extent, contributed to the often-ambiguous relationship between interpretation and environmental education (Sharpe 1982, Milne 1996). Oppositional reasoning used to describe the differences between interpretation and environmental education (see Table 2.1

above) has also tended to undermine the potential role of interpretation in mobilising learners' cultural capital for critical environmental literacy (see Curthoys and Cuthbertson 2002). As Sharpe (1982:25) pointed out: "... separating interpretation from environmental education processes is difficult" as both draw on educational perspectives associated with how people socially construct meanings during interpretive experiences (see section 2.3.2). However, little has been done to explore interpretation and environmental education in relation to their purpose in fostering environmental learning processes.

Ballantyne (1998) has argued for interpreters and environmental educators to perceive and act on their commonalities rather than their differences. This collaborative research project, undertaken with teachers, has focused on the relationship between interpretation and its potential to enable critical environmental education processes in schools (see section 2.3). I suggest that interpretation and environmental education processes be viewed as reciprocally necessary aspects of enabling critical environmental literacy and action competence. In this view, it is important to understand interpretation and environmental education processes as practices enacted by practitioners (teachers and non-formal educators) who act in contexts that are historically and socially constituted.

To embed this reciprocal perspective on interpretation and environmental education practice in this study, I apply the term *environmental interpretation and education processes* (EIE). Subsequently, 'environmental interpretation and education processes' become educational activities that reveal meanings and relationships through the use of real objects and interpretive materials to enable learners critically reflect and act on those meanings in order to transform reality through problem-solving with assistance from teachers (Tilden 1957, Freire 1998, see also Curthoys and Cuthbertson 2002). I may accordingly describe 'environmental interpretation and education processes' *as acts of mobilising learners' cultural capital in a local interpretive setting in order to engage them in investigation, social critique, information finding, action taking and reporting to participate in social change.*

Therefore, through interpretation, learners' cultural capital (acquired in the classroom and in socio-cultural settings) can be mobilised through encounters with real objects in the outdoors to

engage them further in socially critical ‘environmental learning’ experiences. When the learners are encouraged to reflect on and take action towards social change as a result of interpretive learning experiences, socially critical environmental education processes may be initiated. Thus interpretive messages or experiences have the potential to arouse interest in the learners towards solving environment problems and issues that face their local community. This has been a key focus of the work in this participatory action research study (see sections 4.5, 5.2, 5.3). This can be done by enabling the development of an informed concern for the environment, a sensitive environmental ethic and the skills for participating in environmental protection and improvement in learners (see section 2.3.1).

My focus on environmental interpretation and education processes in schools is therefore an attempt to respond to some of the pedagogical and curriculum tensions between schooling and the enhancement of socially critical environmental education processes (see section 2.3.1). However, this focus raises some questions relating to interpretation as an environmental education process as discussed in section 2.3.1. Does interpretation have a role to play in preparing learners to address environmental issues facing their local community? Can interpretation be used to enhance a school’s environmental practices and support socially critical environmental education processes? What role can teachers play in enabling socially critical environmental processes through interpretation? These questions are addressed in this study by exploring a perspective of interpretation as an environmental education process through a critically reflective inquiry process with teachers (see sections 4.4, 6.2). This will, to some extent, bridge the gap that exists between interpretation and environmental education processes (Ballantyne 1998). It will also address the limitations of oppositional reasoning commonly used to describe the differences between interpretation and environmental education. New partnerships between schools and non-formal educators will emerge that will have implications for the way interpretation and environmental education processes are considered in school contexts (see section 6.6).

Globally, botanic gardens have started forming partnerships with schools through a variety of environmental and educational programmes that involve interpretation (Ashwell 1998). The role and relevancy of global botanic gardens in the provision of interpretation and

environmental education is highlighted in the next section.

## **2.4 INTERPRETATION AND ENVIRONMENTAL EDUCATION IN BOTANIC GARDENS**

There are over 1800 botanic gardens and arboreta in 148 countries that receive more than 150 million visitors annually and maintain more than 4 million living plant collections (Wyse Jackson and Sutherland 2000). Unfortunately, 60 % of these botanic gardens are situated in temperate regions of North America and Europe. It is estimated that Africa, one of the high biodiversity areas, has only 98 botanic gardens and most of them are neglected and under-utilised. There is cause for optimism as many new botanic gardens are now being created and environmental education is becoming a priority for them. With rapid urbanisation in Africa, more of the population is now moving into urban environments and botanic gardens may represent for them an important opportunity to visit a natural or semi-natural setting. Raising the profile of environmental education processes in these urban-situated botanic gardens would therefore be a worthwhile initiative. Currently, botanic gardens are re-orienting their interpretation and environmental education programmes to incorporate a vision of a more socially critical orientation (Atiti 2001d, BGCI 2000). These programmes are addressing various environmental issues through a number of approaches (see Wyse Jackson and Sutherland 2000) that draw on both the socially critical goals of environmental education processes and interpretation.

### **2.4.1 Critical environmental interpretation and education processes**

Through environmental interpretation and education processes (see section 2.3.3), botanic gardens are communicating the critical need to use plant resources sustainably (BGCI 1998). This is being done by addressing development issues such as the relationship between people and plants, the role of science in plant conservation, the value of biodiversity, sustainable living and the invasive threat from alien plants (BGCI 1994, Atiti 2001b). Educators in botanic gardens are promoting environmental 'sustainability' by working with communities to understand the vital links between human survival and sustainable development (Wyse Jackson

and Sutherland 2000). I have used the term ‘sustainability’ here to refer to the social and ecological processes for sustaining human interaction with plants in healthy, just and equitable environments (O’Donoghue 2000). Many botanic garden educators and interpreters are “ ... reconstructing and representing nature in more sustainable ways by using plants to raise development and environmental issues” (Huckle 2000:20) through a variety of approaches that include guided tours, outreach programmes, events, workshops and a variety of interpretive materials (see Socolofsky 1995, Mintz, 1999) that engage learners in critical environmental interpretation and education processes. In this way, botanic gardens are actively engaging learners in debate and change through participatory and reflective processes; they are no longer places that practice “... a culture of education that is uncritical and complacent to their social vision” (Sanders 1998:33). The majority of the world’s botanic gardens are found in urban areas and are therefore easily accessible as ‘outdoor classrooms’ where learners can contribute to, and participate in socially critical environmental education processes. They are no longer quiet, safe havens for botanists, as they used to be perceived. Through critical environmental interpretation and education processes, vigorous outreach and partnerships with other organisations, including schools, they are beginning help shape the future well being of the planet for generations to come. Willison (1993:33) has argued that by providing support, training, access to information and a forum where ideas and solutions can be discussed, botanic gardens can empower and enlighten teachers to become involved in the process of making decisions to promote environmental sustainability.

#### **2.4.2 Linking interests of schools and botanic gardens**

Botanic gardens have dynamic learning-centred environments and foundations in inquiry and experiential learning (Reichel 1995:37). Their potential to enhance teacher education programmes that involve a deeper understanding of environmental education processes as an integral part of the school curriculum is immense. Many African botanic gardens have started providing teachers with professional development experiences that support, extend, reinforce and enliven the quality of environmental education processes (see Atiti 1998, Symonds 2000). They are involved in the enhancement of professional competencies of teachers through workshops that move away from the technocratic view of environmental education processes

to a socially critical one (Symonds 2000). During such workshops, "... issues relevant to the learners' daily lives are addressed and the teachers are encouraged to look beyond the confines of the classroom for teaching and learning resources" (*ibid*: 25). Apart from inviting schools to their premises, botanic garden educators are also reaching out to schools and communities that cannot visit them. In some cases, schools are being helped to develop their own gardens for environmental learning (see Ashwell 1998). Such gardens, though they lack the characteristics of a modern botanic garden (see Wyse Jackson and Sutherland 2000), can serve as community gardens due to their educational function (Atiti 2001c).

According to Wyse Jackson and Sutherland (2000:3), community gardens are the fastest growing sector in the botanic garden world. These gardens are, in most cases, designed to serve specific needs in local communities and are managed by the local communities. Examples of community gardens in Africa would include sacred groves, medicinal gardens and themed school gardens. In some Kenyan communities, specific sacred groves are still preserved for cultural reasons (Atiti 2001a and 2001c). Stocker and Barnett (1998, see also Huckle 2000) have argued that community-managed gardens, including school gardens, can contribute to sustainability by producing food (ecological sustainability), creating community places for social and cultural interaction (social sustainability) and providing sites for learning (economic sustainability). Through community gardens, values of sustainability that include those of social responsibility, concern for all life forms, living in harmony with nature and commitment to work with and for others could be enhanced (Tilbury 1995, Fien and Tilbury 1998 and 2002). However, botanic garden educators are faced with the challenge of playing a major role in the social construction of sustainable natures and engaging with communities seeking to reconstruct nature in more sustainable forms (Huckle 2000:24).

Worldwide, the quest to improve school grounds is creating a growing demand for support of a kind that can easily be provided by botanic gardens. As Cox (1993:81) reiterated, botanic garden educators are in a good position to provide advocacy for educational ideas that can be integrated with other needs in the school grounds. It has been found that school grounds play an important role in providing teachers and learners with ongoing learning opportunities, including materials for study and projects within school grounds (Ashwell 1998, Willison

1993). Fien (1997:24) has argued that school grounds can provide wonderful experiential teaching resources and learning experiences contributing to learners' confidence and self-esteem, and their sense of oneness with nature. However, this study argues that such experiences should address wider social and economic contexts that can direct learners towards divergent views in which the links between nature, the learner and society are appreciated. Working with schools to develop their grounds for such purposes is thus a worthwhile endeavour for botanic garden staff.

### **2.4.3 NMK Nairobi Botanic Garden**

The National Museums of Kenya (NMK) Nairobi Botanic Garden has started working with teachers to develop their school grounds for environmental learning. This study will therefore draw on the contribution of the NMK Nairobi Botanic Garden towards the development of materials for environmental interpretation and education processes with a focus on plants. The NMK botanic garden has joined a growing worldwide movement in making environmental interpretation and education processes accessible to a wider audience (Atiti 1998:29). Since 1997, the Garden has been providing environmental education processes to school groups based on an education policy that I developed according to a kind of open curriculum framework (see Atiti 1996). Recently, the Botanic Gardens International Conservation (BGCI 2002 in press) has developed draft guidelines for a socially critical orientation to environmental education processes in which principles of good practice in interpretive materials development of have been highlighted. Some of these principles will be used to inform the development interpretive materials in schools by addressing social, political, biophysical and economic issues related to plants in school grounds in such a way as to encourage learners to think about a sustainable environmental future. I will now briefly examine the context in which interpretation resources and materials were developed in schools with teachers.

## **2.5 THE CONTEXT OF CHANGE**

There appears to be a perennial lack of participation by teachers in the development of interpretive materials in the non-formal education sector in Kenya. This reflects an assumption

that teachers are practitioners and are only required to put into practice what has already been developed by others elsewhere (Robottom 1987, Winberg and Kerfoot 1997). Materials development processes in the non-formal education sector are generally of a deterministic and technicist nature where the developers are the creators of materials and teachers are viewed as technicians who put the materials to use in schools (Lotz 1996). According to Robottom (1987:93) institutionalised language in materials development reflects an authoritative stance that leaves little room to draw on the theory and practice of teachers. The teachers have no say on whether the materials are appropriate for their contexts. Learning support materials (including interpretive materials) developed in this way in both the formal and non-formal education sectors reflect a managerial-hierarchical outlook, creating a hierarchy of ‘developers’ and ‘technicians’. This generally follows a top-down approach that uses research, develop, disseminate and adopt (RDDA) strategies (see O’Donoghue and McNaught 1991).

### **2.5.1 Teacher-centred approaches to materials development**

According to Cornbleth (1990), a technocratic approach to materials development decontextualises environmental learning activities both conceptually and operationally. Conceptually, they separate environmental learning activities as a product from the practice of developing materials that support them and, operationally, the materials treat environmental learning activities as if they were independent of their location in an education system. A change from top-down and centre-out strategies towards participatory approaches to environmental education resource materials development has been recommended (O’Donoghue and Taylor 1988, Lotz 1996). For example, O’Donoghue and Taylor (1988) recommended a collaborative network of materials developers and Lotz (1996) recommended localised use and attention to the conditions for participatory work. It is in the context of these trends that this study was undertaken to review and develop interpretation resources and materials with teachers to foster environmental learning in two Kenyan schools. In order to enable participatory materials development work two conditions are necessary. First, as Huckle (1996) has argued, teachers should be viewed as “transformative intellectuals” (Giroux and McClaren 1986:215). Second, contextualisation of the curriculum through critical approaches to materials development in schools is preferred (Grundy 1987, Cornbleth 1990). As already

pointed out (see section 2.3.1), introducing critical education perspectives in schools can create teaching and curriculum tensions as it challenges dominant conceptions regarding the organisation and transmission of knowledge (Robottom 1987). In the context of this study, curriculum is viewed in the interpretive settings within school grounds, as *an ongoing social process* (Cornbleth 1990). This process comprises the interactions of learners, teachers, cultural capital and the symbols and signs (interpretive materials) in the school grounds. Curriculum then becomes the total sum of environmental learning experiences. The types of interpretation resources and materials prepared for use in the school grounds influence these learning experiences and may assist in contextualising dimensions of the school grounds.

### **2.5.2 Enhancing professional competencies of teachers**

In order to reconstruct schools as “learning communities” (Carr and Kemmis 1986:147), participatory action research may be used to address the dilemma of introducing a critical education perspective in schools (see section 2.3.1). Through this form of educational inquiry, teachers are encouraged to investigate their own practice in order to improve it (see section 3.2.3). This entails improving an education practice *with* the teachers and not *for* them or by imposing *upon* them (Freire 1985). Freire (1985:16) argued for the importance of helping teachers help themselves by placing “... them in consciously critical confrontation with their own problems, to make them the agents of their own recuperation”. Using participatory action research as a form of inquiry into the review and development of interpretation resources and materials with teachers (see sections 3.3.2, 3.3.3) can raise the professional status of teachers (Robottom 1987) from that of technicians to reflective practitioners (see Schön 1983). In this study, I draw on a number of authors who have advocated the use of critical research-based approaches to teacher professional development (for example, Carr and Kemmis 1986, Robottom 1987, Popkewitz 1987, Kincheloe 1991, Stevenson 1995, Elliott 1997, Lotz and Robottom 1998). As I have argued elsewhere, participatory action research is a form of critical research that would enable teachers to develop new approaches to their practice, instead of creating solutions for them (see section 3.2.3).

The teacher-centred approach this study has assumed to the review and development of

interpretation resources and materials provides a good example of how to mediate the relationship of theory and practice (see Chapters 4 and 5). This requires an integration of theory and practice as "... reflective and practical moments in a dialectical process of reflection, enlightenment and political struggle" (Carr and Kemmis 1986:144) by teachers. This may enhance their professional competencies in research, reflective thinking and interpretation resource and materials development (see section 6.4)

### **2.5.3 Sharing 'interpretive capital' with teachers**

As I have already pointed out (see sections 1.2.1, 2.2.2), non-formal education organisations such as the National Museums of Kenya, Kenya Wildlife Service, Giraffe Centre and Wildlife Clubs of Kenya are reproductive sites of 'interpretive capital' (see also Figure 6.1). This study argues that sharing this interpretive capital or the "tools and skills of interpretation" (Uzzell 1989: 9) with teachers may enable a transformation of school grounds to sites for environmental interpretation and education processes (see section 2.3.3). I apply the notion *mobilising interpretive capital* to refer to this process of sharing of 'tools and skills' of interpretation with teachers (see also sections 1.2.1, 1.3.1). In collaboration with teachers, interpretive capital situated within non-formal education organisations and schools can be mobilised, circulated, reconstructed and made available for the development of interpretation resources and materials. *Mobilising interpretive capital* then becomes an engaging process between teachers and non-formal educators in which 'tools and skills of interpretation' are made available, socially constructed and shared. These are then drawn on for the transformation of school grounds and the teaching of critical environmental education processes in schools. This process requires the formation of partnerships between schools and non-formal education organisations and a consideration of school grounds as sites for collaborative inquiry (see section 6.2).

A re-conceptualisation of school grounds as sites for collaborative inquiry has its theoretical roots in the work of John Dewey, who emphasised the role of biophysical environments in shaping learning experiences (see Lundy and Kurth-Schai 1992). The experience-based biological underpinnings of his learning theory are relevant to environmental learning

processes in school grounds. During the last ten years, a global interest in the use of school grounds for environmental learning has emerged (see Lucas 1997). Lucas (*ibid.*) has outlined some of the benefits of using school grounds for outdoor environmental learning as documented in the Learning through Landscape (LTL) project in the United Kingdom. Transforming school grounds into interpretation resources may facilitate a realisation of similar benefits in Kenyan schools. This study is an attempt to actualise this potential.

The Kenya Organisation of Environmental Education (KOEE), a local NGO, recently introduced a programme for eco-schools<sup>12</sup> in Kenya (Otieno 2000). This is a membership programme that aims to enable schools to develop environmental policies that may guide environmental learning processes in schools (*ibid.*). It is anticipated that through the eco-school programme, schools may enhance environmental education processes as an integral part of their curriculum activities. Otieno (*ibid.*) outlines the benefits of an eco-school as increased environmental awareness; an improved school environment; involvement of the local community; pupil empowerment; financial savings and networking.

One of the two schools (Kenya High) that participated in this study is a member of the eco-school programme (see section 5.3). An eco-school committee at the school developed a plan of action in which a section of the school grounds was re-conceptualised as a nature trail and orchard. It was in its attempts to implement this plan of action that the school sought the support of NMK Nairobi Botanic Garden for the development of a nature trail in its grounds.

## 2.6 CONCLUSIONS

In this chapter, I have provided an overview of environmental education processes in Kenya by outlining how they have been historically constituted and are practised in the formal and non-formal education sector. I have considered the pedagogical implications of socially critical approaches to environmental education, and the potential of interpretation as an environmental education process. In doing this I have discussed the learning processes associated with interpretation, notably how meaning is socially constructed. I drew attention to the role of mediation in environmental education. I have noted the potential of interpretation resources

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<sup>12</sup> An eco-school programme is identified by seven key elements (Otieno 2000). These are: an eco-school committee, school environmental audits, a school plan of action, monitoring and evaluation of activities, curriculum work, informing and involving the school and the wider community and a school eco-code.

and materials to mediate and facilitate meaning-making in socio-historical contexts and foster critical praxis.

Thus, by drawing on different points of view, I have provided an overview of theoretical frameworks, which appear to be useful in exploring and an understanding of interpretation as an environmental education process. In particular, I have found the idea of ‘mobilising’ interpretive capital to be a potentially useful framework within which to involve teachers and partners in making interpretive capital (the tools and skills of interpretation) available in school contexts. I have argued that teacher participation in materials development (including interpretation resource and materials development) is essential for enabling interpretive capital to be used in curriculum processes that foster the development of critical environmental literacy and action competence.

This chapter forms the basis for the narrative of how I, together with teachers and other partners, was able to mobilise interpretive capital and develop interpretive materials and resources to foster critical environmental education processes in school contexts (see Chapters 4 and 5). The next chapter provides an overview of the research orientation and methods used in this process. As argued in this chapter, participatory action research has been viewed as an appropriate method of enabling teacher participation in social and educational change.

## CHAPTER 3 RESEARCH METHODOLOGY

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My invitation to those being examined to participate in the formulation, criticism and reformulation of research provided a direct challenge to the positivistic cult of the expert. At the same time, it provided me a sense of direction, an orientation that transformed our idea of research from a mere data gathering exercise into a consciousness-raising, transformative pedagogical technique. (Adapted from Freire 1972:135-7)

### 3.1 INTRODUCTION

I begin this chapter by citing a rephrased quote from a research methods paper, presented by Paulo Freire during a seminar on *Studies in Adult Education* in Dar-es-Salaam in 1972 to indicate the philosophical orientation adopted in this study. I discuss the strategic framework of the study with reference to the critical orientation that I adopted and the research method I used, in which I placed less emphasis on the ‘machinery’ of research techniques as alluded to this quotation. The methodological issues related to the planning and design of participatory action research within a critical orientation are highlighted (see section 3.2.3). I describe how I used participatory action research as a method of inquiry to help teachers and myself investigate our social and education practices in order to change some of them through praxis. Although my idea of the research was that it was less a matter of being a data gathering exercise, I have provided a detailed account of the research techniques that were employed in this study (see section 3.2.4).

I provide a detailed account of how I collaboratively reformulated the research with the teachers (whose practice was my focus). I have done this by outlining some of the research events that occurred within two phases of the study that also reflected two broad action research cycles (see section 3.3). By drawing on grounded theory, I have deliberated on how I made sense of the data I gathered. The data reflected multiple perspectives on the education practice we were examining (see section 3.4). Central to this is the issue of research rigour and validity, which I have discussed in the context of a participatory action research design. I end the chapter by pointing out how emerging findings and themes have been presented in the rest of this thesis.

## 3.2 THE UNDERLYING RESEARCH METHODOLOGY

Research methodology refers to the philosophical framework that guides any research (van Manen 1990, cited in Fien and Hillcoat 1996:31). It is the orientation within which one frames the research question and which guides the research goals and the data generation and analysis techniques. As Corney (1996) pointed out, it is important for one to consider an overall orientation and various approaches within the overall orientation, when clarifying a research topic or question to be investigated. I was able to make such considerations regarding my research design well before the data collection process commenced. This can be attributed to the effort I put into the development of my research proposal, the guidance I received from my mentors and exposure to relevant readings and orientations during a research methods course. I also spent some time examining different research orientations in my preliminary review of literature (for example, Popkewitz 1984, Fay 1987, Bassey 1995, Fien and Hillcoat 1996, Cohen *et al.* 2000). Although I started my data collection process with a predetermined research design within which I worked, I was aware that one "... need not draw only on one [orientation] or approach, but should be in a position to select what seems to be appropriate methods for the purpose" (Corney 1996:81).

### 3.2.1 Deciding on the research design

My focus in this study on the review and development of interpretation resources and materials as a response to curriculum and teaching constraints in Kenyan schools (see also section 2.2.2, 2.3.1) required a dialogic research design within which I could involve teachers actively in the research process (Lather 1986). My research goals, as outlined in my research proposal (see section 1.2), sought to involve teachers in mobilising interpretive capital for the development of interpretation resources and materials in their schools. This was to enable critical environmental education processes that might foster critical environmental literacy and action competence (see sections 1.3.1, 2.3.1). From the outset of this study, it became evident that I could not follow the traditional patterns commonly associated with a positivist approach as this approach generalises results from the specific to a wider context with a particular focus on ends and conclusions, rather than on processes (Carr and Kemmis 1986). Fien and Hillcoat

(1996:27) have argued that the research orientation one adopts eventually determines “... whether research assists in the maintenance of the *status quo* in society or helps to transform the dominant social world-view”. As a result, I decided to work within an orientation that would generate ‘understanding or knowledge’ of the situations I studied and at the same time generate ‘understanding or knowledge’ that would be useful to others in different situations. By ‘understanding or knowledge’ I refer to “... both the capacity to describe what is happening and the capacity to explain it: that is, construct a theory about why it is happening” (Cherry 1999: 61). I therefore found a critical orientation to the study appropriate as it could potentially facilitate the aforesaid intentions.

### **3.2.2 A critical orientation to the study**

A critical orientation entails a commitment to socially transformative research for the common good of individuals in society and as Fien and Hillcoat (1996:29) argue, it is “... grounded in a vision of social change and democratic values as it seeks to empower participants during the process of research”. As such, critical research is not “... just designed to explain or understand social reality but to change it” (Smith 1993:77). Although this emancipatory potential was not guaranteed at the outset of this critical research, teachers have been able to mobilise interpretive capital and have shown evidence of “... motivation needed to bring about desired changes” in their work contexts (Fien and Hillcoat 1996:29; see also section 4.3, 6.4.1). In this regard, they participated in mobilising the “tools and skills of interpretation” (Uzzell 1989:9) and drew on this capital to develop interpretation resources and materials that might enable critical and action-oriented environmental education processes in their schools (see sections 5.2 and 5.3).

I found this orientation to be relevant to this study since it aimed to integrate theory and practice by providing support for teachers who have been engaged in critical reflection and action (Carr and Kemmis 1986). Within a critical perspective, aspects of the context that influence or frustrate the attainment of critical environmental education goals in the two schools were identified (see sections 5.2.1, 5.3.1). However, it was not enough for us to only identify these constraints; we also acted towards changing some of them. Others occurred

within broader social structures over which we had little or no direct control. We were thus unable to effect changes at this level. With regard to review visits to the non-formal education organisations, I did not intend to be ‘critical’ in the sense of voicing disapproval of the way materials were developed and used there by school groups. Rather, it was an attempt to understand the socially and historically constituted contexts within which environmental interpretation and education processes take place (see sections 4.4, 4.5).

Throughout this study, I viewed teachers as professionals with the capacity to set and achieve their own goals, by encouraging them to find solutions to their problems (see sections 2.5.2, 6.4). In this respect, I regarded them as active generators of knowledge, capable of creating their own communities of competence. Knowledge that is democratically produced may enable teachers not to be dependent upon experts (Kincheloe 1991). By locating myself within a critical orientation, I became an ‘insider’ in the review and development of interpretation resources with the teachers whom I regarded as co-researchers. I was not the disinterested ‘objective’ researcher of natural science or the empathetic observer of interpretive science (see Carr and Kemmis 1986, Giroux 1988, Popkewitz 1984, 1987 and 1999), but an active participant in the research.

Nevertheless, positioning this study within a critical orientation provided me with a number of problems. As a novice researcher, I had no inkling of what critical theory entailed before the start of this study. I therefore had to immerse myself in the literature, reading works by a number of critical theorists. While I had hoped to see some light at the end of the tunnel in terms of understanding, I only encountered confusion. The more I read the more I became confused and sometimes became embroiled in what one of my supervisors termed as “theoretical soup” (Lotz-Sisitka 2001 pers. comm.). It has now become clear to me that there was no one definitive perspective on a ‘critical theory’. What I discovered was a range of ‘critical theories’ reflecting the various perspectives of critical theorists (see Geuss 1981, Fay 1987, Bronner and Kellner 1996, Freire 1996, Giroux 1988, Maddock 1999, Popkewitz 1999).

I found Fay’s (1987:5) “critical social science” perspective on ‘critical theory’ relevant for this study. Fay (1987) emphasised that a fully developed critical theory would consist of four

primary theories. These are theories of *crisis*, *education*, *transformative action* and *false consciousness* (*ibid.*). In the context of this study, *a theory of crisis* spelt out the marginalisation of environmental education processes in Kenyan schools, coupled with a need to respond to environmental issues and risks (see section 2.2). In considering *a theory of education* (see section 2.3), I outlined the pedagogical implications of socially critical orientations to environmental learning (see section 2.3.1). I also considered the implications of social constructivist learning theories for interpretation and education processes (see section 2.3.2). Towards this end, I isolated school grounds as areas for change (see section 2.5.3). Plans on how to transform them into sites for critical environmental education processes were then formulated in *a theory of transformative action* (see sections 5.2.2, 5.3.2). Finally, I exposed as false the assumption that the understandings and competencies of teachers are incoherent with the goals of critical environmental education processes through *a theory of false consciousness* (see sections 2.2, 6.4). An example of such an understanding is the belief (amongst teachers and other educators) that only ‘experts’ from outside can bring about changes in their schools (see Wals and Albas 1997). In this regard, teachers have usually been implementers (sometimes viewed as ‘technicians’) of environmental learning support materials in their schools that have been developed elsewhere (Robottom 1987, Lotz 1996).

On the basis of these four primary theories I have outlined above, Fay (1987:23) argued that a *critical social science* perspective is one that

... seeks a theory which will simultaneously *explain* the social world, *criticise* it, and *empower* its audience to overthrow it. Thus, such a theory needs not only to be able to reveal how a particular social order functions, but also to show the ways it is fundamentally unsatisfactory to those who live in it, and to do both of these things in a manner that it itself becomes the moving force helping to transform this order into something radically different.

Such a perspective on the review and development of interpretation resources and materials with teachers would thus, according to Fay (*ibid.*) be termed as *scientific*, *critical* and *practical* if it meets the stated requirements (see section 6.3.2). In order to meet them, I employed participatory action research as my research method of inquiry, which I will describe in the next section.

### 3.2.3 Participatory action research as method of inquiry

According to Tripp (1990, cited in Hillcoat 1996:151), participatory action research is the most effective form of critical research because it offers the opportunity to combine critical intellectual discourse with practical action. In other words, it seeks both research and action outcomes with the research outcome "... often in the form of an enriched understanding by those involved" (Fien and Hillcoat 1996:36). Carr and Kemmis (1986:162) defined participatory action research as

... a form of self-reflective inquiry undertaken by participants in social (including educational) settings in order to improve rationality and justice of their own social or educational practices, their understandings of these practices, and the situations in which these practices are carried out.

In this study, I viewed the education practice that we sought to improve as reflexive, "... to be understood *dialectically*" (Kemmis and Wilkinson 1999:31). That is, participants and their social settings, the objective (external world) and the subjective (internally interpreted), are seen as related aspects of educational practice and should be understood as reciprocally necessary aspects of practice (*ibid.*). Consequently, my purpose in choosing a participatory action research design was to enable a critical and praxiological examination of the relationship between the mobilising of interpretive capital (see section 2.5.3) and the transformation of school grounds for critical environmental education processes (see sections 5.2, 5.3). This inquiry occurred within the context and constraints of teaching in Kenyan schools (see section 2.2). It was not aimed to produce data and better theories about environmental interpretation and education processes or materials development processes. Rather, it was intended to produce a "... meta theoretical understanding supported by reflection and grounded in socio-historical context" (Kincheloe 1995:78) of the two schools I worked with. The design therefore provided me with a framework for engaging the participants in a critical process of challenging their and my current understanding of available interpretive capital and related critical environmental education processes.

Apart from being a process that can empower teachers to take social action for a better

environment, Robottom (1987:108) argued that participatory action research could be a professional development medium for enabling teachers to undertake a critical analysis of theories, practices and settings (see section 6.4). Teacher participants (see sections 5.2.1.1, 5.3.1.1) were able to utilise theory and practice to mobilise interpretive capital to develop interpretation resources and materials that may enable critical environmental education processes in their schools (see sections 5.2.4, 5.3.4). To some extent, they were empowered to take social action for a better environment through this process (see section 6.4).

To employ a research method effectively, Hillcoat (1996:152) pointed out that it is important for one "... to be aware of, and adjust for, its limitations". When choosing participatory action research as my method of research, I recognised that it has problems and is not a panacea for social and environmental justice (see also section 6.3.2). Its management, as Hillcoat (*ibid.*) further argued, can present dilemmas for a critical researcher, particularly regarding issues of incompatibility between expert and practical knowledge and the role of the researcher. The study brought together a mixture of participants and informants with different orientations to knowledge. As the main researcher, I was interested in the theoretical aspects of environmental interpretation and education processes. Conversely, the teachers were concerned with practical knowledge on how to implement their school curriculum through the use of the interpretation resources and materials that were to be developed.

Notably, the interpretive capital that we mobilised through interactions with non-formal educators was at times different from the practical knowledge held by the teachers. Attempts to link them into a single process sometimes produced disharmony (see section 4.3). I managed to overcome this problem by enabling teachers to contribute actively to the knowledge-generation process (see section 4.3.3) and also by integrating practical and theoretical knowledge that was relevant to the transformation of school grounds (see section 4.6.2). I respected and utilised the expertise and skills of the teachers and as much as possible avoided imposing too much expert knowledge, although it was necessary to draw on scientific knowledge at times (see sections 5.2.2, 5.3.2). The role I took in this participatory action research at times placed me in a position of advantage. This was due to the 'expert' knowledge and skills I had on action research and environmental interpretation and education processes.

Initially, the teachers saw me as a person with power, influence, a new vocabulary and status (see section 5.3.2.1). Overcoming this problem was never easy, but I addressed it by adopting a democratic leadership style as suggested by Nichols and Jenkinson (1991, cited in Hillcoat 1996:155), and mediated and facilitated the interactions. In this position, I separated myself from the other participants to take on different roles by shifting my role as a researcher between that of an observer, interviewer, facilitator and participant (see sections 3.2.4.6, 4.3). Nevertheless, when taking on these different roles, I was careful to involve the teachers as equal collaborators (see section 3.3.1.3, 5.2.1, 5.3.1).

### *3.2.3.1 Doing Participatory action research within a collaborative framework*

Kemmis and Wilkinson (1999:22) have argued that participatory action research is “... best conceptualised in collaborative terms”. This is because it is a social and educational process directed towards studying, reframing and reconstructing practices that are by their very nature social (*ibid.*). Prior to this study, I had been working with one of the schools (see section 5.3) through the auspices of NMK Nairobi Botanic Garden (see section 2.4.3) towards the creation of a nature trail in its grounds. The second school sought my help in creating a ‘school botanic garden’ at the time I was designing this study (see section 3.3.1.1). In both cases, I was not the one who initiated the idea of developing interpretation resources on their school grounds. Nevertheless, I later re-conceptualised the idea of developing interpretation resources with the teachers within a collaborative participatory action research framework to cater for my research ‘agenda’. From the start, it was perceptible that this collaborative participatory action research would fulfil three ‘agendas’: schools were to benefit from the use of transformed school grounds for environmental learning (see section 5.2.4), NMK was to benefit from the outreach education programme that was conceived and I was to realise my academic aims at Rhodes University. Perhaps one of the challenges I faced as the main player in this triumvirate was ensuring that all players including myself realised their goals.

By drawing on other features of participatory action research that were identified by Kemmis and Wilkinson<sup>13</sup> (1999, see also Kemmis and McTaggart 2000) I enabled meaningful social interactions between teachers and non-formal educators (see sections 4.2, 4.3,4.4). Through the interactions (see section 3.3.2), interpretive capital was mobilised and later drawn on for

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<sup>13</sup> According to Kemmis and Wilkinson (1999), participatory action research is a social process, participatory, practical and collaborative, emancipatory, critical and recursive. They found these to be the central features of participatory action research apart from the self-reflective spiral (see section 3.2.3.2).

interpretation acts in schools. Due to its participatory and emancipatory intent, participatory action research enabled me to engage teachers in examining their understandings, skills and values in the development of interpretation resources and materials. This was achieved without doing research ‘on’ them, but by researching ‘with’ them (see also section 2.5.2). I also explored with the teachers ways in which environmental education practices in schools and the non-formal education sector are shaped and constrained by wider social structures (see sections 4.4, 5.2.1, 5.3.1). We deliberated on how teachers may reduce the influence of those constraints on their practice. Suggestions were made on how best they might work within the constraints and to improve environmental education processes in the settings that prevailed (see sections 5.2.2.1, 5.3.2.1). In essence, participatory action research aimed at helping the teachers to address some of the teaching and curriculum constraints that impede the realisation of critical environmental education processes in their schools.

Eventually, what began as a one-off project with two schools turned into a reflexive process of learning by doing and learning with teachers by changing the ways in which they used their school grounds for environmental learning and also the way materials were developed (see sections 5.2.3, 5.2.4). It is this transformative intention of participatory action research that distinguishes it from other forms of educational inquiry (Elliot 1997).

### *3.2.3.2 The cyclical nature of participatory action research*

Participatory action research involves a spiral of self-reflective cycles of “... planning a change, acting and observing the process and consequences of the change, reflecting on these processes, and then re-planning” (Kemmis and Wilkinson 1999:21). The action research spiral begins when participants decide to address problems that affect them. By consulting, discussing and negotiating with teachers (see section 3.3.1), we identified and isolated a problem for study as outlined in the previous section. We then worked to understand the problem, explored the opportunities for taking action and also identified the potential difficulties that we were likely to encounter in our work contexts. As we re-conceptualised the development of interpretation resources and materials within a participatory action research framework, we entered the first cycle of the spiral (see sections 3.3.2, 4.1). We formulated plans on how to mobilise interpretive capital within the non-formal education sector towards

the development of interpretation resources and materials in schools. These plans were acted upon and observations on their outcomes made. We then reflected on the processes to understand the strengths and weaknesses of the plans. New plans were then reformulated which took us into the second cycle and the spiral continued (see sections 3.3.3, 5.1).

Throughout these cycles, we reflected upon our learning and how the research was progressing (for example, see section 4.3.3). In this way, we were able to incorporate new insights into our action strategies create new and better plans. Although described here in terms of a mechanical sequence of steps, the actual research events that unfolded did not follow this pattern. The cycles involved overlapping stages of planning, data collection and reflection on data. In my case it never progressed neatly from our initial question of review and development of interpretation resources and materials to the formulation of data collection, analysis and conclusion. However, of importance was that each of the steps outlined above in the spiral of self-reflection was undertaken collaboratively with the teachers. I observed that our mobilising of interpretive capital (see sections 4.3, 4.4) and materials development actions (see sections 5.2.3, 5.3.3) emerged in a constant cycle, one that always highlighted the ways in which we were partially correct, yet in continual need of revision, in our thoughts and actions (Noffke 1995). This cyclical process did not end like traditional notions of research where richer understandings (on materials development processes) may have been provided for others to implement (*ibid.*), rather it triggered an ongoing process of critical reflection on the ways in which interpretive capital may be mobilised towards transforming school grounds into sites for critical environmental education processes (see sections 5.2, 5.3, 6.2).

### **3.2.4 Research techniques and their application**

The research techniques I used most in this study were the three primary techniques for collecting data in critical research, as identified by Fien and Hillcoat (1996, see also Harding 1987). These are listening to informants, observing behaviour and studying documents (interpretive materials). Through these techniques, I generated 'text' that could be read to produce revealing understandings (Fien and Hillcoat 1996). When mobilising interpretive capital within the non-formal education sector, we reviewed textual interpretive materials that

represented historical data and also listened to the views of our informants on materials development actions (see sections 4.3, 4.4). I made observations on the behaviour of participants in different settings (for example, during workshops). When collecting data, I adopted a reflexive approach to the effects of my actions on the experiences of teachers during the research. My role in the generation of text was that (described by Bartlett 1989, cited in Fien and Hillcoat 1996:34) of a co-equal co-respondent participant in the research, responsible for action as much as any other participant in the research. I will now provide a brief account on the different research techniques I applied and illuminate their significance in the participatory action research process.

#### *3.2.4.1 Field notes and audiotape recording*

McKernan (1991) observed that participatory action research is field-based study that can make use of field notes. He went on to identify three types of field notes, including observational notes, procedural notes and conceptual notes (*ibid.*). I have referred to the latter as *conceptual memos* in this study (see section 3.4.1). During the study, I made observational notes that had a bearing upon the research events I experienced, in field notebooks (DS<sup>14</sup> 6). The teachers also kept their own notebooks although I never compared their observational field notes with mine when triangulating data sources (see section 3.4.2). I found it difficult to record lengthy conversations in long notes and in most cases I resorted to making short notes that made little sense to someone else and even myself after some time. To avoid losing the richness of the data in these notes, I immediately transcribed them into research journal notes (DS 21) as I have outlined in the next section. Rewriting them into my research journal enabled me to structure and manage the large amounts of observational field notes I generated in the study. It would have been very difficult to structure and file observational notes that were spread in numerous field notebooks (DS 6). I later transformed the journal notes into conceptual memos (DS 7, DS 20, DS 35, DS 40) during my first layer of data analysis (see section 3.4.1). Apart from field notes, I found it prudent to record observational notes during interviews and workshop sessions to supplement transcript summaries and workshop proceedings.

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<sup>14</sup> As a strategy for managing data (see section 3.4.3), I categorised data into sets (Data Sets). The data sets abbreviated here to DS, are the various sources of data from both phases of the study. I have attached an inventory of these sources in Appendix 1.

The difficulties that I experienced in recording my own conversations when I assumed the role of a 'participant-informant' at some stages in the study (see section 3.3.2.2) prompted me to purchase a tape recorder. Audiotape recording has been found useful for identifying broad patterns of verbal behaviour and the selection of episodes for more analysis (McKernan 1991:106). I audiotape recorded focus group meetings, semi-structured interviews and workshop sessions (DS 7, DS 20, DS 35). I later realised that transcribing such recordings would be a very lengthy and laborious process as I had a total of 41 audiotape recordings (DS 6) on 19 one-hour micro-cassettes. I decided to make summaries and episodic transcripts of these recordings that I have used as a basis for deepening data analysis through critical reflection (Elliott 1993) and also for verbatim quotations. The playing back of audiotapes after a research event revealed qualities that further illuminated my understanding of that particular research event. The use of audiotape recordings also provided me with some flexibility during research meetings, as I never became worried about missing important points. In most cases, I shared summaries that I derived from observational field notes and audiotape recordings with teachers as a strategy for validating data (see section 3.4.2).

#### *3.2.4.2 Keeping a research journal and diary*

In the context of this participatory action research, I distinguished between the use of a research journal (DS 21) and a research diary (DS 22 and DS 23). For me a *journal* became the detailed portrait of all the 140 research events (McNiff, Lomax and Whitehead 1995) that I undertook during the study. On the other hand, the *diary* was a systematic record that I kept on a daily basis. It contained factual information about events, dates for meetings and people involved, research schedules and my own reflections (*ibid.*). As a research technique, a diary can be a tool for self-development since its primary audience is the reflexive self (Elliott 1993). By reviewing entries over time I was able to observe changes in the way I responded and reacted to situations. My journal contained transcriptions of the field notes and my own reflective accounts that have provided richly descriptive data for this thesis. The purpose of including my own reflective accounts was to examine the research experience in order to understand it better by writing about it (see also section 6.3.1). This included my own tentative observations and interpretations of the research events. This confirms what O' Hanlon (1997:171) said of journals: "[They] can be used for reflection, or introspection and for

recording events and feelings”. The writing of the journal therefore enabled me to discover the many different perspectives of the materials development actions. It allowed me to record what was happening to us, the implications of the research events and how our practices were being influenced by the interpretive capital we had mobilised. On the other hand, I used the *diary* as a prompt to record short notes and ideas about the study for later reflection. In this way, it allowed me to store information without the distortion effects of memory and past recollections. I also recorded in it non-research events that had some links to my study and also expressed feelings that I could not make public to the teachers. During the times I felt lost and troubled by ‘turbulent waves’, (see section 1.4) my diary became a comforting companion. These were the times when I needed to discard feelings of despair like those I captured in the reflection that follows:

I was jolted today when the principal of the school told me that he was not willing to release the teachers for the workshop on 14 September. I had least expected this reaction. So what does an action researcher do? What intervention can succeed here? By attending the workshop, the teachers would miss lessons. But to the school principal, lessons should not be missed in favour of other activities (Diary, 10 September 2001).

By writing such feelings of despair in the diary I engaged in a solitary dialogue that enabled me to understand the situation by distancing myself from it in order to interrogate it. I found such reflective accounts restorative, as in this case, when I was later able to engage with the principal and discuss his negative response. I was then able to understand why he responded in that manner.

The style one adopts when writing a research journal or diary will determine the level of reflection. O’Hanlon (1997) identified four modes of journal writing that refer to ways of thinking and reflection as report writing, interpretive writing, deliberative writing and integrated writing. Although my writing reflected all these modes, deliberative writing that includes both reporting and interpretation was the most common in the research journal. Integrated writing frequently occurred in the research diary. According to O’Hanlon (*ibid.*), integrated writing includes reporting a research event, interpreting it and then deliberating on it as illustrated in this diary entry:

I had planned to discuss the proposal or rather plans for the school project as an evaluative process. We never had time to do it. Instead we reviewed the material development phase and agreed on the materials to re-develop. ... There is still a lot of work that has not been done and I am wondering as to whether I will be able to wrap up my data collection phase in March as planned. I have just realised that the discussion we had at the site was actually an evaluative process. The idea of letting data speak for itself then becomes very important in an action research process. Being open-minded is the best strategy, but it's sometimes not easy (Diary, 5 February 2002).

Here I was reflecting on the unpredictable nature of action research events. After reporting the research event, I became reflexive in my writing and attempted to understand the situation from a critical, self-analytic point of view. I examined the need for open-mindedness and attempted to uncover the implications of action research for myself in this situation. Therefore, the keeping of a journal and a diary provided me with opportunities of distancing myself from action in order to investigate it. My journal entries became 'texts' (DS 7, DS 20, DS 35, DS 40) that I have subjected to different sorts of textual analysis (see section 3.4.1). Although I had encouraged teachers to keep reflective journals during the study, none of them provided evidence of having undertaken this and I have now realised that journal or diary writing is not a natural activity for many people (McNiff *et al.* 1996). Even I had problems in regularly writing in my journal and diary. Nonetheless, journal and diary writing for me became a kind of silent dialogue that I could make available to a wider audience when appropriate (O'Hanlon 1997). It was not a mere logging of research events, but a process of learning how to benefit from reflecting on, and understanding my practice. In writing, I articulated my own ideas on materials development, expressed them and later evaluated them with teachers. It then became a reflective practice as described by Schön (1983).

#### *3.2.4.3 Focus group interviews*

I used focus groups as a form of group interview but not in the sense of engaging in backwards and forward question and answer between interviewer and interviewee (Cohen *et al* 2000). We discussed key ideas associated with our research topic in an interactive manner, from which the agenda emerged. In this context, the focus groups brought teachers and non-formal educators together to discuss how interpretive capital could be mobilised to develop interpretation resources and materials that might enable critical environmental education processes in

schools. I relied a lot on this research technique for generating data (DS 7, AM<sup>15</sup> 7-11) during phase one of this study (see section 3.3.2.2). I also used it during our last materials development workshop (DS 16) when reflecting with teachers on the entire study and also during a research visit to Britain when exploring interpretation as an environmental education process (DS 35).

In this way, I was able to generate a lot of data within a very short time. Owing to the principle of collaborative intent (McNiff *et al.* 1996) in this participatory action study, the focus groups took the form of informal discussions. We used them to influence the non-formal educators to become partners in the transformation of school grounds for critical environmental education processes (see section 6.6). One challenge that I was faced with during focus group interviews was how to enable teachers to take more responsibility for the interactions. I did not want to direct the discussions to suit my own practice. At the same time, I did not want the discussions to be unfocused. I addressed these two issues by negotiating an outline of areas to probe in our planning meetings (see section 3.3.2.1). I also ensured that our meetings were open-ended, but to the point and I sometimes had to intervene in cases I thought we were off course. One major advantage of the use of focus groups was the ability to get richer feedback as a result of being able to probe issues in more depth. They also enhanced participation, built confidence and sustained interest amongst both participants and informants during the sessions (AM 14).

#### *3.2.4.4 Semi-structured interviews*

I held some semi-structured interviews (DS 3, DS 4) with three teachers who were not members of the research team to deepen the environmental education profiles of the two participating schools (AM 4, AM 5; see also sections 5.2.1, 5.3.1). I also had semi-structured interviews (DS 26) with two colleagues from South Africa while exploring perspectives of interpretation as an environmental education process within an African context. In all five interviews, I used a semi-structured format. I did this so as to create room for my interviewees to respond to both open and predetermined questions (Elliott 1993:141). I noted that beginning with the interviewees' free responses enabled them to develop confidence and also ensured a climate in which the interviewees felt comfortable to respond authentically to the questions that I raised (Lotz 1996:97). Establishing trust within the short duration of our sessions required me

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<sup>15</sup> AM refers to Analytic Memos. These were personal notes I wrote and used to systematise my thoughts on research actions during data analysis (see section 3.4.1; see also Appendix 1 for full list).

to listen to respondents with interest and empathy. Later, I shared with them summaries of the interviews for validation (see section 3.4.2) and further deepening of the issues captured. Since all the five semi-structured interviews formed supplementary data for this study, I did not endeavour to make full transcripts of them as I found interview summaries and transcriptions of some relevant portions to be sufficient.

#### *3.2.4.5 Workshops as a source of data*

The use of workshops as an in-service training strategy for teachers is widespread and Lotz (1996:93) has pointed out that when used as a research technique, workshops may provide "... a rich source of data in the form of observations, field notes and teachers' work". She further added that workshops could provide opportunities for critical praxis if well facilitated.

In my context, workshops provided me with useful forums in which we planned, reflected and even acted on our research intentions and activities (see section 4.3). In this way, they became mini-action research cycles within a broader one (see section 3.3.2.2). They also provided an important medium for enhancing teacher professional competencies in environmental interpretation and education processes (see sections 4.3, 6.4). In most cases, the workshops served as follow-ups to our focus group interviews (DS 14, DS 15). Notably, the workshops provided avenues for nurturing the non-formal/formal educator partnerships that emerged during this study (see sections 3.3.4, 6.6). This is a manifestation of catalytic validity (see section 3.4.2).

#### *3.2.4.6 Participant observations and use of checklists*

Participant observation has been defined by McKernan (1991:63) as the "... practice of doing research by joining in the life of the social group or institution that is being researched". As a participant observer I became involved in the lives of the teachers and non-formal educators in order to understand environmental interpretation and environmental education processes within their socially and historically constituted contexts. In the process, I was able to experience what it was like to be a participant in researching my own practice (as a non-formal educator) and those of my co-researchers. As a participatory action researcher, I was not always in a good position to systematically watch what others were doing. In most cases I was deeply

engaged in what was happening around me. However, on some occasions, for example during workshop sessions, I managed to step aside and watch what others were doing. I watched how workshop group tasks were carried out and also noted levels of engagement amongst teachers during group discussions.

Participant observations further enabled me to observe non-verbal expressions of the teachers during review sessions and meetings in schools. In one case, I involved S1<sup>16</sup> in making observations on how interpretive labels that we trialled at Samaj were used (AM 17; see also section 5.2.3.2). S1 further delegated this task to three students who watched how the labels were used with reference to a *checklist* that I had prepared. This drifted away from being a participant observation to a non-participant one. For me, participant observation was more than just observing as I systematically recorded data through such research techniques as the keeping of a journal and field notes (see sections 3.2.4.1, 3.2.4.2).

McKernan (1991:107) described a checklist as "... a tool for aiding observation by focusing the action researcher's attention on pre-defined points or criteria". In this study I used it as a series of statements that described the critical attributes (Ballantyne and Uzzell 1994) of the interpretive materials that we developed with teachers (see section 4.3.3). The checklist as a research technique provided us with a basis for evaluating and critically reflecting on the materials that we developed (see sections 5.2.3, 5.3.3). It was thus used to tease out the weaknesses and strengths of the new materials (DS 18). This enabled us to generate data without making value judgments on the way the new materials were developed.

#### 3.2.4.7 Document analysis

The documents we reviewed were in the form of interpretive materials we collected during the review phase (AM 6; see also section 4.4). These documents were elements of the research in their own right as through their analysis we were able to mobilise interpretive capital to develop similar ones in the two schools (see sections 4.4, 5.2, 5.3). Their analysis involved a critical review that focused on a number of issues (see section 4.4) and took place during materials development workshops (DS 14, DS 15; see also section 4.3). Although Blaxter *et al.*

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<sup>16</sup> I have used codes to maintain the anonymity of the teachers, as they did not wish to have their names appear in this report. Teachers from Samaj have been designated as S (S1, S2...) while those from Kenya High as K (K1, K2...). Non-teacher participants from the two schools were also coded.

(1996) regarded documents as artificial and partial accounts, we analysed the ones we collected with reference to the discussions we had with non-formal educators who had been involved in their development. This provided us with opportunities for cross-verification and internal evaluation, thus increasing their reliability as sources of data. We used content analysis to come up with various themes (see section 4.4.4; see also Appendix 4) that reflected how they were developed and used.

#### 3.2.4.8 Photography

McNiff *et al.* (1996) acknowledged that photography is now widely used as a research technique to document action and monitor progress. Photographs can be used to recall events, show the quality of participants' engagement in research activities and can even be used to validate the research (*ibid.*). I was able to capture a number of research events on both prints and slides. The prints are contained in a photo-album (DS 24) and the slides have been catalogued on the basis of research events (DS 25). The importance I attached to the use of photography as a research technique is revealed in the following self-reflection:

Today I spent many hours arranging photographs taken during my research 'voyage' ... but how will I use these many [more than 400] photographs? ... I think the photographs will be useful in a number of ways. Some will provide captions for the materials being developed. The photo album [DS 24] provides a neat summary of my research activities. The slides [DS 25] will be used to give interpretive talks to extend on this research. I have come to realise that an interpreter and a camera are inseparable. Photography has emerged as one of my main research techniques on this voyage (Diary, 6 April 2002).

Through photography, I was able to document actions that took place during the development of interpretation resources in the two schools that I worked with (see section 5.2.2.2). This enabled us to evaluate our progress and also share with others the work that we were doing. Photographs taken during workshops and review visits to the non-formal education sector showed the level of participants' engagement in the research activities. During my research trip to Britain (DS 35; see also section 3.3.3), I used photographs to share my study during research meetings that I held with critical friends. To some extent, photography provided me with a basis for validating my work (see section 3.4.2). I have also used some of the photographs in workshop reports and as graphics in the materials we developed with teachers (DS 18).

Through slides I was able to share interim findings (see section 3.3.3) from the study during conferences and seminars (see Appendix 2). Some of the limitations that I experienced in photography as a research technique were the high expenses involved and the reliance on another person to take photographs and slides.

#### *3.2.4.9 Questionnaires*

Although questionnaires are normally employed in the context of survey research (Elliott 1993:143), I used them to collect data to establish school profiles on environmental education processes (DS 3, DS 4; see also sections 5.2.1 and 5.3.1). The use of questionnaires enabled me to get an in-depth understanding of the status of environmental education processes at Samaj and Kenya High within a short time (see section 5.1). It would have taken me more time if I had used another technique like interviews. The questionnaire that I developed contained both open-ended questions and rating scales. I used them to elicit quick feedback from the teachers on a number of issues. These included learning and teaching processes, the use of the outdoors for teaching, and linkages with non-formal education organisations. Since I was dealing with a relatively small group with whom I had already developed some working relationships, I did not experience any problem when applying this research technique.

#### *3.2.4.10 A case study approach*

As a research technique a case study approach attempts to bring into focus the in-depth features and characteristics of the case being studied as it goes for 'depth' rather than 'breadth' of coverage (Roberts 1996).

McKernan (1991:74) has defined case study as:

...[The] study of a single case or bounded system, it observes naturalistically and interprets higher order interrelations within the observed data. Results are generalisable in that the information given allows readers to decide whether the case is similar to theirs. Case study can and should be rigorous.

I used this technique to focus on the two schools separately and treated each as a 'case' or unit (see sections 5.2 and 5.3). Roberts (1996) pointed out a number of characteristics of a case study that I found relevant for my two 'cases'. The schools were unique and were bounded by

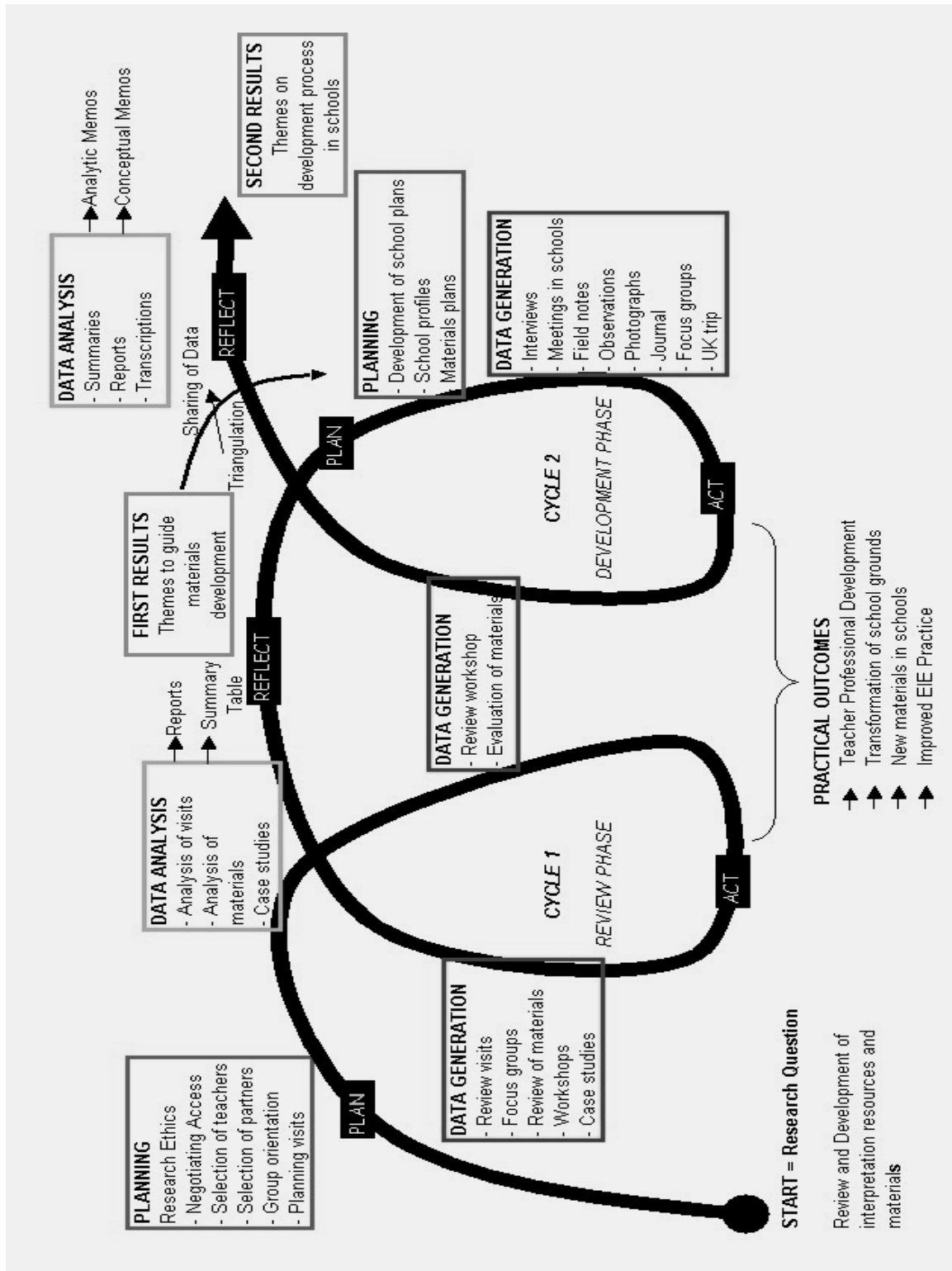
the interests of the teachers; for example, in one school the focus was on developing a nature trail (Kenya High), whilst the other (Samaj) had an interest in developing a 'botanic garden'. Thus, the two schools became my units of study, my 'cases' each being studied within its real life situation.

When reporting the two 'cases' in Chapter 5 I have taken into account the social, economic, cultural and political contexts in which the study occurred. The 'cases' are therefore more than a description of environmental education processes in the schools. Rather, they contain a disclosure of some of the contextual factors that may limit critical environmental education processes (see sections 5.2.1 and 5.3.1). I constructed the two cases as the research developed by shifting the conceptual and empirical boundaries during the course of the study. For instance, although we had planned to complete the development of one interpretive trail at Kenya High, we only initiated the process (see section 5.3.2). In this way, the final case became a construction rather than an object that I had studied. One advantage of presenting the two schools as separate units is to provide them as examples on which others may be able to draw on without generalising data.

In the next section, I outline the research events that occurred within the two phases of this study (see sections 1.2.2, 1.2.3; see also Figure 1.1). These phases are described here as broad cycles of the participatory action research process in the study.

### **3.3 THE RESEARCH PROCESS**

I carried out this study in two distinct phases that are reported as two broad cycles of inquiry (see Figure 3.1 below). In Figure 3.1, the two broad cycles are shown summarising the research process and data sources. In the first phase (review phase), I engaged a group of teachers from Samaj and Kenya High in reviewing how interpretation resources and materials in five non-formal education organisations were developed and used by visiting school groups (see section 4.2). The review phase is described in section 3.3.2 as my first cycle of inquiry. It involved mobilising interpretive capital (see sections 1.2.2, 1.3.1, 4.1) within five non-formal education organisations through review visits, focus group interviews and workshops.



**Figure 3.1** Two broad cycles of inquiry in the review and development of interpretation resources and materials

Findings that emerged (see sections 4.4.4, 4.6.2) were drawn on to inform the development phase of the study (see sections 5.2, 5.3).

The development phase is described in section 3.3.3 as my second cycle of inquiry. It entailed developing, with teachers, interpretation resources and materials in their school grounds to enhance critical environmental education processes (see sections 5.2 and 5.3). Beyond these two phases, I became involved in nurturing partnerships that emerged from our interactions with other non-formal educators (DS 40; see also section 3.3.4).

First, I illuminate how this participatory action research was collaboratively re-conceptualised (see section 3.3.1) during my preliminary consultations with teachers and non-formal educators when negotiating access. I will then highlight how issues of research ethics and motivation were addressed (see section 3.3.1.3) before describing the broad cycles we underwent on this ‘voyage’ (see sections 3.3.2, 3.3.3, 3.3.4; see also Figure 3.1).

### **3.3.1 Preliminary consultations and negotiating access**

As a novice ‘voyager’ on this research undertaking, I was not at first sure when and where to board my ‘ship’. I wondered how many other schools I was to bring aboard apart from the two that had approached me earlier for collaboration. Attempts to involve a primary school were abandoned due to bureaucratic requirements for access. I decided to work with only two schools whose accessibility was already assured. Between 9 November 2000 and 2 February 2001 I held seven consultations with twelve teachers from Kenya High and Samaj (AM 1; see also section 5.2 and 5.3), and five with non-formal educators from the National Museums of Kenya (NMK), Kenya Wildlife Service (KWS), Giraffe Centre, Wildlife Clubs of Kenya (WCK) and African Butterfly Research Institute (ABRI). During the time that I was engaged in these consultations, an opportunity to facilitate a two-day workshop on interactive learning for primary school teachers presented itself in the coastal part of our country. At this point, I had not completely refined my research proposal (DS 1) and I was still contemplating reviewing how environmental education processes may be enhanced in a sample of Kenyan schools. As a result, the workshop provided a chance for ‘testing the waters’ (AM 3). Six teachers

volunteered to be interviewed despite the tight schedule of the workshop. This became my first research interview and with it my research ‘voyage’ had begun. However, findings from this research event have not formed part of this study.

### *3.3.1.1 Negotiating access to schools*

Gaining access to Kenya High and Samaj schools as stated above was a mere formality.

Nevertheless, I was apprehensive about teacher reactions to my research ‘agenda’ as reflected in this journal entry:

My first preliminary visit to Kenya High was a follow-up to a phone call I had with the teacher in charge of the eco-school project. When I arrived at the school, I found the teachers very busy with marking. I wondered whether I would fruitfully engage them in the participatory research. Will the teachers be cooperative especially with their heavy workload? I shared with the team the nature of my research project and did the same with the principal. It was easy negotiating access because I was already working with the school on aspects of their eco-school project. The school had earlier approached me to assist them in developing a nature trail before my study (Journal p. 10, 13 November 2000).

The willingness of five teachers from the school to participate in the study as co-researchers later dispelled my apprehension. The five teachers were all members of the eco-school project that had been initiated by a local non-governmental body (see section 2.5.3). The teachers had been informed of the changing course of my work with the school by their project coordinator (K1). During the study period, a new member (K3) was added to the team and one left on maternity leave (K6).

In the case of Samaj school their involvement in this study was as a result of a visit made by two teachers (S1 and S2) and a group of science club members to the NMK Nairobi Botanic Garden in November 2000. On this visit, they sought my assistance in developing a school ‘botanic garden’ on their grounds as a club project. I casually shared my research focus on working with schools to develop interpretation resources and materials for environmental learning with S1 and S2. As a result of my research commitment I informed them that I could not work with them at that moment outside the research framework. In addition to this, I had my own reservations about working with teachers from a private school that was still unknown

to me. However, the ‘tide’ changed in favour of Samaj when the key teacher from the primary school I had been negotiating to work with resigned from the school. In order to work with the primary school I had also been required to seek clearance from the City Education Department, a process that turned out to be very slow. These two factors and the visit that I made to Samaj on 9 December 2000 influenced my decision to include Samaj in my study.

The well-landscaped school grounds that were adorned with a variety of plants particularly impressed me (see also 5.2). S1 and S2 seemed eager to model their proposed school ‘botanic garden’ along the NMK Nairobi one and had in mind what themes to develop at their site (see section 5.2.2.1). I had not experienced such enthusiasm or such a proactive approach with Kenya High. At this point, however, the idea of developing a school ‘botanic garden’ at Samaj was still at a club level. I wanted us to move the project to the school level so that the school managers were involved. I did not want my research efforts and those of S1 and S2 to be reduced to obscurity. A meeting with the principal of Samaj therefore became necessary at this preliminary stage. This meeting revealed the willingness of the principal to take on the project at the school level. I briefed him on the nature of my research and what the project would entail and pointed out the input of NMK towards the realisation of the project. After this, I requested the project coordinator (S1) to choose a team of five teachers with whom to work. I therefore had no role in the choice of the five teachers from this school with whom I worked (the number increased to six later).

### *3.3.1.2 Negotiating access in the non-formal education sector*

To set in motion research activities for phase one of my study, I consulted with seven non-formal educators from the five organisations I selected to work with in consultations with teachers (see section 3.3.2.1). They were the National Museums of Kenya, Giraffe Centre, Kenya Wildlife Service, Wildlife Clubs of Kenya and Butterfly Centre (see section 4.2.1 for their profiles). The purpose of this was to negotiate access, share my research focus and also to familiarise myself with interpretation resources that existed in these organisations (AM 2). This took place between 9 November 2000 and 24 January 2001. Except for the Butterfly Centre, NMK had strong working ties with the other organisations. All occur within the same radius in Nairobi and are active service providers of non-formal environmental education processes (see

2.2.2). At a personal level, the educators that I consulted at KWS, WCK and the Giraffe Centre knew me already. These factors had been considered during the selection of non-formal partners with the teachers. Some of the teachers were also aware of the interpretation resources that existed in the organisations. I therefore experienced no difficulties when negotiating access and all I was asked to do was to put our request in writing as a matter of formality.

### *3.3.1.3 Issues of motivation and research ethics*

I discussed issues of motivation and research ethics with teachers and non-formal educators during the negotiation of access discussed in the previous sections. As regards motivation for the teachers, the overriding factor was the realisation of a school project that they could own and with which they could be associated. Through interactions with non-formal educators and attendance at workshops, the professional competencies of the teachers in materials development were likely to be enhanced (see sections 2.5.2, 4.3, 6.4). My valuing them as reflective practitioners with significant contributions to critical praxis in materials development actions later emerged as a significant motivating factor. This collaborative participatory action research project (see section 3.2.3.1) in which our real educational practices became accessible to reflection, discussion and deconstruction provided few ethical considerations. Nevertheless, as Simons (1989) pointed out, all decision-oriented human research and especially in action research, have ethical dimensions. On this point, Bassey (1995:15) has identified three major ethical dimensions in the conduct of social research as "... respect for persons, respect for truth and respect for democratic values". I will briefly highlight how I addressed each of these in this study.

When taking and using data from teachers and other informants, I did so in ways that recognised initial ownership of the data. I considered their privacy, for example, and did not tape record a conversation without informing them. When writing workshop reports, I did not reveal their identities without their approval and did not quote our private conversations for use as data. Although I did not prepare an ethical statement, I verbally explained to the participants during our preliminary consultations, the purposes and procedures of the research. I described to them the arrangements for protecting their privacy and also indicated how findings were to be shared and reported, with the emphasis on acknowledging their

contributions. The negotiating of access discussed earlier also formed part of a research ethic on *respect of persons*. I wrote letters to the school principals and heads of the non-formal education sector. I wrote letters inviting the selected teachers to participate in the action research and I made it clear from the start that they were co-researchers and not ‘subjects’ that I would use in the research. I informed the teachers that I expected them to play a major role in the study by generating of knowledge. As co-researchers, they were expected to understand the nature and scope of environmental education processes in their schools and also to develop materials jointly with NMK for use in their school grounds. In cases where students were to be involved in a research activity, I let the teachers facilitate this. Throughout the study, I let all interested parties know what I was doing and also guaranteed participants’ right to withdraw from the research as a way of respecting their democratic values. In terms of the research ethic of *respect for truth*, I kept a systematic and careful record of data (see Appendix 1) in order to safeguard my work from any accusation of untruthfulness. I have also been truthful in data collection, analysis and reporting of findings. Since this research was important for my own professional growth, I maintained my own intellectual right of reporting the findings, but in accordance with the ethical dimensions that I have stated above.

In the next section, I describe the research events as they unfolded during the first phase of this study within a metaphorical framework of ‘voyaging into the unknown’.

### **3.3.2 Phase one: ‘Voyaging into the unknown’**

‘Voyaging into the unknown’ best describes my attempts with the twelve teachers from Kenya High and Samaj to mobilise interpretive capital within the non-formal education sector (see also sections 1.4, 4.1). I had no idea what lay in store for me in terms of understanding environmental interpretation and education processes within the socially and historically constituted contexts of the organisations we visited, hence this metaphor. In addition, environmental interpretation was a relatively new concept that was not deeply rooted in the social and educational practices that I had set out to investigate (see section 2.3).

The ‘voyage’ entailed undertaking twelve review visits to the five organisations between 30

November 2000 and 7 March 2001 (DS 7, AM 7-11; see also section 4.2). Critical reflections on these visits and materials collected took place during two workshops, held on 22 June 2001 (DS 14) and 14 September 2001 (DS 15) as described in section 4.4 in Chapter 4. The two workshops also provided forums for re-planning the next cycle of inquiry. Through focus group interviews, workshops and document analysis of textual materials collected, we sought to understand key shaping ideas regarding the development and use of interpretive materials in the organisations that we visited (see section 4.4.1). This involved identifying the educational and sociological perspectives that informed environmental interpretation and education processes in the non-formal education sector (see section 4.5). This provided us with the interpretive capital that informed the development of interpretation resources and materials during phase two (see sections 5.2, 5.3).

#### *3.3.2.1 Planning for review visits with teachers*

During the broad planning sessions (DS 2) that occurred in schools, I took time to share with the teachers the goals of the study and the rationale of undertaking review visits to the non-formal education sector (DS 1). We then jointly decided on which non-formal education organisations to visit and on suitable dates to commence the review phase. To enable them to further conceptualise the study, I prepared some readings on action research, environmental interpretation, materials development and environmental education processes for the teachers (DS 11). These were put in a file that I gave to the project coordinators (S1 and K1) from the two schools. The files were placed in a central location in both schools to enhance access for the teachers. To encourage the teachers to reflect on their practice, I issued them with logbooks and notebooks (see section 6.4.2). I shared with them an outline of the review visit and possible areas to probe during our focus group interviews with non-formal educators. The planning sessions were held separately for the two schools with each choosing its own suitable dates for the review visits. We also discussed logistics in terms of transport and agreed on suitable times for the sessions. At this planning stage, I provided the communication link between the teachers and non-formal educators and usually confirmed the suitability of the dates chosen. Re-visits were also planned at the request of teachers. Later in the study, I planned for two workshops (DS 14, DS 15) that were aimed at:

- sharing ideas on environmental interpretation and environmental education processes with the teachers (see section 4.3);
- providing more insights into materials development actions in the non-formal education sector through case studies and document analysis of textual interpretive materials (see section 4.4; see also Appendix 4);
- critically reflecting on phase one findings and initiating plans for phase two (DS 15; see also Table 4.5); and
- providing a forum for the teachers from two schools to meet and share their school plans and experiences (DS 15).

To realise all these, I invited some of the educators from the five organisations we had visited to make presentations and also negotiated for the participation of the teachers (see Appendix 3 for workshop correspondence). I encountered many challenges when planning these workshops as revealed in some of these journal reflections:

The person I had invited from WCK will not be available for the workshop. ... I learned that the person I had invited for the workshop from KWS had been transferred to Naivasha Training School. Since I had directly addressed the letter to him, nobody at the organisation was aware of the planned workshop. ... I was surprised that the teachers [at Samaj] had not received information from the principal regarding the workshop. I had posted the letter of invitation to the principal and my assumption was that he would communicate with the teachers (Journal pp. 171-172, 20 June 2001).

The teachers at Kenya High are willing to attend the workshop, but subject to the principal's permission and approval. I was not able to meet the principal as she was in a meeting. ... S1 informed me that the principal [Samaj] has softened his attitude and was willing to release some teachers for the workshop. However, they would arrive late for the workshop hence the need to revise my workshop programme (Journal p. 225, 11 September 2001).

Although I had informed the principals of the two schools at the outset of this study about my plans to hold workshops for their teachers towards their professional development, I had on to re-negotiate the participation of the teachers in each of the workshops. This implied that my plans for the study were enabled and constrained by the conditions that prevailed elsewhere and in most cases could not be defined by my own set of wishes but by a set of collective conditions that I had to assume as my own (see also section 4.6.3). Even though I did most of

the planning of the workshops in terms of the logistics, teachers were involved in making decisions on the topics to be discussed and also on suitable dates for the workshops (see section 4.3). I always sought their approval of the plans I developed in terms of workshop content and structure. This enabled us to develop trust, communication and understanding of each other's perspectives. This democratic approach became useful in addressing power imbalances associated with the different kinds of knowledge (expert and practical knowledge) and different roles noted earlier in this chapter (see section 3.2.3.1).

### *3.3.2.2 Data generation, reflection and sharing findings*

Our first review visit was made on 30 November 2000 to WCK with three teachers from Kenya High and the enthusiasm with which I approached the commencement of the data generation process is revealed in this journal entry:

It was exciting to start the review phase after a hectic time of negotiating access, setting dates and other logistics. ... I needed two cameras, one for taking slides and another for prints. A colleague accompanied us as the photographer of the day and off we left NMK for WCK. The actual data collection process had started (Journal p. 26, 30 November 2000).

More review visits were to be made later, in which a lot of data was generated through photography as indicated in this journal entry (see also section 3.2.4.3). I also observed how our informants handled guided tours of their interpretation resources (see section 3.2.4.6). During focus group interviews, I moderated the sessions to ensure that we did not veer off course. Although I had provided the teachers and the informants with an outline of key areas for probing, the focus group interviews assumed an open-ended approach with no reference to the outline that would have served as an interview schedule (see section 4.2.2). Nonetheless, most of the twelve review visits that we undertook to the five non-formal education organisations followed this structure:

- introductions and sharing of research focus;
- an overview of materials and methods that characterise environmental interpretation and education processes in the organisation (see sections 4.4, 4.5);
- collection of a sample of textual interpretive materials that occurred in the organisation

(AM 6);

- a guided tour of the interpretation resource that existed in the organisation (see section 4.2.2);
- in-depth probe on how interpretive materials that we found in the organisation were developed and used with visiting school groups (see sections 3.2.4.3, 4.4.1); and
- reflections on emerging issues and wrap up.

There were cases where organisations were re-visited, for example, Kenya High revisited WCK (twice) and the Giraffe Centre (twice). In one rare case, a review session took place in a school setting as affirmed in the journal entry that follows:

This session took place at Kenya High instead of NMK. This was to reduce transport problems because of inadequate time for making transport arrangements. It was much easier for me to travel to the school and take on the role of a *participant informant* in the school than to postpone the session. The teachers were happy with this arrangement especially during this time when last year's exam results had just been released (Journal p.100, 2 March 2001).

During the twelve review visits that we made, we were able to interact with twelve non-formal educators and we reviewed thirteen interpretive materials. We conducted eight review visits with Kenya High and only three with Samaj. This reflected the different social and historical settings in the two schools (see section 5.2, 5.3). I interviewed Ndaruga (2001 pers. comm.), a colleague at NMK on how a wetlands poster was developed and used by schools (see Appendix 4). I did not involve the other participants, but informed them about the research event.

The two workshops (DS 14, DS 15) that were implemented during this phase followed a similar framework (see Appendix 3 for a workshop programme). Presentations on environmental interpretation and education processes by some of the non-formal educators with whom we had interacted during organisational visits formed the basis of these workshops (see sections 4.3, 4.4). For instance, during the 22 June 2001 workshop (DS 14, AM 15), I provided an overview of environmental education processes, materials development processes and participatory action research. An educator from the Giraffe Centre (Gitonga), a naturalist

from KWS (Mbogo) and a graphic designer from NMK (Adoyo) presented case studies on the *development of Giraffe Centre guide booklet, environmental interpretation at KWS Nairobi Safari Walk, and design and development of interpretive signage at NMK* respectively (AM 15; see also sections 4.4.2). Teachers undertook group tasks with some of them constituting planning sessions for phase two (see section 4.4.1; see also Table 3.1 below on a planning task). By undertaking these tasks, teachers were engaged in critical reflections that yielded very rich data on the mobilising of interpretive capital within the non-formal education sector (DS 14, DS 15, see section 4.3).

Workshop data was compiled into proceedings (DS 14, DS 15, AM 15) that were usually shared with teachers, school principals, non-formal educators and colleagues at NMK as a strategy for disseminating and validating findings (face validity) (see section 3.4.2).

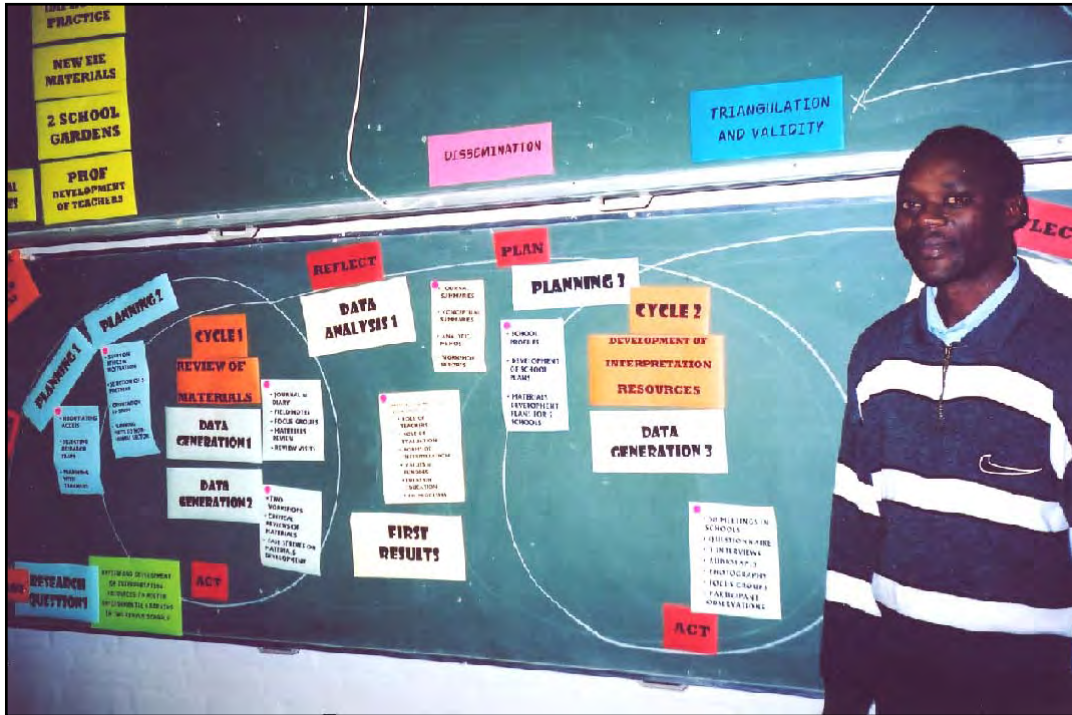
**Table 3.1** A planning task undertaken during the 22 June 2001 workshop

**TASK: Planning for the development of an interpretive material**

By drawing on the information derived from the review process and today's presentation, plan for an interpretive material that you will start developing for use in your school grounds. Consult *Reading 11* for some guidance. You will work in small groups that will be based in your schools. Your interpretive material could be a brochure, trail booklet, poster, worksheet interactive displays, or interpretive signage. Later you will be given examples to draw upon when implementing your plans.

Summaries on materials we reviewed (see Appendix 4) were shared with teachers and non-formal educators to further deepen the analysis. I also shared initial findings from this phase through seminars at NMK (DS 20), other workshops (DS 37 and DS 38) and conferences (DS 27, DS 28 and DS 30). I have presented papers at three international conferences in an effort to share emerging research findings with a wider audience and to get feedback on the research in progress (see Appendix 2). Appendix 2 contains papers I presented at the 11<sup>th</sup> Eastern Africa Environmental Network (EAEN) annual conference in Nairobi, Kenya (see also Atiti 2001d) and the 19<sup>th</sup> Environmental Education Association of Southern Africa (EEASA) annual conference in Maseru, Lesotho (see also Atiti 2001e). These two papers were based on this review process. Also attached is a paper I presented during the Botanic Gardens Conservation

International (BGCI) fifth International Congress on Education in Botanic Gardens in Sydney, Australia (see also Atiti 2002). The research process was also shared during two sessions on research methodology courses at Rhodes University in October 2001 and August 2002. The later session is captured in Figure 3.2 below.



**Figure 3.2** Sharing the research, design and process at a research course

During the presentation shown in Figure 3.2, I shared the research design and process described here and how various research techniques (see section 3.2.4) were applied. This occurred before I started writing this chapter. Critical comments from the course participants enabled me to further deepen my understanding of participatory action research methodology and data analysis. Sharing my findings at the various forums that I have mentioned assisted me in ensuring the rigour of this research (see section 3.4.2). This is because the comments I received from critical friends while preparing and presenting the papers helped me to reflect further on my educational intentions and my interpretations of my actions (Lotz 1996).

### 3.3.3 Phase two: 'Changing the tide'

Planning for this phase started on 8 March 2001 with a process of formulating broad plans for

the development of interpretation resources and materials in the two schools with the teachers (see section 5.2.2.1, 5.3.2.1). At the same time, I developed a questionnaire to review the status of environmental education processes in the two schools (see section 3.2.4.9). This was administered to the eleven teachers in mid-March (DS 3 and DS 4). The process of formulating broad plans for the two schools was completed in mid-July and the interpretive plans that emerged were submitted (DS 9 and DS 10) to the management of the two schools by the project coordinators (S1 and K1).

On 19 September 2001, I held semi-structured interviews with two teachers (S6 and K7) as a further review of environmental education processes in the two schools. Interview summaries were prepared and shared with the teachers two days after the interviews. Later into the study, I conducted another interview with a farm manager at Kenya High (K 8) who had developed an interest in the implementation of the project. I analysed all the eleven returned questionnaires in the months of March/April 2001 and shared the interim findings with the teachers and their principals on 22 May 2001. These findings and those from the three interviews (DS 3, DS 4) have been used to draw up profiles of environmental education processes at the two schools (AM 4, AM 5; see also sections 5.2.1 and 5.3.1). The main purpose of developing these profiles was to understand how the participants were "... formed and re-formed as individuals, and in relation to one another" (Kemmis and Wilkinson 1999:23) in their school settings. The profiles were also aimed at developing a deeper understanding of the contextual issues that might impede critical environmental education processes (see section 2.2.2).

Drawing on the interpretive capital that we had mobilised (see section 4.6.2) in the first phase of the research, we acted on the formulated interpretive plans for the transformation of the school grounds as sites for critical environmental education processes (see sections 5.2.2 and 5.3.2). This was carried out between 6 August 2001 and 9 May 2002 through a series of 58 focus group sessions with teachers in their schools (DS 20, AM 18, AM 19). I shared summaries of these meetings with the teachers on a regular basis. During this collaborative action, we attempted to change and improve our own practice in interpretation resource and materials development. This was an attempt to address some of the curriculum and pedagogical tensions associated with the implementation of critical environmental education processes in

the two schools (see sections 2.3.1, 5.2.1, 5.3.1).

I have used the metaphor ‘changing the tide’ to refer to this collaborative process of social transformation where we were changing “... reality in order to investigate it” (Kemmis and Wilkinson 1999:24). At the same time, we were investigating reality in order to change it (Fals Borda 1979, cited in Kemmis and Wilkinson 1999:24). Reflections on the interpretation resources and materials development actions were jointly undertaken during focus group sessions in schools and at a workshop (DS 16) that was held on 3 April 2002 (see section 4.3.3). This workshop was also used to critically reflect on the entire study with a view to sharing useful insights that were gained in interpretation resource and materials development. We also critically evaluated some of the interpretive materials developed in the two schools and deliberated on the future of the emerging school projects beyond this participatory action research study (DS 16). Resource persons from NMK further provided the participants with more interpretive capital and ideas on fundraising through two formal presentations (see section 4.3).

### **3.3.4 Beyond phases one and two: ‘Finding the shores’**

In ‘finding the shores’, I refer to the feeling of confidence that I started experiencing when some practical outcomes became evident towards the end of the study as captured in these reflections:

I was impressed by how much I have learned from this session. However simple an interpretive label is, the important thing is that it should be able to provoke learners into learning. The teachers are slowly realising their potential in developing interpretive materials for use in their local contexts (Journal p. 280, 16 November 2001).

We moved to the site to view the actual development of the school garden. ... Personally I was impressed with the transformation ... it seems that a lot has happened since September this year. The action research has now outgrown me and more input from others has now become necessary (Journal p. 299, 20 December 2001).

It was with pomp and flair! The school operations came to a standstill and from 2.30 p.m. to 5 p.m. the focus was on the launch. The students recited poems, speeches were made and later guided tours of the new facility presented. I was happy at the realisation of this participatory action research project (Diary, 19 April 2002).

Beyond the two phases that I have described in sections 3.3.2 and 3.3.3, I became involved in planning, acting and reflecting on research events that emerged as a result of our interactions with the non-formal educators during the review visits to their organisations. These events included participation in workshops organised by WCK and Giraffe Centre (DS 37), contacting new partners (DS 40) on behalf of the two schools and participating in reviews of interpretive materials at WCK (DS 36). As a result of this study, NMK and KWS held a joint workshop for teachers in which three participants (K1, S1 and S2) were from a team of my co-researchers (DS 38). K1 and K2 also participated in the WCK and Giraffe Centre workshops (DS 37). Our invitations to participate in these workshops are evidence of new partnerships (especially schools/non-formal) that resulted from our interactions with non-formal educators (see section 6.6).

A research visit that was made to Britain to share aspects of the study with colleagues involved in environmental interpretation and education processes within the perspective of botanic gardens formed part of the research ‘voyage’ (DS 35). The relevance of this research event within the metaphoric framework of ‘Finding the shores’ is revealed in the following journal entry several days after the trip.

Apart from meeting colleagues, I used BGCI offices to review relevant literature ... I did manage to photocopy some readings ... it was worth travelling to the UK. A ... shift has occurred in terms of my professional inclination. I will lean more to environmental interpretation after this research. The potential is enormous. The waters are deep but the interpretation ship is sturdy (Journal p. 298, 19 December 2001).

During this research trip (19-22 November 2001), I explored key emerging perspectives on interpretation as an environmental education process with Sutherland (2001 pers.comm.) and Graham (2001 pers. comm.). Sutherland illuminated the perceived differences between environmental education processes and environmental interpretation. She further provided me with relevant literature on environmental interpretation that I have drawn on in the previous chapter. I also had informal discussions with Royal Botanic Gardens Kew education and interpretation staff. These discussions provided useful insights into environmental education and interpretation programmes for school groups at the Garden. Bromley (2001 pers. comm.)

shared her experiences on involving teachers in materials development processes at Kew Gardens. She also shared some tips on how to evaluate interpretive materials (DS 35).

At the Learning through Landscapes (LTL) London office, I held an informal meeting with Doyle (2001 pers. comm.) in which we brainstormed the use of school grounds for environmental learning. The focus of this study on transforming school grounds to enable environmental learning at Kenya High and Samaj was reflected in the work done by LTL on school grounds development (see also Lucas 1997). Doyle shared aspects of processes involved in the management of schools grounds from her work context (DS 33, DS 35) that I have drawn on when suggesting guidelines on interpretation resource development in Chapter 6 (see section 6.5.1).

### **3.4 HOW I ANALYSED AND INTERPRETED THE DATA**

In this study, data collection, analysis and interpretation were continuous processes and occurred throughout, with earlier analysis informing later data collection. This was because, unlike survey and experimental research, qualitative studies tend to have a peculiar life cycle, one that spreads collection and analysis throughout a study (Huberman and Miles 1998). One advantage of this is that I was able to rectify errors I sometimes made in the field, as there was always a second chance. Nonetheless, I was faced with the task of trying to reduce the amount of data generated, while still gathering more (see section 3.4.3). Blaxter *et al.* (1996:185) have described data analysis as the search for illumination and understanding with a likelihood of developing and advancing concepts. The process by which I have ascribed meaning to the data I collected and analysed, and then compared that meaning with those advanced by others can be defined as data interpretation (*ibid.*).

By drawing on grounded theory, (see Glaser and Strauss 1967, Arksey and Knight 1999), I describe how I analysed and made sense of the data generated. I will then explain how I validated the data by regularly reviewing data analysis with the participants by means of critical reflection (Lotz 1996:100) and comparing different data sources (triangulation). Lastly, I will share how I managed the large amount of data this study generated and outline various

themes that have emerged from the data analysis. Finally, an outline on how these themes have been presented in the thesis is provided.

### 3.4.1 Drawing on grounded theory

Grounded theory is an approach that is concerned with “the discovery of theory from data” (Glaser and Strauss 1967:1) by

...constantly searching, comparing and interrogating the first [layer of analysis] to establish analytical categories that address the research questions, that are mindful of the research literature, and which will allow the greatest amount of the data to be coded without either forcing them into categories or having categories that are so sprawling as to be virtually meaningless (Arksey and Knight 1999:162).

My first layer of data analysis involved transcribing the field notes into the research journal. I did this immediately after research meetings since the notes I made were sketchy and haphazardly done (see section 3.2.4.1). During the transcriptions, I reflected on possible gaps that could be filled by the next round of data collection. Towards the end of phase one of the study (see section 3.3.2), I started coding the journal data summaries by noting categories on the margins and derived what I called *conceptual memos* (see section 3.2.4.1). These were themed notes from the journal summaries based on one research event. When coding incidents in my data into categories, I constantly compared similar patterns within data sources and across data sources. Similar conceptual memos from different research events were later merged to produce data summaries (see Appendix 4) that I shared with teachers and our informants, to further deepen them. This was a strategy of involving other participants in data analysis through joint critical reflection (Lotz 1996). From this first layer data analysis, I was able to identify issues to focus on in subsequent data generation activities.

Except for the workshop data, most of my second layer of data analysis occurred after the data generation phase. In this further analysis of the reduced data, I painstakingly went through the conceptual memos and looked for emerging patterns, meanings, particular characteristics and fruitful lines for discussion. I then synthesised conceptual memos with similar patterns and rewrote them separately as analytic memos; for example, I wrote an analytic memo (AM 10)

comparing, analysing further and compiling the conceptual memos (DS 7) on the four review visits that we made to the Giraffe Centre. In this way, I was able to establish links between emerging patterns, explore concepts and theorise on materials development processes. Links made in the patterns of materials development and use in the five organisations that we visited have enabled me explore concepts such as evaluation, forms of interpretation, teacher participation and links to the curriculum (see section 4.4.4). Consequently, I have been able to theorise about the different levels of teacher participation in materials development processes (see section 4.4.4.1).

I particularly found the writing of *analytic memos* very useful since they contained my logical thinking about the evidence I had collected and critical reflections on the same. McKernan (1991:72) has described analytic memos as “...documents written by the researcher in order to systematise his or her thoughts on a stage or cycle of action research”. To me, they were personal notes about my conceptual memos that enabled me to read and reflect on the research easily and frequently. In most cases I kept these notes short and cross-referenced them to other sources of data. This procedure of data analysis and interpretation that I have outlined here pervaded the whole research process as new concepts emerged to further describe related observations.

### **3.4.2 Data interpretation and validity**

Throughout the first and second layers of data analysis, four main factors interacted to shape the meanings I made of them (Arksey and Knight 1999). These were the research goals and design, the literature I reviewed, the research question that focused on materials development, and responses from informants and co-researchers that became the basis of the text. The research design I adopted (see section 3.2.1) and the research goals (see section 1.2), determined the nature of the data I collected and also shaped the way I have interpreted data. The preliminary literature I reviewed at the outset of this study offered me a framework with in which I started interpreting this data. More sophisticated engagements with literature later in the study led to further refinements in the data analysis and interpretation. For example, during the organisational visits with teachers (see section 4.2), I was on the lookout for themes that

seemed to reflect how materials were developed and used by school groups. This was done from the perspectives of the informants, research question and methodology. The meanings that I found in the data were informed by the literature and this led me to discard large amounts of data that I found irrelevant. The disposal of unwanted data became my initial data management strategy (see section 3.4.3).

I will now highlight how I dealt with issues of rigour and validity in this participatory action research project. Central to the issue of rigour was the consistency of the justification for mobilising interpretive capital. The repeated justification of mobilising interpretive capital with teachers (see sections 1.2, 2.5.3, 4.3) and critical friends (see sections 3.3.2.2, 3.3.4) helped me to test and reflect on my research findings and ensured some rigour in this research (Lotz 1996). As regards validity, Cronbach (cited in Lather 1986:269) pointed out that the task of validation is "... not to support interpretation but to find out what might be wrong with it ...". Hillcoat (1996:153) further argued that in the absence of validation "... the research process ceases and subjective pondering begins". To minimise such distorting effects of partiality and to ensure the reliability of data, I used four major self-corrective techniques. These were: triangulation, face validity, catalytic validity and construct validity (see Cohen *et al.* 2000, Lather 1986).

In *triangulation*, I compared data sources from different perspectives (AM 6-AM 11, AM 18, AM 19, DS 35) as the study involved a team of teachers with different subject areas, their principals, non-formal educators, colleagues and critical friends. I thus used triangulation as applied by Elliott (1993:133) in the context of understanding "... a situation from a multiplicity of perspectives". I also compared various data sources (DS 3, DS 5, DS 15, DS 21, DS 22, DS 24) that were generated through a variety of research techniques. I achieved *face validity* by recycling descriptions of research events, emerging analysis and conclusions through a sample of respondents and participants (DS 9, AM 8, AM 9, AM 17). I then sought agreement on constructs that occurred in these descriptions, analyses and conclusions as a basis for *construct validity* (Hillcoat 1996). Construct validity required a systematised reflectivity (Lather 1986) to reveal how the interpretive capital that we mobilised changed our assumptions and theories towards interpretation resource and materials development actions (see section 4.3). Such

reflections ensured that theoretical impositions did not dominate the research process. This was evident during workshops (DS 14-16, AM 13, AM 14) and materials development actions in schools (see section 5.2.3).

Lather (*ibid.*) suggested that *catalytic validity* should help participants to understand their worlds in order to transform them (see also Kincheloe and McLaren 2000). There were many cases in which this research process re-oriented, focused and energised (Lather 1986) us towards understanding our contextually constrained practices in order to transform them as evidence of catalytic validity (DS 19, DS 38; see also sections 5.2.5, 6.4.1). One vivid example is shared in the following diary entry:

I have found Samaj teachers very productive in terms of ideas, a clear indication that teachers have a lot of theory and practice on materials development actions. Using the draft worksheet that I had developed as a framework, we were able to come up with a new draft of worksheet for senior classes. ... The principal has greatly warmed towards the project. He is very eager to have it launched ... As regards the 3 April workshop 2002, I did not need to negotiate for the teachers' participation this time. He even wondered as to why only three teachers from the school had attended the 14 September 2001 workshop when he went through the proceedings. He had forgotten that he had been very reluctant [see section 3.2.5.2] to even release the three teachers who had attended. What a transformation! (Diary, 25 March 2002).

### **3.4.3 Data management and display**

Denzin and Lincoln (1998:180) have described data management as "...the operations needed for a systematic, coherent process of data collection, storage and retrieval". Apart from storing the data in electronic form, I also created folders for different categories of data (see Appendix 1). Forty data sets were formed, for example Data Set 7 (DS 7) contained all conceptual memos from phase one of the study while Data Set 24 (DS 24) had all the photographs I took during the study period. Figure 3.3 below is a display of the data sources from both phases of this study. I categorised these data sets into five categories and where appropriate wrote corresponding analytic memos (AM) that I put in separate folders. I found this strategy useful, as I was able to easily retrieve data for further clustering and reduction. In addition, I kept inventories of research events and audiotape recordings. An inventory of all the research events during the study yielded 140 entries and that of audiotape recordings had 41 entries.

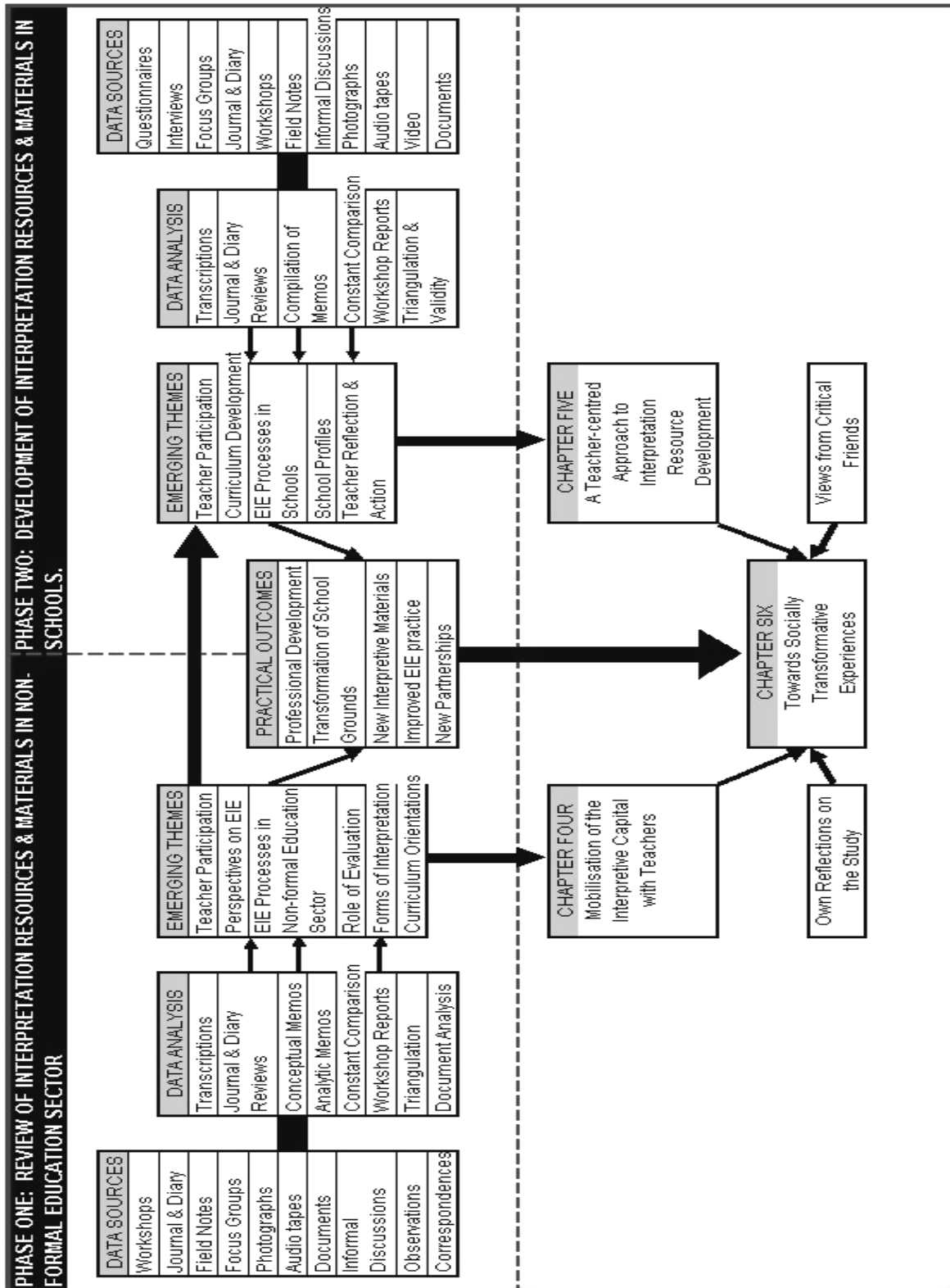


Figure 3.3 Display of data sources, data analysis and emergent themes

This provided me with ease of access when triangulating data sources. The data display shown in Figure 3.3 above, though in a condensed form, has influenced the emerging texts and my interpretations in the chapters that follow (see also Figure 3.1).

As noted by Huberman and Miles (1998:188), "... valid analysis is immensely aided by data displays that are focused enough to permit viewing of full data sets in one location and are systematically arranged to answer the research question at hand" (see Figure 3.3). Themes and reflections from phase one data sources are presented in Chapter 4. In Chapter 5, I have reported what took place at Kenya High and Samaj as separate case studies by drawing on data sources from phase two. Patterns and themes from both phases that constitute practical outcomes have been consolidated and discussed in Chapter 6 in the form of conclusions. Fundamentally, the data display (see Figure 3.2) has been to me what Hubermans and Miles (1998:189) asserted: "Displays beget analyses, which then beget more powerful, suggestive displays". The display helped me to identify patterns and themes to write on. My initial written texts made sense of the display and suggested new analytic moves in the displayed data.

### 3.5 CONCLUSIONS

In this chapter I have addressed methodological issues associated with undertaking a collaborative participatory action research study within a critical orientation. 'Voyaging into the unknown', 'changing the tide' and 'finding the shores' have been metaphorically used to imply the transformational possibilities that were inherent in this critical education research. I have examined the practical implications of undertaking the study within a participatory action research design. I have described the research process in which we mobilised interpretive capital in five non-formal education organisations to improve on our interpretation resources and materials development practice in schools. A variety of research techniques that were used to gather evidence in the mobilising acts have been shared. Nevertheless, what made this participatory research 'research' is not how efficiently I applied this array of research techniques but that it was "... an abiding concern with the relationship between social and educational *theory* and *practice*" (Kemmis and Wilkinson 1999:34) on environmental

interpretation and education processes.

I have described the various ways in which I communicated my initial research findings, for example, through workshop reports. Nonetheless, I have to point out here that in spite of the ease with which I prepared these reports, I was awfully scared when it finally came to writing the findings in this thesis. This confirms what Blaxter *et al.* (1996:207) said about writing for research:

It is something of a contradiction or paradox, therefore, that many researchers, both *novice* [my emphasis] and experienced, are extremely reluctant or fearful when it comes to committing their ideas on paper.

Lastly, I have been able to draw meanings from the displayed data (see Figure 3.3) through a range of strategies that included the use of comparison, noting of patterns, clustering data with similar patterns, triangulation, following up key lines of inquiry and checking results with respondents. By putting all these strategies into play, I was able to achieve what Gherardi and Turner termed “data transformation” (cited in Denzin and Lincoln 1998:181) where information was condensed, clustered, sorted and linked over some time.

I now turn to describing how, in collaboration with twelve teachers from Samaj and Kenya High (co-researchers), we mobilised interpretive capital within five non-formal education organisations. The mobilising acts were carried out through social interactions with non-formal educators and mediating interpretation resources and materials that occurred in the organisations and workshops.

## PHASE ONE

### **REVIEW OF INTERPRETATION RESOURCES AND MATERIALS IN THE NON-FORMAL EDUCATION SECTOR**

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‘Voyaging into the Unknown’

## CHAPTER 4 MOBILISING INTERPRETIVE CAPITAL WITH TEACHERS

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Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable. (Tilden 1977:9)

### 4.1 INTRODUCTION

This chapter describes how I ‘voyaged’ into the uncharted territory of environmental interpretation and education processes in the non-formal education sector with a group of twelve teachers from Samaj School and Kenya High (see sections 1.4, 3.3.2). It is a reflexive story, which shares the findings of the first cycle of the participatory action research process in this study (see Figure 3.1). The findings are based on the interactions that we had with educational resources (both human and non-human) within five non-formal education organisations (see section 4.2). Central to these interactions was the process of *mobilising interpretive capital* with teachers (see sections 1.2.2, 1.3.1, 2.5.3). This involved generating theoretical and practical accounts of the symbolic capital (see section 1.2.1) available within the non-formal education sector. As implied in Tilden’s (1977) third principle in my opening quotation, interpretation as an art is a form of symbolic capital that may be shared with teachers to enhance their professional competencies (see section 4.3). On this premise, mobilising interpretive capital with teachers was carried out within the context of “... learning by doing and learning with others” (Kemmis and Wilkinson 1999:24).

The findings being described in this chapter are located within Latour’s (1999) social theory on the ‘situatedness of knowledge production’ (see sections 1.2.1, 1.4). In his *Essays on the Reality of Science Studies*, Latour (*ibid.*) described how scientific ‘facts’ are constructed in context. He related the way scientific facts are constructed and circulated to that of ‘flows’ in a circulatory blood system. Within the context of this study, social construction and circulation of interpretive capital for transformation of school grounds (see section 1.2.3) has been related to that of a ‘circulatory system’ with a number of flows (Latour 1999; see also section 6.2).

These flows (interrelated processes) are what facilitated the ‘voyaging into the unknown’ as described in this chapter. They are: the data generation techniques (see section 3.2.4) I applied; the partnerships we created with non-formal educators (see section 6.6); my co-researchers (teachers); the two schools I involved in the study (see sections 5.2, 5.3) and the dimensions of mobilising interpretive capital. The theme running through this chapter is that of the social construction and the sharing of interpretive capital with teachers that focuses on the fifth flow (dimensions of mobilising interpretive capital).

Mobilising interpretive capital with teachers involved making review visits to five non-formal organisations (see section 4.2), clarifying environmental interpretation and education processes in workshops (see section 4.3) and reviewing a sample of interpretive materials collected during organisational visits (see section 4.4). Undertaking these three interrelated processes, as described in this chapter, enabled us to develop a more in-depth perspective on environmental interpretation and education processes. By drawing on relevant social and educational theories, I discuss methods on environmental interpretation and educational processes in the non-formal education sector (see section 4.5). This is a further exploration of the perspective on interpretation as an environmental education process as introduced in Chapter 2.

Towards the end of this chapter (see section 4.6), I critically reflect on my interactions with teachers and non-formal educators in mobilising interpretive capital. Reflections on how the non-formal education organisations have matched their educational resources to the needs of schools (see section 4.6.1) are shared. A synthesis of the interpretive capital that was mobilised for use in schools is provided (see section 4.6.2) and constraints experienced during this phase of the study illuminated (see section 4.6.3). First, I describe the historical and social ‘waters’ that we plunged into by presenting the profiles of the organisations we visited.

## **4.2 REVIEW VISITS TO NON-FORMAL EDUCATION ORGANISATIONS**

A number of environmental education centres have been developed in response to environmental problems (see section 2.3.1) to enhance the provision of environmental education processes to schools in Kenya (Musyoki 2001 pers. comm.). For example, the Giraffe Centre was started in 1983 to educate the youth through its focus on the conservation

of an endangered animal species (the Rothschild giraffe) (*ibid.*). Many of the non-formal education organisations have interpretation resources that are used to engage learners in meaning-making and environmental learning (see Atiti 2002). A good example is the National Museums of Kenya, where I am the educator at its Nairobi Botanic Garden (see section 2.4.3). Many other organisations with similar interpretation resources for environmental learning occur within Nairobi and other parts of the country.

This review phase of the study involved visiting four other non-formal education organisations within the proximity of NMK (see also section 3.3.2). These were: Kenya Wildlife Services (KWS), Wildlife Clubs of Kenya (WCK), the African Butterfly Research Institute (the Butterfly Centre) and the Giraffe Centre. As I have argued (see sections 1.2.2, 2.2.2), non-formal education organisations are reproductive and distribution sites for symbolic capital (see section 1.2.1; see also Figure 6.1). The review visits to the organisations were aimed at mobilising the available symbolic capital to enable teachers to acquire techniques, social relations, skills and knowledge (interpretive capital) for the transformation of their school grounds (see sections 5.2, 5.3, 6.2).

In this section, I reveal the social and historical contexts in which we mobilised interpretive capital with teachers by providing some insights into the profiles of the organisations that we visited (see section 4.2.1). Later, I review how some interpretation resources were developed to foster environmental learning amongst school groups (see section 4.2.2). This is examined within the context of mobilising interpretive capital with teachers for transformation of school grounds at Samaj and Kenya High.

#### **4.2.1 Organisational profiles**

The findings that I share here are based on the interactions we had with the non-formal educators and also on my own experiences of working with KWS, WCK and Giraffe Centre educators. I focus on the educational resources that existed in the organisations and their broad conservation and education missions (see also section 4.6.1).

#### *4.2.1.1 National Museums of Kenya*

The National Museums of Kenya (NMK) is a non-profit making organisation that has a network of regional museums spread across the country. Its functions are made explicit in its mission statement (DS 38) and may be summarised as collecting, researching, documenting, preserving and exhibiting aspects of Kenya's natural and cultural heritage and educating its diverse audience on these (NMK and KWS 2002). A number of research departments exist to realise these functions (for example, ornithology, the herbarium, palaeontology, ethnography). To create public awareness about the importance of conservation and in particular the conservation of Kenya's unique natural and cultural heritage, a number of public programmes are provided by NMK. These include permanent, temporary and travelling exhibitions; educational programmes for school groups and the general public and the production of museum publications (AM 7).

A wide range of environmental education programmes that include workshops for teachers, garden-based action-oriented activities, guided tours, lectures and slide talks and films and video shows are offered. This is done within the NMK education department's mission of promoting people's understanding and the sustainable use of natural and cultural resources by enhancing access to NMK's research collections and exhibits (DS 38; see also NMK and KWS 2002:4). A number of facilities and education staff are available to ensure the realisation of this mission. There are three lecture halls with the necessary audio-visual equipment. Ten education officers are currently employed by NMK to implement public education programmes. I am one of these educators and my responsibility lies in the implementation of garden-based environmental education programmes (see also sections 1.1, 2.4.3, 4.2.2.2).

Apart from the education department, two other departments are directly involved in the provision of education services. The exhibits department has graphic designers who are involved in the production of interpretive materials (see section 4.4.3.1). The audio-visual department plays a pivotal role in the production of videos, slides and photographs needed for education programmes. I drew on the staff of these two departments (DS 14, DS 24, DS 25) a lot during the implementation of workshops (see section 4.3).

#### *4.2.1.2 Kenya Wildlife Service*

Kenya Wildlife Service is an autonomous state corporation mandated to conserve, protect and manage Kenya's biodiversity for the benefit of humans (NMK and KWS 2002). It manages several National Parks across the country and addresses human/wildlife conflicts. It undertakes research into biodiversity issues and also markets wildlife as a resource to tourists. KWS and NMK have strong collaborative links as a result of their related functions. A memorandum of understanding between them exists (NMK and KWS 2002).

KWS has a number of education centres across the country to support environmental learning processes amongst school groups and the general public. Its Wildlife Conservation Education Centre in Nairobi was the focus of our visits. The Centre undertakes many education programmes (AM 8) aimed at enhancing people's understanding of wildlife, ecosystems and the value placed upon them. Excellent facilities and resources exist to support the education and conservation missions of KWS. There are two lecture halls equipped with audio-visual equipment, and a desktop publishing unit with a modern studio for the production of education materials exists (AM 8).

Five naturalists with an educational training background have been employed at the Nairobi office. They facilitate environmental learning using interpretation resources at KWS including the recently developed Nairobi Safari Walk (see section 4.4.3.2). Other interpretation resources include the Nairobi National Park (the oldest national game park in Kenya) and the Nairobi Animal Orphanage. Although we did not focus on the National Park during our review session, this interpretation resource provides excellent opportunities for the environmental education of school groups. Visits to the park form part of an ecological circuit used by WCK, NMK and the Giraffe Centre for ecological field studies with organised school groups (see section 4.4.1.2).

#### *4.2.1.3 Wildlife Clubs of Kenya*

Wildlife Clubs of Kenya (WCK) is a charitable, non-governmental association that was formed in 1968. It has five regional offices and nine action groups spread across the country. Its mission is to educate and stimulate Kenyan youth for a better understanding of the

environment (see WCK 2002). The organisation has a network of members composed of 2000 school clubs, corporate members and associate members (*ibid.*). The Langata Environmental Education Centre in Nairobi has a youth hostel offering accommodation to visiting school groups. A training college has recently been opened to offer tertiary courses on tourism. Four education officers were employed there at the time of this study, one of them specifically responsible for a mobile education unit (outreach programme). The WCK mobile education programme provides illustrated talks on conservation to schools across the country. Other environmental education programmes are also on offer (AM 9). An ecological package programme that entails giving slide talks and conducting ecological field studies for school groups was one such example (see section 4.4.1.2). In Nairobi, the package involves taking school groups on an ecological circuit that includes visits to the WCK Nature Trail, KWS Nairobi National Park and the Giraffe Centre. There were plans to add the Butterfly Centre to the circuit (AM 8). A magazine known as *Komba* (a Kiswahili word for bush baby) is published and distributed to the members as a way of communicating environmental information (see WCK 2002).

#### *4.2.1.4 The Giraffe Centre*

The Giraffe Centre is located in Nairobi's Langata suburb and was created by the African Fund for Endangered Wildlife (AFEW), a Kenyan organisation that was founded in 1979 (AM 10). The mission of the Giraffe Centre is to educate Kenyan school children about their wildlife and environment. This is achieved through various environmental interpretation and education programmes. One such programme involves visiting school groups in the feeding of the Rothschild giraffes at the site. Allowing interactions with the Rothschild giraffe, which is an endangered animal species, is aimed at enhancing an awareness of the plight of endangered animals in the visiting school groups. The feeding of the giraffes is well liked by both school groups and tourists. The annual environmental essay and art competition that is used to create environmental awareness is perhaps the most popular activity in the calendar of the Centre. This competition climaxes with the awarding of prize to winners from all over the country. The prize awards are handed out during the first week of June to mark World Environmental Day. Other environmental learning activities include training workshops for teachers, fun-days for the younger children and environmental awareness workshops for high school students.

The Centre has a 100-acre nature sanctuary, the remnant of a tropical dry forest that once used to exist around Nairobi. There, a nature trail has been created (see section 4.2.2.3). The Giraffe Centre education facilities and the nature sanctuary were created in memory of the founder of AFEW, the late Jock Leslie-Melville. He had the vision of creating an education centre and rescuing a population of 120 endangered Rothschild giraffe species that were on a game ranch in Western Kenya at that time. Two lecture halls and a resource room have been developed to enhance the provision of education programmes to school groups. The resource room has displays of posters of the children's work arising from annual environmental art competitions. Interactive education displays are also found at the information centre. Two full-time education officers were employed to facilitate a variety of environmental education processes for visiting school groups (AM 9).

#### *4.2.1.5 The African Butterfly Research Institute*

The African Butterfly Research Institute (ABRI) is a privately owned commercial organisation in the suburbs of Nairobi (Karen). It has one of the most recent non-formal environmental education centres, the Butterfly Centre, in Nairobi. The Centre is still unknown to many schools and the public (it opened its doors in December 2000). ABRI's living and preserved collection of butterflies is one of the largest in the region. Between 400 and 500 live adult butterflies can be seen at any one time at the Butterfly Centre (AM 11).

The Centre has four visitor areas: the interpretation area, the flying house (similar to a greenhouse), a restaurant and a gift shop. The interpretation area has both informational and interpretive boards with texts and drawings on butterflies. Animated and interactive displays are also in this area. Butterfly exhibits have been used successfully as themes to illustrate biology and invertebrate natural history. They focus on Kenyan butterfly species and foster awareness of the need for the conservation of butterflies and their natural habitats. The flying house is a form of greenhouse that contains a tropical garden with host and nectar plants. Host plants provide food for butterflies during their larval stages and nectar plants provide nectar for adult butterflies (AM 11). The greenhouse is modelled on the concept of a butterfly garden where nectar and host plants are usually cultivated to attract butterflies (DS 5). Assorted products including models of butterflies are sold at the gift shop.

Three naturalists, who have no educational training background, had been employed to conduct guided tours for school groups and other visitors at the Butterfly Centre. Although the African Butterfly Research Institute is a relatively small place, it has started performing the functions of education, conservation, research and recreation, focusing on butterflies and other insects. On its premises is a research house where breeding of butterflies is conducted. A well-stocked library and lecture boxes that contain preserved collections of butterflies also exist.

Having provided the social and historical context within which interpretive capital was mobilised, I describe in the section that follows how, with the teachers, I reviewed the development and use of some of the interpretation resources we found in the above-mentioned organisations.

#### **4.2.2 Reviewing the development and use of interpretation resources**

At the outset of this study, I had not planned to review how interpretation resources (see section 1.2) were developed and used to support environmental learning amongst school groups. It later became clear to me that I could not develop interpretive materials with teachers (as indicated in my initial research goals), without first developing interpretation resources on their school grounds (see sections 1.2). The following journal entry illustrates this *reflection-in-action* (Schön 1983):

The participants were more interested in the nature trail development than the actual process of materials development. Although I had given them some guidelines on areas to explore, little effort was made towards this. We seem to have focused more on the broader Ooloolua Nature Trail programme than looking at specific aspects of how the trail guide was developed (Journal p. 36, 5 December 2000).

This reflection provides an example of teachers being able to determine aspects of the research process and hence, their own learning. This challenged my earlier narrow approach to the review process, which I had anticipated to focus only on interpretive materials. As we ‘voyaged’ on, a more open-ended approach to the mobilisation of interpretive capital was adopted to include reviewing how some interpretation resources were developed and used. As

mentioned earlier, the two schools had conceptualised interpretation resources to develop on their grounds prior to this study (see sections 1.1, 1.2.2, 3.2.3.1). We therefore focused on reviewing the development of a botanic garden and nature trails with Samaj and Kenya High teachers respectively. These were our attempts to make available interpretive capital to be drawn upon during the development of similar interpretation resources in the two schools (see sections 5.2, 5.3).

In this section, I provide an orientation for the perspective of interpretation as an educational process of meaning-making and critical reflection (see also sections 2.3.2, 4.5). I do this by critically examining how learners might be actively engaged in environmental learning processes at the Nairobi Museum (indoor interpretation resource), through social interactions with peers, more knowledgeable adults and the displayed objects (see section 4.2.2.2). I then describe how interpretive capital on the development of a botanic garden was mobilised through social interactions between teachers from Samaj and myself (see section 4.2.2.3). Finally, I outline how interpretive capital was also mobilised on the development and use of nature trails with teachers from Kenya High (see section 4.2.2.3). First, I provide an overview of the interpretation resources that we found in the organisations we visited and their significance in the provision of environmental interpretation and education processes.

#### *4.2.2.1 Interpretation resources within the non-formal education sector*

Our review visits revealed the existence of a variety of interpretation resources that support environmental interpretation and education processes amongst school groups (see also section 4.5). These were as follows (DS 7, AM 7 – 11):

NMK had a natural history museum (Nairobi Museum), a botanic garden (NMK Nairobi Botanic Garden), a nature trail (Oloolua Nature Trail), a snake park and aquarium; at KWS we found a national park (Nairobi National Park), a simulated habitat with captive animals (Nairobi Safari Walk), and an animal orphanage (Nairobi Animal Orphanage); both WCK and the Giraffe Centre possessed nature trails; and an interpretive centre with a greenhouse containing captive butterflies (Butterfly Centre) at the African Butterfly Research Centre.

These interpretation resources reflect Kenya's cultural, historical and natural heritage. They may be categorised into museums, botanic gardens, national parks, nature trails and exhibits on

captive animals (Nairobi Safari Walk, Snake Park, Aquarium, Butterfly House). In all the five organisations, a focus on the conservation of the natural and cultural heritage through education programmes was emphasised and made explicit in their mission statements (see section 4.2.1). This can only be achieved if learners are connected to these interpretation resources through educational processes of meaning-making and critical reflection (see section 2.3.2).

Through interpretation, learners may be connected to interpretation resources in the non-formal education sector through first-hand experiences with objects, artefacts and the landscape (Tilden 1977, Curthoys and Cuthbertson 2002). Effective interpretation can facilitate critical environmental education processes if interpretive capital is mobilised in ways that encourage learners to experience real objects, ask critical questions and develop action competency (see section 2.3.1). Illustrative media (interpretive materials) can foster meaning-making processes assisting learners to discover real-life examples of principles, problems and issues (Ballantyne and Uzzell 1994) and ask critical questions. This can stimulate them to participate in problem-solving and decision-making within their local contexts.

Apart from its potential to enable the development of critical environmental literacy and action competency in learners, interpretation in the organisations we visited seemed also to achieve other purposes. These included promoting an understanding of the organisations' missions, enhancing the public image of the organisations and accomplishing management goals through resource protection (DS 21; see also Sharpe 1982 on objectives of interpretation). These are exemplified in the following journal extracts:

... Interpretive signage with *messages on conservation activities* of KWS will be displayed. ... Seating areas at KWS Safari Walk will have messages that emphasise *return visitation* (Journal p. 34, 30 November 2000). [A public relations role for interpretation is implied here].

*Welcome to the World of Dudus* (insects) was the inviting interpretive signage that was inscribed on one of the boards (Journal p. 69, 3 February 2001).

The opening message on page three of the booklet was: *Leave nothing but footprints; take nothing but pictures* (Journal p. 77, 12 February 2001). [Learners are encouraged to manage the natural resource].

In addition, visitor orientation boards and directional signage found at both NMK and KWS (AM 7, AM 8) seemed to play a major role in visitor management and the enhancement of public image (Adoyo 2001 pers. comm.).

Nonetheless, interpretation by itself has a limited capacity to develop critical environmental literacy and action competence in the learners (Curthoys and Cuthbertson 2002) and also to realise related goals (Sharpe 1982). This can be attributed to single exposures for many of the school groups that visit interpretation resources (for example, the Nairobi Museum) within the non-formal education sector (see Sharpe 1982, Ballantyne 1998, Curthoys and Cuthbertson 2002). The role of the Nairobi Museum in mobilising learners' cultural capital for meaning-making processes and critical reflection amongst school groups is examined in the next section within this limitation.

#### *4.2.2.2 Meaning-making processes at the Nairobi Museum*

Museums have developed into institutions that collect, care for and communicate about their collections (Hooper-Greenhill 1994). As museum education expands, museum educators are developing their roles through new approaches to interpretation (*ibid.*). This is evident at the NMK, judging from its various approaches to environmental interpretation and education processes (see sections 2.4.3, 4.2.1.1). The NMK uses its collections and resources at the Nairobi Museum and the regional museums to enhance the standards of education in Kenya (AM 7). The emphasis in the school curriculum on using primary sources of information for learning has meant a high number of visitations by school groups to NMK. More than 150 000 school children visit the Nairobi Museum annually (DS 38). The Nairobi Museum has collections on natural history, archaeology, ethnography, geology and history. These are in the form of inanimate artefacts, exhibits of stuffed animals and dioramas. They have been interpreted to stimulate learners to think about the environment by mobilising their cultural capital learned in classrooms and other socio-cultural contexts. The potential of NMK to support environmental learning amongst visiting school groups lies in the well-labelled artefacts and the diverse collections. Their significance is what makes interpretation a relevant and worthwhile activity. The importance of exploring interpretation as an environmental education process is similarly linked to the potential value of these collections for educational

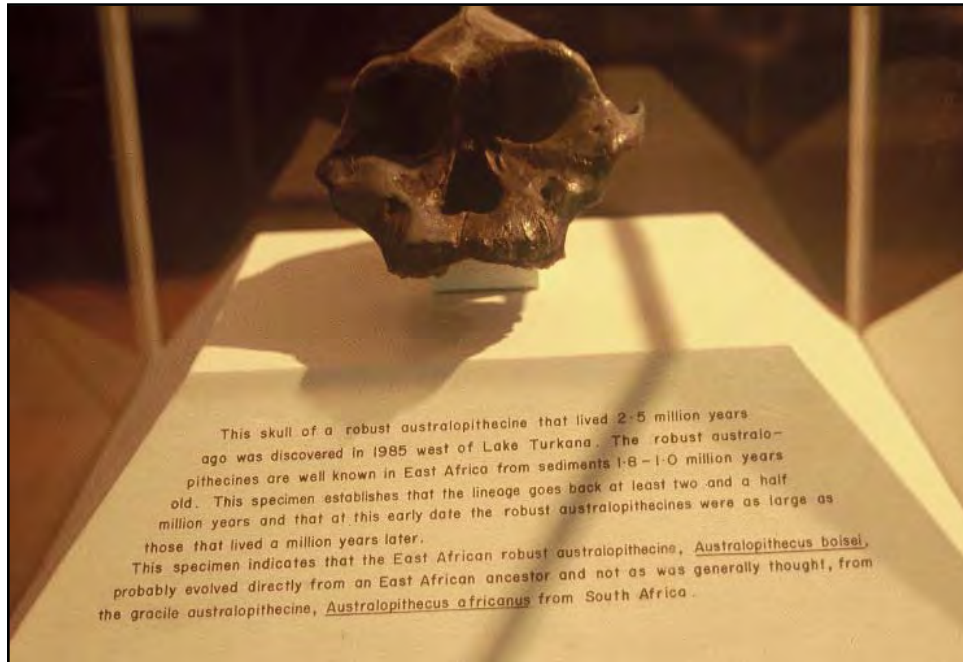
purposes. The following reflection that formed the basis for sharing my experiences in considering the educative role and value of interpretation during the *Museum 2000 Conference* that was held in Stockholm, Sweden (DS 29), emphasises this point:

To display an object of significance to the [learners] without attempting to communicate some of its values may be termed as irresponsible ... How can one interpret an artefact to meet the needs of different [learners]? What interpretive medium can be employed to create a relationship between an artefact and the [learner]? ... Can [an artefact] be used to put people, and things into their environmental context? ... The aim should be to get the [learner] to stop in front of an artefact, remain long enough to look at the artefact and be stimulated to immediate or future thought or action. ... In interpretive practice an artefact should publicly display text. How long should the narrative be? [How should it be written?] (Journal p. 166, 12 June 2001).

Although I had expected a lot from this workshop (as implied in the above reflection) we were only able to share a few aspects of interpretation within the perspective of my study. Despite the focus on meaning-making, none of the theoretical framework on which museum practitioners ground their interpretation was evident (see also section 2.3.2). We discussed how to write interpretive texts, but the educational perspectives behind the process never emerged (DS 29; see also section 2.3.2).

Earlier in the study, I documented through photography, some of the interpretive signage (see also section 4.4.3) found at the NMK. I involved a colleague (a museum photographer) to take slides of the interpretive panels, labels and associated texts around the Galleries, Snake Park, Aquarium and Botanic Garden (DS 7, DS 24, AM 7). Although I did not involve my co-researchers (teachers) in this exercise, I shared the slides (DS 24) during a workshop (DS 14; see also section 4.3) in which we reviewed some of the interpretive texts (see section 4.4.1). In the same workshop, a colleague (Adoyo) presented a case study on how interpretive signage is developed at the NMK (see section 4.4.3.1). Here, I focus on one of the slides of a displayed artefact with an accompanying interpretive text, taken at the Nairobi Museum (see Figure 4.1 below).

Like most of the artefacts that exist at the Nairobi Museum, the one shown in Figure 4.1 may engage learners in meaning-making processes through interpretation acts.



**Figure 4.1** An interpreted artefact at the Nairobi Museum  
(DS 25, 11 December 2000)

As learners walk through the Museum and interact with such an artefact (fossil of a hominid skull), their cultural capital might be mobilised for meaning-making processes and critical reflection. They might also make sense out of the interpretation acts in order to relate the meanings constructed in joint interactions with others to their lived experiences (see section 2.3.2.2). In the presence of a teacher or NMK museum education officer (a culturally more knowledgeable person), the learners may be assisted within their 'zones of proximal development' to make meaning of the subject (prehistory) being communicated (Vygotsky 1978). The meanings learners make may also be 'mediated' through the interpretive text. However, a closer look at this text reveals that it is more informational than interpretive (see Ham 1992, Tilden 1977). It only relates well to the subject of prehistory in content and serves to transfer prehistoric knowledge to learners (see section 2.3.2.3). The text itself may not challenge learners to engage in actions or processes to engage further meaning making processes (critical praxis).

From my experience at the NMK, very few learners on general visits take time to read the interpretive texts ascribed to various artefacts. There is a need to present these texts in ways that learners might be able to assimilate and respond to more easily. Some of these texts have not been evaluated since their installation (Adoyo 2001 per. comm.). Evaluation studies in museums have found out that large amounts of information provided in exhibitions may be “... educationally redundant” (Uzzell 1998c: 247). Uzzell (1998a) has criticised interpretation in museums for having a focus on the past. As in the above example (see Figure 4.1), the object being interpreted is mediated within an historical framework. The Nairobi Museum, like many other museums, presents the past in isolation from the present. This may negate the fact that the present is a continuation of the past, and that the present is tomorrow’s past (Uzzell 1998a). According to Uzzell (1998a: 15): “All historical moments should be seen as part of larger processes which are still in operation, and which often have wider spatial ramifications than are typically represented”. Through a future-oriented perspective within interpretive and educational experiences (Fien 1994, Fien and Tilbury 1998), non-formal educators and interpreters may present scenarios for the future direction of society (Uzzell 1998a). This can challenge learners to consider and make informed choices about aspects of the society in which they live or might want to live (see section 2.3.1.1).

In the section that follows, I describe how, through my interactions with Samaj teachers, interpretive capital was mobilised for the development of the NMK Nairobi Botanic Garden.

#### *4.2.2.3 Interpretive planning and the development of Nairobi Botanic Garden*

During the review visit by Samaj School teachers to the NMK Nairobi Botanic Garden on 14 February 2001 (DS 21, AM 7), I played the roles of a participant, an informant and a facilitator at the same time (see also section 3.3.2.2). The difficulties I experienced are reflected in the following journal entry:

One great challenge I faced today as an informant participant was to record what was discussed. It was difficult for me to write or take notes as I talked. Although I had expected the teachers to ask me questions, very few did. I ended up doing most of the talking with teachers taking a passive role. One question I kept on asking myself was whether the teachers were learning anything from my sharing of the experience (Journal p. 89, 14 February 2001).

By taking on the role of a participant informant, I allowed the teachers to investigate my own practice at the NMK Nairobi Botanic Garden (see also 4.4.2.2). Drawing on the interpretation resource planning process that took place at NMK in 1995 (AM 7) and also on my work experience, I provided some insights into the development of Nairobi Botanic Garden. A guided tour of the Garden with the teachers further exposed how I use the Garden with school groups. Before outlining the development process, I offer some background information on the NMK Nairobi Botanic Garden (see also section 2.4.3).

The six-hectare Nairobi Botanic Garden is situated in the grounds of the NMK within the city of Nairobi. At the moment, it is the only modern botanic garden in the country that serves the functions of education, research, conservation and recreation (see Atiti 1998). Together with the nearby Nairobi Arboretum, it is a member of the Botanic Gardens Conservation International (BGCI), a charitable organisation that networks global botanic gardens. Wyse Jackson (1999, cited in Wyse Jackson and Sutherland 2000:12) defined botanic gardens as "... institutions holding documented collections of living plants for the purposes of scientific research, conservation, display and education" (see also section 1.3.1). This definition includes a diversity of institutions that range from large gardens to small ones (see Wyse Jackson and Sutherland 2000 for the types of botanic gardens). *The Botanic Gardens Conservation Strategy* (IUCN, BGCS and WWF 1989) outlined a number of defining characteristics<sup>17</sup> of a botanic garden. The use of the term 'botanic gardens' has also been interpreted to include arboreta (see sections 1.3.1, 5.3) and other specialised forms of plant collections (Wyse Jackson and Sutherland 2000). The school-based 'botanic garden' (community garden) that we developed at Samaj (see sections 1.3.1, 5.2) is described within this framework (see section 5.2).

I now turn to the interpretive planning process that led to the development of various themes at the NMK Nairobi Botanic Garden. This process was carried out in 1995 by two consultants (a plant conservation scientist and a landscape designer) from Royal Botanic Gardens, Kew. The

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<sup>17</sup> The *Botanic Gardens Conservation Strategy* (IUCN, BGCS and WWF 1989:5) listed a number of characteristics that define a botanic garden. Some of these are: promoting conservation through environmental education programmes, adequate labelling of the plants, an underlying basis for the collections, proper documentation of the collections, an undertaking of scientific research, monitoring of the plants in the collection, open to the public, communication of information to other gardens and the public. Recently, BGCI reviewed the role of botanic gardens and published the *International Agenda for Botanic Gardens in Conservation* (Wyse Jackson and Sutherland 2000) that may be drawn on by botanic gardens when planning and developing their own specific programmes.

consultants carried out interpretive inventories of various sites in the country to identify a suitable area for the resource. In this research phase, they consulted other organisations and staff at NMK. Information gathered was used to decide on the present site at NMK.

Interpretive features that existed at the site were located, identified and described. Specialised input from NMK scientists and educators was drawn on and various themes for development suggested. These themes reflected some of the area's ecological and historical resources, which included wetland plant communities, a quarry garden and a memorial garden. The educational opportunities and limitations of each theme were highlighted.

Facilities and interpretive materials that were required to tell stories on the proposed themes were suggested. Inputs required in the form of budgets and plants were also drawn up. All these were synthesised to produce the NMK Nairobi Botanic Garden master plan that outlined the purpose, objectives, themes, organisational structure and principles of the proposed garden. It also included supporting maps, lists, development and operational details, budget and implementation and evaluation plans. The British government through a Plant Conservation Programme at the East African Herbarium (NMK) funded this process. Implementation of the master plan was coordinated by a steering committee that drew its membership from all the key NMK departments.

The interpretive planning process outlined above, reflects an expert-driven model (see section 2.5) that relied a lot on scientific information and consultants. It was a prescriptive planning model with a high degree of exclusivity of involvement that reduced collaboration during the research phase. I draw on interpretive literature (Bradley 1982, Sharpe 1982, Veverka 1994, Uzzell 1998c) to further illustrate features of this approach to interpretive planning and development.

Development of interpretation resources often follows a linear model<sup>18</sup> that involves three phases of survey, analysis and plan (Uzzell 1998c). Sharpe (1982:18) described these stages as a series of seven logical steps as follows: "... determining objectives, taking inventory, analysing data, synthesising alternatives, developing a plan, implementing a plan, and evaluating and revisiting it". In a nutshell, the process involves collecting all the relevant

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<sup>18</sup> According to Uzzell (1998c: 235), this planning model was devised by Patrick Geddes and has been taught in planning schools since the 1920s. Most interpretive planning follows it. Its features reflect that of the RDDA model of curriculum design (see section 2.5).

information about the interpretation resource to be developed and then analysing it with a view to projecting the data into the future. Finally a plan is drawn up that attempts to incorporate all the information and analyses within the context of 'good' planning and interpretive practice. This plan is then implemented through a communication model of '*who* says *what* to *whom*, *where*, *when*, *why* and *how*' (Veverka 1994, Uzzell 1998c). In the context of non-formal education organisations, 'who' may be graphic designers (see section 4.4.3), scientists, educators; 'what' are the themes and stories to be told; 'whom' are the actual audience; 'where' and 'when' refer to the precise locations and times at which interpretations will take place. 'Why' addresses the aims and objectives of the interpretation; and 'how' refers to the techniques to be employed (Uzzell 1998c).

In this technocratic approach, owners and managers of the interpretive sites have a preconception as to what they want without giving full consideration to all factors and their interaction (Uzzell 1998c). Recently, Curthoys and Cuthbertson (2002:234) critiqued this approach to interpretive planning and development for its reliance upon expert information when they argued:

Expert knowledge is typically equated with scientific knowledge. Yet science has traditionally shied away from the intangible, from things that are not easily categorised and quantified, and from areas of emotional attachment.

They went on to advocate an open and participatory approach to interpretive planning that might stimulate meaningful interactions within a localised setting (*ibid.*). I have adopted a similar approach to interpretation resource development with teachers as discussed later in my next chapter (see sections 5.2 and 5.3). Curthoys and Cuthbertson (*ibid.*) have further proposed four principles to guide interpretive planning in a localised setting. They are based on an undertaking to protect ecological integrity during the planning process; an inclusive and holistic conceptualisation of expert knowledge; a facilitation of the creative expression of connections to local settings and the availability of time and flexibility. Some of these principles concur with features of the participatory action research approach, which guided the design of this study (see sections 3.2.3).

These principles can also be drawn on when developing nature trails, as shown in the findings shared in the next section. The findings are based on the interactions between the teachers, non-formal educators and myself on the development and use of nature trails at the NMK, WCK and the Giraffe Centre.

#### *4.2.2.4 A focus on the development and use of nature trails*

A total of seven review sessions on the development and use of nature trails that existed at the NMK Ololua forest reserve, WCK and the Giraffe Centre Sanctuary were carried out (DS 7; see section 3.3.2.2). The nature trails were meandering footpaths with numbered posts that corresponded to interpretive texts in trail booklets (AM 7, AM 9, AM 10). The three trails have been developed to provide access to remnants of dry upland forest that once covered much of the Nairobi area. Apart from the plant focus, teaching and learning processes at the trails take into account other features like rivers, birds, insects, mammals and aspects of human influence on the environment. The main purpose of the trails was to provide first hand experience with nature (Gatheru 2000 pers. comm.).

According to Sharpe (1982: 298), “any short trail that provides access to a natural setting could be termed as a nature trail even if it lacks interpretation”. Those that provide interpretation at a series of stops in the form of a brochure, interpretive sign or booklet (the case in the three trails) become self-guided trails (Honig 2000). A number of advantages have been associated with self-guided trails (see Sharpe 1982, Ham 1992, Honig 2000). In the context of NMK, WCK and the Giraffe Centre nature trails, learners may be able to use them in their own time without relying on educators. Through the use of trail booklets, large numbers of school groups are usually divided into small groups (Gatheru 2000 pers. comm.). This, to some extent, may safeguard ecologically sensitive areas (Curthoys and Cuthbertson 2002). Using a trail booklet easily provides interpretation in “out-of-the-way” areas that may not be accessed by large numbers of people at the same time (Sharpe 1982: 300). In spite of these advantages, a self-guided trail story may not reveal many aspects of an object, as the communication is only one way. Social interactions between learners and more culturally knowledgeable educators (see section 2.3.2.3) during guided tours are likely to result in interpretation that is enjoyable, relevant, organised and thematic (Ham 1992). This may foster meaning-making and enable

critical environmental education processes.

During one review session (AM 10), K1 inquired why a trail had been developed at the Giraffe Centre. According to Gitonga (2001 pers. comm.), the trail offered many opportunities for environmental education activities for school groups through experiential learning (see section 4.3.1.1). Gitonga further noted that the majority of the visitors completing the nature trail were school children under the age of eight years. Activities for such young learners were structured, depending on their needs. Such activities included treasure hunts and simple games (see also section 4.5). Visits by older students (secondary school) were fewer and this was attributed to the overloaded curriculum (see section 2.2.2). Teachers from Kenya High were motivated to have a nature trail in their school, based on this constraint (see section 5.3.2).

Review sessions at the NMK and WCK with Kenya High teachers narrowed to focus on the process of developing a nature trail within their school grounds. I draw on our interactions with Gatheru (2000 per. comm.) and Ng'ang'a (2000 per. comm.) to outline the process. From the start, the purpose of the trail should be well stated. In schools, a nature trail may be used to interpret a site and to foster environmental learning. Linked to stating the purpose, is the need for one to have a theme in mind (see Sharpe 1982, Ham 1992, Honig 2000). A general theme that will foster environmental learning may be considered. Identification of features for interpretation at the site through a consultative process is required. This process requires the involvement of learners and as many teachers as possible to ensure the mobilising of the interpretive capital in school contexts. A whole-school approach is thus advocated.

When identifying features for interpretation and processes of mobilising interpretive capital in context, a consideration of the flow of stops and the trail layout are important (see also Honig 2000). The stops on the trail should support the overall theme, which should have links to the school curriculum and to the learners' experience in the local environment. Activities for learners should be tailored in accordance with curriculum needs, but in such a way as might mobilise their cultural capital towards taking action for the environment (see section 2.3.1.3). Depending on the creativity of a teacher, it is possible to incorporate an environmental focus in all subjects using the outdoors (see section 4.3.1.1).

Minimal impact on the environment should be made when cutting the nature trail. Once the trail is cut, different interpretive materials may be developed to foster environmental learning. Such materials may include worksheets and trail leaflets (see sections 5.2.3 and 5.3.3). Constant use of a developed site can prevent overgrowth of paths and reduce maintenance costs. However, the natural features of the site ought to be maintained as far as possible.

I have outlined how through our social interactions (with non-formal educators and interpretation resources), interpretive capital was mobilised and shared through a focus on the development and use of some of the interpretation resources we found at the NMK, WCK and the Giraffe Centre. In the next section I examine how through workshops, interpretive capital was further mobilised, shared, reconstructed and then made available for drawing on by teachers during the transformation of their school grounds.

#### **4.3 CLARIFYING ENVIRONMENTAL INTERPRETATION AND EDUCATION PROCESSES THROUGH WORKSHOPS**

In Chapter 1 (see sections 1.1, 1.4), I argued that mobilising interpretive capital with teachers involved ‘voyaging’ into the hitherto unknown territory of environmental interpretation education in the Kenyan context. In consequence, my co-researchers lacked professional competencies in environmental interpretation and education processes prior to this study (see sections 5.2.1.1, 5.3.1.1). Introducing aspects of socially critical approaches to environmental education processes (see section 2.3.1) and theoretical perspectives of interpretation as an environmental education process therefore became necessary. It was on this basis that workshop forums, in which interpretive capital was mobilised, were created (see also sections 3.2.4.5, 3.3.2.2) to clarify the concepts of environmental interpretation and environmental education with teachers. This fostered in teachers an understanding of interpretation and environmental education processes as mutually reciprocal aspects of enabling the development of critical environmental literacy and action competence (DS 16). This provided the conceptual basis for mobilising interpretive capital with teachers as discussed in this chapter.

In three workshops (see sections 3.3.2, 3.3.3) that were held at NMK (DS 14, DS 15, DS 16), non-formal educators and colleagues at the NMK shared their interpretive capital with teachers. Characteristic of these workshops were opportunities for critical reflection and assessment of the actions of participants (workshop processes) through evaluation questionnaires (DS 13) and informal feedback. In this way, interpretive capital was socially constructed and re-constructed as non-formal educators and teachers interacted to make meanings on the basis of each other's experiences (Wells 2000). This was within the contexts of the environmental education processes that occurred in both schools and the non-formal education sector. Social interactions during the workshops facilitated a critical and praxiological examination of the relationship between environmental interpretation and education processes. The social interactions were supplemented with readings (DS 11; see also Appendix 3 for readings list) that I provided during the workshops. Through active engagement with some of these readings in workshop sessions, further interpretive capital was mobilised with teachers.

As mentioned at the beginning of this chapter, the process of mobilising interpretive capital was also aimed at enhancing 'teacher professional development'<sup>19</sup> (see section 6.4). I draw on the critical reflections of teachers after workshop sessions (DS 13, AM 14; see also section 4.6.2) to provide evidence of how the professional competencies of teachers may have been enhanced. First, I describe how teachers were engaged in workshop activities aimed at exploring environmental and education processes with non-formal educators.

#### **4.3.1 Exploring environmental education processes with teachers**

Taking on the role of a resource person during the June workshop (DS 15, AM 14), I shared with the teachers, three views on education (see Fien 1993) and located environmental education processes within the socially critical orientation (see section 2.3.1). To this end, I clarified what a socially critical approach to the teaching of environmental education processes in schools entailed (see section 2.3.1). In the same vein, I brainstormed orientations to curriculum development with reference to interpretive materials (see section 2.5). In this way,

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<sup>19</sup> In this study, I have restrained myself from using the term 'teacher professional development' as it has been used in many workshop contexts to imply 'something done *to* teachers' during a learning process (Wells 2000). In this study, I use the term 'enhancing teacher professional competencies' to imply that learning was *with* teachers (see also section 2.5.2). We were assisting each other to learn in our 'zones of proximal development' (see section 2.3.2.2) when mobilising and constructing the interpretive capital through reflective practice.

a capital of ideas that teachers were to draw on during the critical reviews of interpretive materials was mobilised (see section 4.3). Within the critical orientation of this study, I engaged the teachers in self-reflective group activity that required them to identify some constraints that hinder critical environmental education processes in their schools (AM 13). These activities are shown in Table 4.1 below.

**Table 4.1** Constraints to the teaching of environmental education

<p><b>22 June 2001 workshop group activity involving discussion of constraints and responses</b></p> <ul style="list-style-type: none"> <li>• In groups discuss some of the constraints/tensions you have experienced in implementing environmental education processes in your school.</li> <li>• How have you responded to some of these constraints or how are you planning to respond to them?</li> <li>• Your school is currently making attempts to develop interpretive opportunities on the school grounds to enable environmental learning. With reference to the constraints that you have cited above, comment on the effectiveness of this approach in preparing learners to address environmental issues facing their local community (DS 14).</li> </ul>
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Constraints to the implementation of environmental education processes in their schools were identified and possible responses to them deliberated (Atiti 2001e; see also Appendix 2 for paper presented during EEASA conference). A lack of experience and training in environmental education, inadequate materials that may support environmental learning in schools, an absence of environmental policies in the schools and an overloaded curriculum were cited as major constraints (see sections 2.2.2, 5.2.1, 5.3.1; see also Robottom 1987, Fien 1993). As a response to some of these constraints, the teachers proposed the introduction of both pre-service and in-service training in environmental education, the formulation of environmental policies in schools, the involvement of school managers in environmental problem-solving and the development of interpretation resources and materials within schools. In trying to suggest possible responses to these constraints, teachers were encouraged to deliberate solutions to some of these problems and contextual factors as an aspect of critical education research (see section 3.2). This provides an example of how teachers were engaged in a process of mobilising interpretive capital in context (see also sections 5.2.1, 5.3.1). At the end of this workshop activity, K5 claimed that she had gained useful insights into how to

improve the teaching of environmental education processes at their school (DS 14).

To further locate socially critical environmental education processes within the school curriculum, Musyoki (educator from the Giraffe Centre) was invited as a resource person for the September 2001 workshop (DS 15). Her presentation focused on '*Centre-based environmental education processes and the school curriculum*'. She challenged us to adopt a holistic approach to the teaching of environmental education processes that viewed the environment as an interacting system of social, physical, economic and political dimensions (see O'Donoghue 1988, Lotz 1996; see also section 2.3.1.1 for views on the environment). Such a view can enable teachers to address environmental issues and risks from a broader perspective and foster a better understanding. Furthermore, this may enable teachers to realise that environmental education processes can be incorporated into all subject curricula, not only in the sciences (see section 2.2.1).

Musyoki (2001 per. comm.) outlined how different approaches to the teaching of environmental education processes have emerged over time (see also Lotz-Sisitka 2001). She shared with us a number of methods and activities that may be used to enhance environmental education processes as follows:

Guided investigation; sensory and creative methods; using tools of science to provide a link between local environment issues and topics in the school curriculum; action research or community problem solving; and interpretation, that is a valuable form of communication used in non-formal education sector (DS 15, 22 September 2001 workshop proceedings).

Addressing environmental issues through a combination of these methods is required for socially critical environmental education processes to be fostered in schools (see section 4.5). Activities that engage learners in active learning, where they are allowed to discover and take action, are ideal for fostering critical environmental literacy and action competence (see sections 2.3.1.3, 5.2.4, 5.3.4).

Reflecting on this presentation later, SC1 had this to say:

[The presentation] ... specifically gave me a realistic view on how environmental education processes can be applied to various subjects across the curriculum. It also gave me more insights into how environmental education processes can be made more

interesting by encouraging student participation through games and other relevant activities (AM 14).

Reflections like this one from SC1 may imply that the presenter (Musyoki) enabled teachers to engage in constructing new knowledge (see section 2.3.2.2) through the sharing of ‘interpretive capital’ and the meaning-making processes that took place. Other examples are illustrated in the following reflective comments from returned evaluation questionnaires (DS 13):

I have been able to know how to prepare materials ... I should include as many people as possible during the development process (K5). There is need to have adequate monitoring and evaluation in the teaching of environmental education processes (S4) (AM 14, 22 June workshop evaluation).

Most of the workshop activities were geared towards materials development, and this accurately coincided with my expectations (S1); ... the workshop was aimed at helping us learn how to develop materials for the arboretum and we learned a lot (K5); ... it widened my scope of the environment especially the concepts of education *for*, *about* and *in* (K3) (AM 14, 22 September workshop evaluation).

I appreciate the knowledge that I have gained as a result of my participation and hope to be involved in more future activities (S4); the workshop organisation and facilitation has been very educative, it has shed a lot of light in many areas of environmental education and interpretation. ... It served as a forum for exchanging different experiences that the participants have gone through in the time they have worked on this project (S6) (AM 14, 3 April 2002 workshop evaluation).

From the above reflective comments, it is evident that through the workshops, teachers gained a better understanding of environmental education processes. In the next section, I examine how environmental interpretation was also explored through workshop sessions with teachers. Central to this, is the sharing of techniques, skills and knowledge on interpretation (interpretive capital) with teachers.

#### **4.3.2 Exploring environmental interpretation with teachers**

One aspect of this study involves exploring a perspective of interpretation as an environmental education process (see sections 1.2, 2.3.3). This required non-formal educators to share (make available) “tools and skills of interpretation” (Uzzell 1989: 9, see also Atiti 2002).

Environmental interpretation as a profession is a relatively new area in Kenya. To introduce

teachers to some of the discourse of environmental interpretation, I engaged a colleague (Lusweti) from NMK and a naturalist from KWS (Mbogo) to share their interpretive experiences with teachers. Lusweti (from NMK) facilitated three sessions on '*Introduction to interpretation*'; '*Practicing thematic interpretation*' and '*Development of interpretive materials for various age groups*' during the 22 June 2001, 14 September 2001 and 3 April 2002 workshops respectively (DS 14, DS 15, DS 16; see also Appendix 3 for a workshop programme). Mbogo (2001 pers. comm.) shared some guidelines on how to practise interpretation in schools during a presentation on '*Environmental interpretation at the KWS Nairobi Safari Walk*' (DS 14). First, I describe these guidelines.

According to Mbogo (*ibid.*), there are a number of considerations/guidelines for implementing interpretation in schools. She shared them as follows:

A consideration of the type of audience in a school (for example, learners, teachers and parents) is necessary when deciding on the nature and purpose of information for interpretation. Once a decision is made, the information should draw from a wide range of subjects through a consultative process in the school. The information should be presented to the learners in an interpretive way by making it relevant, enjoyable and readable. This may enable the learners to remember and retain the messages<sup>20</sup> for a longer time. The site for interpretation should be suitable to enable access to the information. This information may be presented at different levels, for example, for learners, teachers and even parents. While the school's budget will determine the choice of the interpretive material to be used, durability and quality of the material should be strived for. Where the budget permits, different guidebooks and worksheets may be developed for various levels of learners (DS 14, 22 June 2001 workshop proceedings).

I draw on Lusweti's (2001 pers. comm.) presentations to provide further insights into how interpretive capital was mobilised and reconstructed during workshop sessions with teachers.

Teachers in their work contexts may draw on principles and qualities of interpretation (Tilden 1977, Ham 1992; see also 2.3.2.1) to enable environmental interpretation and educational experiences with learners. Practising interpretation through interpretation resources developed in schools has many advantages other than enabling environmental learning processes (see section 2.3.1). These were generated during the June workshop as follows:

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<sup>20</sup> This argument is based on the transmitter-receiver model (Hooper-Greenhill 1994) that reflects a behaviourist approach to environmental learning (see section 2.3.2.1). This approach has been criticised for its assumptions that a change in environmental behaviour may occur in learners if they know more about their environment (see Huckle 1993, Wals *et al.* 1999).

Saving the schools time and money spent in organising field trips to non-formal education organisations. Interpretation resources owned by schools will create a sense of pride in the school community of teachers, learners and parents. Interpretation through them may win public support in fundraising for environmental learning projects. It will also contribute to effective management of school grounds as many schools have under-utilised areas in their compounds. For schools with such large areas, it is possible to incorporate into their development, recreation areas (e.g. camping facilities) that may be used for school-based eco-tourism activities. Charging for the use of such areas by outsiders may generate much-needed income in the schools. Lastly, practicing interpretation within school grounds provides opportunities for the teachers to carry out research in their own backyard (DS 14, 22 June 2001 workshop proceedings).

During the workshop, the teachers identified some environmental interpretation and education methods that may be used within their school grounds to engage learners in investigation, social critique, information finding, action taking and reporting to participate in social change (see section 4.5.2). These methods included guided tours, demonstrations, storytelling, role-plays, games and debates (DS 14). In addition, the teachers identified non-personal approaches to interpretation within schools that involve the use of a variety of interpretive materials like interpretive signage, publications (posters, brochures, trail leaflets and activity sheets), multi-media (audio-visual programmes, videos and audio tours) and exhibitions (see section 4.4.2, 4.4.3; see also Sharpe 1982, Ham 1992, Honig 2000).

Due to the focus of this study on the development of similar materials, Lusweti further engaged the teachers in mobilising interpretive capital on the possible qualities of such materials (DS 15) during her presentation on the *'Development of interpretive materials for various age groups'* (see sections 5.2.3, 5.3.3). As a result of this engagement, qualities interpretive materials may possess to foster meaning-making processes amongst learners through interpretation and educational experiences were socially constructed (DS 16). The following qualities were shared (DS 16):

The materials should mobilise learners' cultural capital easily for meaning-making processes in the absence of the teacher; they should be appropriate to the levels of the learners; should reflect principles and qualities of interpretation within a communicative perspective; should be flexible for use both the interpretation resource and in the classroom; and should engage learners in problem posing to enable them critique and challenge what is being interpreted (3 April 2002 workshop proceedings).

Materials that possess most of these qualities have the potential to assist in the mediation of social interactions that may assist learners to engage in critical praxis. However, development of such materials requires a thematic approach to interpretation (see sections 5.2.3, 5.3.3). This is an approach that entails building themes into a title (see Ham 1992, Honig 2000) to provide focus for the interpretation. Lusweti (2001 pers. comm., see also Ham 1992) pointed out the differences between a theme and topic when she stated:

A theme is the specific message about the subject of presentation and is always stated as a complete sentence. It contains related facts that exclude the irrelevant ones ... a topic is the subject of the presentation. It is a word or fragment of sentence and covers many unrelated themes and facts (DS 15).

Table 4.2 below further illuminates these differences. From the table, it is evident that themes are easier to follow and makes information more personal. If used well in interpretive material, they may stimulate learners to engage with the subject being presented (see section 5.2.3.4).

**Table 4.2** Differences between topics and themes

<i>Topic title</i>	<i>Theme title</i>
Samaj School Garden	Samaj School has a new Garden.
Succulent Garden	These plants ration water.
Waste Management	Let's reduce our wastes.
Herbal Garden	You can treat yourself here!

A workshop activity (DS 15) on how to develop and work with such themes provided an opportunity for the teachers to reflect on the advantages of adopting a thematic approach to interpretation in schools. S1 claimed that he gained useful insights into practising thematic interpretation when he reflected: "Practising thematic interpretation ... can bring about captivating messages which provoke students' thoughts, hence make them critical and have a broader view to environmental issues" (DS 15).

To be in a position to critically evaluate interpretation resources and materials developed in schools, an evaluative tool is required (see sections 5.2.3, 5.3.3). In the section that follows, I

outline how teachers were engaged during a workshop activity in a process of mobilising interpretive capital that resulted in the generation of an evaluative tool.

### 4.3.3 Generating an evaluative tool to explore interpretation practice

During the 3 April workshop 2002 (DS 16), teachers were engaged in the process of generating a checklist<sup>21</sup> (see Table 4.3 below) that was used to critically evaluate some of the materials developed in their schools.

**Table 4.3** A checklist developed by teachers

- Is the material attractive?
- Does the material provoke learners? Does it stimulate ideas?
- Does the material need little or no explanation?
- Is the content adequate and relevant to the needs of the school curriculum?
- Are the facts accurate?
- Is it easy to use? Is the writing legible?
- Does it require a response from the learners?
- What is the cost implication in the production of the materials?
- Is the cost realistic?
- Has the material been produced in an environmentally friendly manner?
- Is the material durable?
- Can the materials be easily reproduced?
- Is the material flexible to use?
- Is the information contained in the material enjoyable?

Drawing on their own practice and theory, teachers generated ideas to come up with the above checklist. This was one of the many ways teachers proved their potential as active generators of interpretive capital through ‘learning by doing’ (see also sections 5.2.2.3, 5.3.2.3). In this case, no theoretical impositions on how to evaluate materials were made, apart from providing

<sup>21</sup> The checklist that was developed consisted of a series of statements that described critical attributes of the materials teachers developed (Ballantyne and Uzzell 1994). These statements provided a basis for reflecting on the effectiveness of the interpretive materials in engaging the learners in critical and action-oriented environmental education processes. Checklists play an important role as teaching and learning tools for promoting critical evaluation of a performance and product (*ibid*; see also section 3.2.4.6).

reading materials as background (DS 11). It provides an example of construct validity (Lather 1986) as highlighted in section 3.4.2 in the previous chapter.

The statements in the checklist (see Table 4.3) reflect some key qualities envisaged in the practice of interpretive materials development in what some have termed as ‘principles of good practice’ (see BGC I 2000). These include: relevance to the school curriculum; qualities and principles of interpretation (Tilden 1977, Ham 1992; see also previous section); costs and durability; flexibility in use and reproduction; accuracy of information; and values observed during reproduction. Interpretive materials that reflect some of these key qualities have the potential of, mobilising learners’ cultural capital for meaning-making processes that may lead to critical reflection and action.

Drawing on the above checklist and one developed by Ballantyne and Uzzell (1994) (provided as workshop reading), the teachers were able to critically evaluate a sample of materials they had developed in their schools (DS 18). In this way, the interpretive capital constructed was immediately put to use (Wells 2000). I have further synthesised these two checklists into one (see Table 4.4 below) that may be drawn on by teachers when evaluating materials developed within their contexts.

Like the guidelines suggested in Chapter 6 (see section 6.5), this checklist should not be used in a prescriptive manner. Ideally, an evaluative tool needs to be developed before commencing the development of interpretive materials (Graham 2001 pers. comm.). Teachers can involve their learners in generating criteria on which to base critical evaluation.

Non-formal educators may use the checklist synthesised in Table 4.4 below to identify the strengths and weakness of interpretive materials in their organisations (see Ballantyne and Uzzell 1994). Opportunities for improving materials development practices can be identified (see section 4.4.4.7) and then acted upon. In this way, interpretive materials that can engage learners in critical and action-oriented environmental education processes may be realised.

**Table 4.4** An evaluative tool for interpretive materials

<b>Critical attributes</b>	<b>Descriptive statements on the critical attributes</b>
<b>Links to the school curriculum</b>	<ul style="list-style-type: none"> <li>• Is the content relevant to the school curriculum?</li> <li>• Are the themes reflecting various subjects in the school?</li> <li>• What age group is the material suitable for?</li> <li>• Does the information cater for various age groups?</li> </ul>
<b>Costs and durability</b>	<ul style="list-style-type: none"> <li>• Is the material affordable?</li> <li>• How durable is the material?</li> </ul>
<b>Values</b>	<ul style="list-style-type: none"> <li>• What values are being reflected in the material?</li> <li>• Do the materials reflect ecological and social values in the text?</li> </ul>
<b>Flexibility and reproduction</b>	<ul style="list-style-type: none"> <li>• Can the material be used both in both outdoors and classroom settings?</li> <li>• How easily can the material be reproduced?</li> </ul>
<b>Design and appearance</b>	<ul style="list-style-type: none"> <li>• Is the material captivating?</li> <li>• Doe the materials cater for different learning styles?</li> <li>• What is the standard of presentation in terms of texts and pictures?</li> </ul>
<b>Learning and teaching methods (Environmental interpretation and education methods)</b>	<ul style="list-style-type: none"> <li>• What learning and teaching approaches are proposed in the text?</li> <li>• To what extent does the material allow for mobilising learners' cultural capital for critical and action-oriented environmental learning activities?</li> <li>• Do the materials pose questions that may lead to critical reflection and action?</li> <li>• Do the materials propose a variety of educational and interpretive experiences?</li> </ul>
<b>Follow-up activities</b>	<ul style="list-style-type: none"> <li>• Do the materials encourage learners to find out more information on their own?</li> <li>• Are there suggestions on actions learners may take to solve a local environmental problem?</li> </ul>
<b>Information presentation and accuracy</b>	<ul style="list-style-type: none"> <li>• Is the information presented in a relevant, enjoyable, thematic and organised manner?</li> <li>• Does the information relate to the lived experiences of the learners?</li> <li>• Is the information in the material accurate and up-to date?</li> <li>• Does the information relate the learner to the object being interpreted?</li> </ul>

**Source:** Adapted from Ballantyne and Uzzell (1994:118-121) and 3 April 2002 workshop proceedings (DS 16).

In the next section, I describe how interpretive capital was further mobilised with teachers through a review of how some interpretive materials were developed and used for environmental learning in the five organisations that we visited.

#### **4.4 REVIEWING INTERPRETIVE MATERIALS WITH TEACHERS**

In Chapter 1, I indicated that one of my initial research goals was to review how a sample of interpretive materials were developed and used within the non-formal education sector (see section 1.2). In this section, I examine this initial research goal in the re-conceptualised framework of mobilising interpretive capital with teachers (see section 1.2.2). Through interactions with a sample of interpretive materials collected during organisational review visits (DS 5), teachers were supported in mobilising interpretive capital that was later drawn on during the development of similar materials in their schools (see section 5.2.3, 5.3.3).

It will become evident from the sections that follow that the contents of an interpretive material may largely reflect materials development practices within an organisation. This argument is captured in the various themes that emerged from the materials review processes with teachers (see section 4.4.4). The inscription of meaning in materials development practices, as outlined in these themes, was through processes that entailed critical reviews of a sample of materials within a negotiated framework during focus group interviews and workshop sessions. In addition, social interactions with some of the non-formal educators also contributed to this meaning-making. During the interactions, understanding, skills and values (interpretive capital) associated with interpretive materials development were examined. An overview of how some of the interpretive materials were reviewed with teachers is now outlined.

##### **4.4.1 An overview of review processes**

During our organisational visits (see section 4.2), we found a variety of interpretive materials that were used to support environmental learning processes with school groups (DS 5, AM 6). These included interpretive signage, interpretive labels, worksheets, trail booklets, interactive displays, teachers' packs, exhibitions, brochures, posters and videos (see Appendix 4). In total, thirteen interpretive materials were documented for review (AM 6) through photography (see section 3.2.4.7) and a collection of samples of textual materials. Interpretive materials have been regarded as non-personal interpretive media<sup>22</sup>(Sharpe 1982) and can be categorised into

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<sup>22</sup> I apply the term interpretive media here to refer to “means, methods, devices, or instruments by which the interpretive message is presented to the public” (Sharpe 1982:101). Traditionally interpretive media are divided into personal (see section 4.5.1.2) and non-personal.

interpretive publications (posters, brochures, trail leaflets and worksheets); interpretive panels (interpretive signage, labels, orientation boards); multi-media (audio-visual programmes and videos) and exhibitions (see Sharpe 1982, Ham 1992, Honig 2000). Our reviews focused only on publications and interpretive signage. Reviewing the development and use of publications (see section 4.4.2) and interpretive signage (see section 4.4.3) occurred at three levels: during organisational visits; critical reviews during workshops (document analysis) and during presentations on materials development case studies in workshops. At all the levels, interpretive capital was mobilised by engaging the teachers in reflexive processes of critical contextual reviews (Lotz-Sisitka 2001b) of identifying practices and key shaping ideas on the development and use of interpretive materials (see Table 4.5 for review framework).

**Table 4.5** Mobilising interpretive capital through workshop group tasks

**22 June 2001 workshop group tasks**

**TASK 2: Critical review of textual interpretive materials**

- You will work in groups to critically review some of the materials we collected during review visits. Your main task is to critically review the educational ideas informing the development of the resource. Before undertaking this task, go through *Readings 3, 6, 7 and 8* (see Appendix 3).
- In your review, comment on: The education orientations of the authors, the role of the learner and teacher, the values being supported by the material, the environmental education methods being proposed in the text and whether you would use the material in your school.

**14 September 2001 workshop group tasks**

**TASK 1: A critical reflection on phase one of the study**

In groups, critically reflect on the review visits we made to NMK, the Giraffe Centre, KWS, the Butterfly Centre and WCK by making detailed comments on: Your views on the roles played by the non-formal educators in materials development; the relevance of the visits to your school project; teacher participation in materials development; key findings and how you have started applying them to your project; and gaps you may want to fill as a result of the review visits.

**TASK 2: More critical reviews of materials**

You will work in groups to critically review more textual interpretive materials we collected from the organisations that we visited. This time give more detailed comments, based on the insights you have gained so far. Each group will be expected to review at least two types of materials. Make detailed comments on: The design and appearance of the material; applicability to the school context; your perception of the role of the user; environmental education methods being proposed in the material; educational orientation of the author; values that the materials supports and any other comments.

Through focus group interviews (see sections 3.2.4.3, 3.3.2.2) that took place during organisational visits (DS 7, DS 21; see also section 4.2), non-formal educators shared their

interpretive capital on how the materials we found in their organisations were developed and used with school groups. The interpretive capital that was mobilised was captured through photography (see sections 3.2.4.8, 4.2.2.1), taking notes, audiotape recording (DS 7) and journal writing (DS 21). By triangulating these different sources (see section 3.4.2), a summary of the findings on the thirteen interpretive materials reviewed was tabulated (AM 6, AM 16; see Appendix 4). During the June 2001 and September 2001 workshops (DS 14 and DS 15; see also sections 3.2.4.5, 4.3), teachers were engaged in three group tasks (see Table 4.5) in which five interpretive materials were critically reviewed (see Atiti 2001e).

In Appendix 4, information on the interpretive materials reviewed with teachers has been summarised into two tables (see Tables 4A and 4B) under various themes. These themes reflect the interpretive capital that was mobilised. Tables 4A and 4B in Appendix 4 are a synthesis of information on all the interpretive materials we reviewed. This information is on: the context of use; when and how the materials were developed; curriculum links; the role of evaluation; pedagogical processes; views on education and the environment reflected in the texts and environmental values reflected in the texts. In addition to themes reflected in Tables 4A and 4B, insights into environmental education methods proposed in the texts and principles of interpretation reflected (appearance and design) was mobilised. I have drawn from both tables when examining the overall themes emerging from the reflexive processes of critical contextual reviews with teachers (see section 4.4.4).

Four case studies on materials development were presented during the June 2001 and September 2001 workshops. During the June 2001 workshop, Mbogo (KWS), Gitonga (the Giraffe Centre) and Adoyo (NMK) presented: '*Environmental interpretation at KWS Safari Walk*'; '*Design of Giraffe Centre trail booklet*'; and '*Development of interpretive signage at NMK*' respectively (DS 14). I presented on how I developed an activity sheet on '*Plants in our Environment*' during the September 2001 workshop (DS 15). Interactions with teachers during and after the presentations on these four case studies further mobilised interpretive capital that was made available to be drawn on for the development of similar materials in schools (see sections 5.2.3.4, 5.3.3.2).

In the sections that follow (see sections 4.4.3 and 4.4.3), I describe the development actions associated with various interpretive materials (publications and interpretive signage) by largely drawing on the workshop presentations on the four case studies by non-formal educators. Findings from the presentations are also drawn on when examining the themes that emerged from the materials review processes (see section 4.4.4). First, I review the development of interpretive publications at NMK, WCK and the Giraffe Centre.

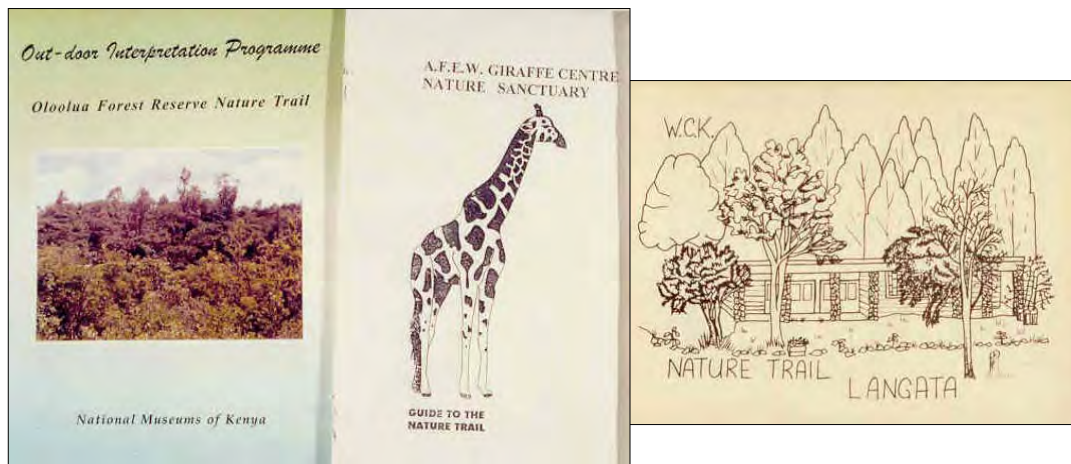
#### **4.4.2 Reviewing the development of interpretive publications**

According to Dunmire (1982, see also Ham 1992, Honig 2000) interpretive publications may include interpretive handbooks, theme booklets, trail booklets and publications directed to school groups. In this study, my focus was on the publications such as teacher packs, worksheets and posters that are mainly directed to school groups. Not all publications may be interpretive within the context of interpretation principles and qualities (Sutherland 2001 pers. comm.; see also sections 1.3, 2.3.2.1). For example, an informational poster differs from an interpretive one. An interpretive poster can mobilise learners' cultural capital for meaning-making processes that may enable critical reflection and the taking of action. An informational poster only serves to provide factual information that may not engage learners in critical reflection (see section 2.3.2.3)

A number of advantages are associated with interpretive publications as a medium of interpretation (see Dunmire 1982, Ham 1992). Within school contexts, they have the potential for offering background information on environmental themes, as well as mobilising learners' cultural capital for meaning-making processes through social or cultural interactions (see sections 2.3.2.2, 2.3.2.3). Interpretive publications also have the advantage of being flexible as they can be used both in the classroom and in the outdoors (see section 4.3.1.2). However, they have the disadvantage of being a one-way form of interaction (self-mediated interpretation) when a learner uses them in the absence of peers and more culturally knowledgeable adults (teachers) (see also section 4.5.1). The processes involved in the development of WCK, NMK and the Giraffe Centre trail booklets are now shared (see also Appendix 4).

#### 4.4.2.1 Trail booklets

The three trail booklets we found at WCK, NMK and the Giraffe Centre are reviewed here (see Figure 4.2), drawing on the interpretive capital that was mobilised through interactions with both the materials and non-formal educators (see section 4.4.1). Findings shared on the WCK and NMK trail booklets are based on the focus groups interview Kenya High teachers had with non-formal educators from the two organisations (see also 4.2.2.3). The findings on the Giraffe trail book described here are from the case study presentation by Gitonga (2001 pers. comm.) mentioned earlier (see section 4.4.1). Teachers from both Samaj and Kenya High later drew on the interpretive capital that we mobilised during the development of trail booklets in their schools (see sections 5.2.3.4, 5.3.3.1).



**Figure 4.2** The three trail booklets that were reviewed  
(DS 24, 22 June 2001)

#### WCK trail booklet

Following our social interactions with Ng'ang'a (2000 pers. comm.) during a review visit to WCK with Kenya High teachers, a number of fundamentals underpinning the development process of the WCK trail booklet emerged (AM 9). Key features to be interpreted at the site were first identified. A team comprising an ornithologist, a botanist, a zoologist and an artist was then contracted to research and write interpretive texts on these features and to design the booklet. The artist and botanist on the team made illustrations to support interpretive texts and also made design decisions on the booklet. After editing and proof reading, the draft that

emerged was taken to a commercial printer in Nairobi. Through donor support, several copies were printed for use at the site. A document review of the booklet revealed some salient features in terms of design and content (DS 5, AM 9). The cover page has an artist's impression of the trail site and a map showing the trail layout was found on the inside page. A total of 16 stops or stations with interpretive texts and illustrations of key features formed the contents of the booklet. A checklist of birds and plants that occur at the locality was incorporated as a basis for identification. The same design was reflected in the NMK trail leaflet that I now discuss.

#### NMK Ooloolua trail booklet

During our focus group interview with Gatheru (2000 pers. comm.) of NMK (see also section 4.2.2.4), teachers from Kenya High mobilised interpretive capital on how the NMK Ooloolua trail booklet was developed. Initially, two sets of trail booklets were in use at the NMK Ooloolua forest reserve where two trails had been developed. The two trails have now been merged into one, to make it easier for use by school groups. This necessitated the development of the trail booklet that was reviewed. Gatheru was involved in the development of this new trail booklet. First, he carried out an evaluation of the use of the previous sets of trail booklets with a group of teachers. He found that the earlier trail booklets were not linked closely enough to the school curriculum (DS 7). As a response to these findings, in-house consultations to decide on new forest ecology themes for interpretation were initiated. Texts on selected themes were researched and written up to produce a first draft. This draft was then piloted with various school groups at the nature trail. Later, some teachers were invited for a workshop in which both the draft booklet and the entire Ooloolua outdoor interpretation programme were evaluated. In this second evaluation exercise, teachers were taken through the trail stops using the draft booklet and asked to make some evaluative comments. Teachers' comments and observations (DS 7) were then used to inform the re-development of the trail booklet which was found to reflect the needs of the school biology curriculum (Gatheru 2000 pers. comm.). The printing and production of the trail booklet was financed through donor funding.

#### The Giraffe Centre trail booklet

Through our focus group interviews with Gitonga and Musyoki (2001 pers. comm.) from the

Giraffe Centre, insights into the development of the organisation's trail booklet did not emerge (DS 21). We only found out that the trail booklet had been developed to enhance self-guided tours for school groups and other visitors to the nature trail (AM 10; see also section 4.2.2.4). It was on this premise that Gitonga (an educator at the Centre) was invited, at the request of Samaj and Kenya High teachers, to present a case study on how the trail booklet had been developed (see section 4.4.1). Insights that emerged as a result of this presentation are drawn on to illuminate the interpretive capital that was made available (AM 15). According to Gitonga (2001 pers. comm.), the trail booklet that we reviewed was developed in 1983 as a result of a consultative process that involved a team of three people (an ornithologist, a botanist and an educator). Both the ornithologist and botanist were from other organisations. Their role was to provide scientific information on both animals and plants within the nature trail. This scientific information provided a basis for writing the interpretive texts of the trail booklet. The design and printing of the booklet was done in-house.

However, the trail booklet that was developed had many weaknesses as described by Gitonga (2001 pers. comm.) in the following workshop remarks:

The trail booklet turned out to be not as appealing as anticipated; it had too much text and was not very attractive. As a result, the learners were found not to learn much when using the booklet. They seemed not to get what they expected and the Centre management felt the same. The information in the guidebook was found not relevant for all the different groups that visited the Centre (primary students, secondary colleges, local and international tourists). There was therefore the need for the management of the Giraffe Centre to come up with a more appealing booklet that may serve its wide audience well (22 June 2001 workshop proceedings).

At the time of this study, we learned that a new trail booklet was being developed at the Centre with input from both the staff and naturalists from other organisations. It will differ from the previous one in one meaningful way; instead of markers, headings with catchy themes will be incorporated so as to stimulate the curiosity of learners (see also sections 5.2.3.4, 5.3.3.1). The involvement of teachers in the development of the trail booklet was not mentioned. The challenge for the Giraffe Centre may be in developing one trail booklet that can support environmental learning processes for diverse groups of learners.

Apart from trail booklets, we also found teacher packs with activity sheets at WCK and NMK. Drawing on the social interactions between teachers, WCK educators and myself I outline the development of two teacher packs to indicate the interpretive capital that was mobilised.

#### *4.4.2.2 Teacher packs with activity sheets*

The relevance of developing activity sheets in schools (see section 5.2.3.2) was summarised by S2 when he said: “Activity sheets would be appropriate in our school, especially for the higher classes, where the learners are required to do most of the learning activities on their own” (DS 21). Activity sheets can be used to support learners in exploring environmental problems and issues in their schools grounds. Except at the Butterfly Centre, the use of activity sheets (worksheets) was reported in all the organisations we visited (DS 7; see also section 4.5). Here, I focus on the development of two teacher packs that contained activity sheets that we found at WCK and NMK. In both cases, a brief mention on how the packs were used with school groups is made.

#### **WCK ecology teacher pack**

This pack consisted of slide pictures of various aspects of the WCK nature trail and animals of the Nairobi National Park. The slide pictures had accompanying interpretive texts. Activities for the learners and a glossary of ecological terms formed part of the pack contents. This pack is used to supplement the secondary school curriculum, and supports the development of environmental literacy amongst learners through exposure to aspects of the biophysical environment. The teaching and learning processes involved entail an educator giving a slide talk based on the pack contents to visiting school groups in a WCK lecture room. The learners are then taken for outdoor ecological studies at the WCK nature trail and later to the Nairobi National Park to undertake the activities described in the pack (DS 5). A mix of methods and processes seem to be used in combination. There is active learning in the environment (see Figure 2.1 in section 2.3.2.3) and also ‘show and tell’ methods that emphasise facts about the environment (see Janse van Rensburg and O’Donoghue 1995).

Our focus group discussions (see 3.3.3) with educators at WCK revealed some of the development processes associated with the ecology pack (DS 7, AM 9). First, in-house

consultations were undertaken to determine the themes to be addressed. A team of twelve people was then selected to undertake the development of the pack. This team included WCK education staff and educators from other organisations. Notably, three secondary school teachers formed part of the team. A literature search was done and interpretive texts on selected themes drafted. The texts were supported with good quality photographs and slides of interesting features and animals. This pack was designed to have a pictorial section containing slides and another section of activities for the learners. To ensure that the pack supported environmental learning beyond the boundaries of the WCK site, a section with follow-up activities for learners was incorporated. The final draft that emerged was proof-read by WCK education staff before it was taken to a commercial printer. Some useful considerations were incorporated in a bid to minimise the costs of production of the ecology pack. The use of colour slides and photographs was avoided; printing was done in bulk and on cheaper paper with the final copy being spiral bound.

#### NMK Nairobi Botanic Garden teachers' pack

This material has been used to implement garden-based environmental interpretation and education processes at the Nairobi Botanic Garden (AM 7). The pack contains four themes on plants that are related to the primary school science curriculum (DS 5). In terms of structure it has aims; learning outcomes; pupils' activity sheets and some background information for teachers. Activity sheets on a chosen theme from the pack are given to visiting school groups, sometimes well in advance. The learners are then given a chance to undertake activities on a chosen theme with guidance from the NMK educator and the accompanying teachers.

During the review of this interpretive publication with the teachers, I shifted my role from that of a researcher to an informant. I shared how I developed the teachers' pack that was conceived during a training attachment programme at an overseas garden. Before I started the actual development process, I first consulted with colleagues from other botanic gardens to get ideas and suggestions. I had never developed a teachers' pack before. Drawing on examples provided in other packs, I identified appropriate themes for my context and developed interpretive texts for them. I subjected the first draft to peer evaluation and used the comments that were given to further refine the pack. I did not involve teachers who were the end users

during the development phase. I only involved them after I had piloted the pack with a few schools. This was done during an informal feedback session for the teachers who had participated in the piloting of the pack. Comments made by the teachers were then used to improve the pack. Evaluation became a continuous process during the subsequent implementation of themes in the pack as teachers were requested to make reflective comments on an evaluation form.

Reflecting on the development processes I shared, K1 asked me whether I had consulted curriculum guides (syllabi) during the development of the NMK Nairobi Botanic Garden teachers' pack. On its relevance to the school curriculum, K2 commented: "I find this pack more relevant to secondary schools than primary ones". K1's question and K2's remarks underscored the necessity of developing interpretive publications whose contents are adequate and relevant to the needs of the school curriculum and levels of learners (see Table 4.4).

In the next section, I briefly outline how a publicity brochure was developed and used to promote conservation activities of the Giraffe Centre.

#### *4.4.2.3 The Giraffe Centre publicity brochure*

We reviewed a publicity brochure from the Giraffe Centre through our interactions with Musyoki (2001 pers. comm.). She shared with us on how the brochure had been developed. Good quality pictures were taken and the education staff wrote the interpretive text first draft. This process required some teamwork. The brochure was then designed and taken to a commercial printer. The printing was on a cheaper light brown paper that was considered environmentally friendly. To minimise printing costs, the use of colour photographs was avoided. The final draft has been used to market the activities of the Centre and also to fundraise for environmental education programmes. Positive responses from overseas tourists were said to be a confirmation of the effectiveness of this publicity brochure. Teachers from Samaj and Kenya High later developed publicity brochures to market the interpretive plans for developing school-based interpretation resources (see sections 5.2.3.1, 5.3.2.1).

Having outlined some of the actions that were involved in the development of a sample of

interpretive publications from NMK, WCK and the Giraffe Centre, I describe how I reviewed with teachers the development of interpretive signage at NMK and KWS (see sections 4.4.3.1, 4.4.3.2; see also Appendix 4). This review was based on our interactions with Adoyo and Mbogo (2001 pers. comm.) during their presentations on materials development case studies (see section 4.4.1).

#### **4.4.3 Reviewing the development of interpretive signage**

We found a variety of interpretive panels (interpretive signage, labels and exhibitions) during our organisational visits (DS 7). These included interactive displays at the Butterfly Centre; exhibitions at NMK; visitor orientation boards; interpretive labels and a banner at NMK. Some of these were used: to inform the public of new developments (for example, KWS Nairobi Safari Walk); promote an understanding of the organisations' missions and encourage an environmental ethic in the visitors (signs on rules). NMK had the highest variety of interpretive panels at its four interpretation resources (AM 7; see also section 4.2.2).

A number of advantages are associated with the use of interpretive signs as media for interpretation (Sharpe 1982, Ham 1992, Honig 2000). Once installed, they are always available for use for environmental learning. This depends on the durability of materials used to produce them. Unlike interpretive publications, interpretive signs are site specific. They can therefore relate directly to features being interpreted, thereby drawing attention to environmental issues and problems of concern (Honig 2000). However, once prepared, interpretive signs have the disadvantage of being static with inflexible information that may not be easily updated. Good quality outdoor panels that may resist the effects of weather are usually very expensive (Mbogo 2001 pers. comm., see also Ham 1992). Signs are also impersonal and may not easily stimulate the curiosity of learners in the absence of more knowledgeable adults (personal interpretation). An overview on the development of interpretive signage at both NMK and KWS is now provided.

##### *4.4.3.1 Development of interpretive signage at NMK*

A graphic designer (Adoyo) from the NMK exhibits department, whom I had invited as a resource person to our first materials development workshop (DS 14), gave a general overview

on how interpretive signage is developed and used at NMK. Adoyo (2001 pers. comm.) summarised the interpretive signage development practice at NMK thus:

There are different types of labels and signage produced at NMK for various departments. For example, in the aquarium, signage texts are computer generated in full colour. Although this is expensive, it is manageable because the aquarium is a small place. Directional signage is usually engraved on wood and is used to provide orientation to visitors. In this case, interpretation is used as a management tool. An orientation board has also been developed in the main Gallery to show the plan of the floors thus orienting the visitors (DS 14, 22 June 2001 workshop proceedings).

Interpretive signage at NMK is developed by means of a variety of techniques (AM 7). There is the use of plaques, stencil lettering, handwriting or painting of signboards, engraving on wood, and computer printing. Plans are underway to start in-house screen-printing that will improve the production of interpretive signage and at the same time cut down costs since screens can be reused. According to Adoyo (2001 pers. comm.), the production of interpretive signage for a new exhibit (at the Museum galleries or Snake Park) usually starts with the writing of interpretive texts by relevant research scientists. Since such texts are in technical language, the NMK educators are normally approached to edit into non-technical language.

Printing is done as per requirements for either outdoor or indoor interpretive panels, and whether they are to be temporary or permanent (see also Honig 2000). The texts are then put alongside the feature being interpreted, for example, a diorama or an illustration in display cases (exhibitions). The materials used in producing interpretive panels vary, depending on whether the interpretive signage is for indoor or outdoor usage. It is much easier to design indoors panels for mounting interpretive signage than outdoor ones (Adoyo 2001 pers. comm.).

#### *4.4.3.2 Development of interpretive signage at KWS*

At the time of this study, we found a newly developed interpretation resource at KWS (see section 4.2.1.2). The KWS Nairobi Safari Walk has started offering unique interactive educational and recreational wildlife experiences to school groups through its three simulated habitats of wetlands, savannah and forest (DS 38; see also NMK and KWS 2002). It has been imposingly designed through the use of appropriate landscaping techniques with efforts being made not to turn it into a zoo. The interpretation resource seeks to foster amongst its learners

an awareness, understanding and appreciation of Kenya's variety of wildlife in their surroundings, their interdependence and relationship with humans (NMK and KWS 2002). Its great potential to foster environmental learning amongst visiting school groups is summarised in these comments made by Mbogo (2001 pers. comm.) during her workshop presentation (DS 14):

Guided tours are provided to visiting school groups explaining the ecology of the adjacent Nairobi National Park. Interpretive graphics with messages on the conservation activities of KWS will be displayed at various points along the Safari Walk. Some of these messages will focus on human-wildlife conflicts. In the seating areas, messages that emphasise return visitation will be placed (22 June workshop proceedings).

Development of interpretive signage at KWS occurred at two levels, in-house production in the case of the signage at the Nairobi Animal Orphanage and the use of experts in the case of the signage at the Nairobi Safari Walk (DS 7, DS 14). The process involved in the production of the existing interpretive signage at the Orphanage entailed taking of photographs of the animals or features to be interpreted using a digital camera. The photographs were then scanned and accompanying interpretive text written. The printed materials are usually laminated to protect them from water. Although the use of scotch printing is preferred it is expensive and requires outside funding. In her case study presentation, Mbogo (2001 pers. comm.) pointed out that interpretive signage at the Animal Orphanage has been found to be dull with a lot of technical information that contains little educative value. As a result, there has been a shift to the development of interpretive signage that may mobilise learners' cultural capital for meaning-making processes through encounters with wildlife at the Nairobi Safari Walk.

A variety of appealing materials that include interpretive signage have now been developed for installation at the Nairobi Safari Walk (AM 15). To provide insight into how these materials were developed, I draw on the interpretive capital mobilised through interactions between the teachers and Mbogo during the June 2001 workshop (DS 14). Information on the features to be interpreted at the Nairobi Safari Walk was first gathered through a consultative process with experts from other related conservation organisations (these included NMK, WCK and the Giraffe Centre). This ensured that accurate, up-to-date and reliable information was used in the writing of interpretive texts. During the drafting of interpretive materials, a number of learning

concepts were used on (see section 2.3.2.2). Some of these were shared as follows (Mbogo 2001 per. comm.; see also Veverka 1994):

We all bring our past into the present; first impressions last; unless helped we often fail to see or comprehend; categories can blind us; meanings are in people and not in words; make learning fun; information overload causes distortion and fatigue; simplicity and organisation clarify meaning; a picture can be worth a thousand words.

Once the interpretive texts were written, a consultant was contracted to edit, design and oversee the printing. At the time of this study, the printing had not been done, but scotch print material will be used, because though very expensive, it will produce high quality results. The durability of interpretive panels was also considered. The texts are to be mounted on aluminium panels supported on wood. This will ensure that the signage is protected from water and will also withstand outdoor conditions.

A number of themes (patterns) emerged (see also Figure 3.3) as a result of reviewing with teachers the development and use of interpretive materials in the non-formal education sector (see previous sections and also Appendix 4). These themes from the critical contextual reviews (Lotz-Sisitka 2001b) of identifying practices and key shaping ideas that influence materials development processes reflect the interpretive capital we mobilised with teachers. They are examined in the next section.

#### **4.4.4 Themes emerging from critical contextual reviews of materials**

Our social interactions with non-formal educators and interpretive materials during organisational review visits provided useful insights into the social and historical contexts in which interpretive materials were developed and used in the non-formal education sector. Apart from making available interpretive capital for materials development in the schools (see sections 5.2.3, 5.3.2), critical contextual reviews of materials also provided opportunities for the non-formal educators (including myself) to reflect on their educational practices (see section 6.3.1) and establish new partnerships (see section 6.6). The teachers found most of the interpretive materials that we reviewed applicable to their school contexts. Posters from both NMK and the Giraffe Centre had been specifically developed for use in the schools.

In the following sections I draw together the interpretive capital that was mobilised by examining a number of themes emerging from critical contextual reviews of interpretive materials with teachers. These themes are teacher participation in materials development; education theories that informed the development processes; form of interpretations; curriculum links; perspectives on the environment; underlying values and the role of evaluation.

#### *4.4.4.1 Levels of teacher participation*

The development of the materials we reviewed was mainly as a result of in-house consultations (see Appendix 4). In a few cases, as like in the development of WCK trail booklet and the interpretive signage at the Butterfly Centre, experts from elsewhere were engaged. Teacher participation in the development of interpretive materials was limited to only a few examples (see Appendix 4). In most cases, materials development processes reflected top down approaches that used research, develop, disseminate and adopt (RDDA) strategies for materials development (see O'Donoghue and McNaught 1991, Lotz-Sisitka 2001b; see also section 2.5). Although the RDDA strategies for interpretive materials development were appropriate in some contexts (for example, the development of videos at NMK and KWS), the kinds of materials (multi-media) developed may reflect a perspective that interpretive capital can only be constructed by a small group of experts (Lotz-Sisitka 2001b).

There were a few examples (the development of NMK poster and WCK ecology pack) where teachers formed part of the development team. Teachers were also involved during the evaluation and piloting of some developed materials (NMK trail booklet and teachers' pack). However, the presence of teachers on the development team may not necessarily imply enhanced teacher participation. In the development of the WCK ecology pack (see section 4.4.2.2), the three teachers who were selected to be part of the development team were not involved in the initial conceptualisation of the ecology pack idea. WCK educators still controlled the development process as initiators of the ecology pack idea. This represented a situation of pseudo-participation (false participation) in which attempts were made to improve the relationship between expert materials developers (non-formal educators) and the materials

users (teachers) (see also Lotz-Sisitka 2001b). It reflects a perspective of action research as a strategy to engineer change (*ibid.*). This study offers a challenge to both the top-down (RDDA) and social engineering approaches to materials development through its teacher-centred approaches (see sections 2.5.1, 5.2, 5.3). The participatory action research approach that was adopted facilitated the mobilisation of interpretive capital through interactive meaning-making processes amongst teachers, non-formal educators and a pool of interpretive materials (see O'Donoghue and Taylor 1988).

The importance of involving teachers in the development of interpretive materials cannot be over-emphasised. Ballantyne (1998) noted that establishing an ongoing relationship between non-formal educators and teachers through collaborative materials development can help maintain the continuity between formal and non-formal learning environments. Involving teachers in the development of interpretive materials to be used before, during and after school visits to non-formal education organisations may extend and increase the impact of the environmental interpretation and educational experiences amongst school groups (*ibid.*)

#### *4.4.4.2 Education theories that informed development processes*

Most of the interpretive publications were designed to support environmental learning processes through encounters with real objects in the environment (see section 4.4.2). Their development reflected education theories from social psychology (constructivism) on how meanings are socially constructed in context (Berger Luckmann 1966, Vygotsky 1981, Charon 2001; see also section 2.3.2). Learning activities that were contained in the trail booklets and teacher packs sought to mobilise learners' cultural capital acquired in schools and other socio-cultural contexts for meaning-making processes through social interactions with peers, objects and more knowledgeable adults (see section 2.3.2.2). The perceived role of non-formal educators (more knowledgeable adults) when developing interpretive publications (NMK and WCK trail booklets) were those of organising learning opportunities to enable learners to socially construct meanings within their zones of proximal development (see section 2.3.2.2).

The development of interpretive signage and posters seemed to reflect perspectives on knowledge transmission (behaviourism) (see section 4.2.2.1). Most of the signage we found at

NMK, KWS and the Butterfly Centre (see Appendix 4) was information-led and aimed at communicating environmental knowledge to change the behaviour of learners (see Hungerford and Volk 1990, Howard 1998). For example, a lot of information was included in the Giraffe Centre poster to create awareness of the conservation of the endangered Rothschild giraffe (see Appendix 4). The development of posters and interpretive signage was thus based on the transmitter-receiver model that draws on communication and mass media theories (Hooper-Greenhill 1994; see also section 2.3.2.1).

In some interpretive materials (see section 4.4.2.2), the texts reflected perspectives from critical pedagogy (see section 2.3.2.3). Some of the activities found in the WCK ecology pack and NMK Nairobi Botanic Garden teachers' pack seemed to encourage the active engagement of learners in collaborative investigations of real environmental issues in local environments (see section 2.3.1.1; see also Greenall Gough and Robottom 1993). This active engagement in cooperative inquiry processes may present opportunities for a dialogue between learners, educators and the real object (see section 2.3.2.3). A material whose development reflects a socially critical educational perspective (WCK ecology pack) can mobilise learners' critical reflection and action (critical praxis) for social transformation (see sections 2.3.1.3, 2.3.2.3).

#### *4.4.4.3 Forms of interpretation supported by the materials*

The interpretive materials supported three forms of interpretation: self-mediated, mediated and critical interpretation (see also section 4.5). Interpretive signage and posters supported self-mediated interpretation in which learners used the materials on their own to gain knowledge about the environment through reading and looking. The Giraffe Centre publicity brochure (see section 4.4.2.3) also supported self-mediated interpretation. The trail booklets and teacher packs emphasised mediated interpretation as their use with school groups relied mostly on the availability of an adult. Due to an emphasis on the realisation of the school curriculum (see the next section), non-formal educators and teachers interpret the activities in the materials to stimulate learners' meaning-making processes. Critical-praxis oriented interpretation is supported if the materials further engage learners in the active generation of new knowledge following mediated interpretation. Some learning activities in the NMK Nairobi Botanic Garden teachers' pack were developed to create opportunities for learners to engage in critical

educational processes through role-playing on environmental problems and risks. This material supported a critical form of interpretation as it sought to engage learners in critical or complex thinking about real issues (see section 2.3.1.1).

#### *4.4.4.4 Links to the school curriculum*

All the materials we reviewed (except the Giraffe Centre publicity brochure) had direct links to the school curriculum (see also section 4.6.1.3). Some like the posters and interpretive signage had very broad links while others like the WCK ecology pack and the trail booklets (see Appendix 4) were specifically developed to supplement the secondary school biology curriculum. The interpretive signage we found at the Butterfly Centre had broad and comprehensive links to both primary and secondary school curricula with a focus on insects. The following journal reflection confirms this:

Many aspects of the curriculum are addressed through the interpretive panels at the Butterfly Centre. For example, one interpretation panel had information on how butterflies may be used to teach mathematics and at the same time create environmental awareness. In this panel, a photograph of wings of butterflies showed patterns that resembled Roman numerals and the letters of the alphabet; this links well with the teaching of Mathematics and English in the primary school curriculum. In another panel, information on ecological concepts covered in the secondary school biology curriculum was displayed. The ultra-violet vision of butterflies that was demonstrated by our guide is a topic covered in physics. The display of a large map indicating the distribution of butterflies in the world may be used in geography (Journal p. 71, 3 February 2001).

Although it is important to develop interpretive materials with such wider curriculum links as indicated above, more emphasis should be placed on those materials that also enable the development of critical environmental literacy and action competence in the learners.

#### *4.4.4.5 Environmental perspectives supported by the materials*

The materials reviewed with teachers supported different environmental perspectives. Development of the posters and most of the interpretive signage at NMK, KWS and the Butterfly Centre was based on scientific knowledge that projected technocratic environmental perspectives (see Huckle 1993, Job 1999). Interpretive texts in these materials focused on the management of the environment with particular emphasis on changing learners' behaviour (see

section 2.2). The focus on the teaching of facts, concepts and generalisations about environmental patterns, processes and problems through posters and interpretive signage has been termed as education *about* the environment (Fien 1993; see also sections 5.2.1.2, 5.3.1.2). Many of the activities in the WCK ecology pack put more emphasis on the teaching of ecological concepts rather than the causes of environmental problems (see section 2.3.1.1).

The three trail booklets that were developed at NMK, WCK and the Giraffe Centre (see section 4.4.2.1) viewed the environment as a medium for education (Fien 1993). They included activities that aimed to mobilise learners' cultural capital through direct encounters with objects in nature trails. This had the potential of fostering environmental concern on the learners as they are exposed to ecosystems within the nature trails at NMK, WCK and the Giraffe Centre. The following extract from the WCK trail booklet confirms this (DS 5):

On this trail we have seen a variety of habitats in a very small piece of land. Let us enjoy it and keep it as it is, and let us try to understand its life through all the seasons of the year. ... We hope this nature trail will help you to better observe the plant and animal communities in your own home or school (WCK 1984:20).

This text supports the perspective that the environment is composed of complex interactions between life systems and physical components that should not be disturbed (see section 2.3.1.1). The environment is thus perceived as a social construct (Di Chiro 1987) that must be viewed as an interacting system of biophysical, social, economic and political dimensions (see section 4.3.1; see also Fien 1993, Janse van Rensburg and O'Donoghue 1995). Some activities found in the NMK Nairobi Botanic Garden teacher pack that required learners to examine values and beliefs related to the environment (DS 5), reflected a perspective on education *for* the environment (Fien 1993). The materials we developed with teachers in their schools (see sections 5.2.3, 5.3.3) sought to reflect this perspective.

#### *4.4.4.6 Underlying values in materials development processes*

Most of the materials we reviewed had environmental learning activities that could engage learners in exploring values that promote ecological sustainability and social justice (see sections 2.3.1.2, 4.4.2; see also Fien 1993). Interpretive texts in the trail booklets found at NMK, WCK and the Giraffe Centre promoted values of interspecies equity, a communal

obligation to conserve biodiversity, living lightly on earth and respect for nature (see Appendix 4; see also IUCN, UNEP and WWF 1991, McKeown 2002). The following examples from the NMK and WCK trail booklets confirm this.

The pump that you see here ... uses water pressure to pump water. ...[It] does not use energy from diesel or petrol. ... It's an environmentally friendly pump! Why do we need to minimise the use of ... fossil fuels in our daily activities? (NMK 2001:12).

There are small pockets of soil on this rocky outcrop. Many different plants have managed to grow there. How many can you count beside the marker? Please do not pick or damage any of these plants (WCK 1984:7).

Carefully, remove the fallen leaves on a patch in the ground. Scratch the soil using a stick. What do you see? ... Most soils in tropical forests are relatively poor. Why is it wrong to cut down the remaining forests in Kenya (which account for less than 2.6% of the total land area) in order to plant crops? How can we ensure that we retain our indigenous forest, but also feed the growing Kenyan population? (NMK 2001:3).

In the last example, learners can be engaged in exploring values that focus on both social justice (basic human needs) and ecological sustainability within the local and wider contexts. Engagement of learners in environmental learning processes, as in the above, might develop their capacities to clarify their views on environmental issues (Fien 1993).

During the development processes of the WCK ecology pack (see section 4.4.2.2) and the Giraffe Centre publicity brochure (see section 4.4.2.3), values related to *livingly lightly on the earth* and *inter-generational equity* were demonstrated (see section 2.3.1.2; see also IUCN, UNEP and WWF 1991, McKeown 2002). In both cases, the use of colour photographs in the text was avoided and a cheaper paper was used during the printing. This minimised waste and to some extent, ensured sparing use of resources.

#### 4.4.4.7 Evaluation role and its funding implications

Evaluation as an integral component of materials development did not feature much in the interpretive materials we reviewed with teachers (see Appendix 4). Formative evaluation took place in the development of the NMK trail booklet (see section 4.4.2.1). The Giraffe Centre and WCK trail booklets were reviewed several years after their development and the development of new booklets initiated (see sections 4.4.2.1, 6.6.1). Most of the interpretive

signage at NMK and has never been evaluated (see section 4.2.2.2). Aspects of ongoing evaluation processes were evident during the development of interpretive signage and a teachers' pack at the NMK Nairobi Botanic Garden (see section 4.4.2.2; see also Appendix 4).

Evaluation processes in the development of interpretive materials seem to be influenced by the availability of donor funding, amongst other factors. For example, in the development of the NMK wetland poster, it was not possible to evaluate the effectiveness of the material after its implementation, due to the lack of funds (Ndaruga 2001 pers. comm.). As with most of the materials we reviewed, the development of this poster relied on donor funding. Usually, inadequate funds are set aside for evaluation processes after the development since donor funds are provided within a limited time framework.

However, Beckmann (2000, see also Uzzell 1998b) has argued that cost should not be an issue in carrying out evaluation processes that require the re-examination of the effectiveness of interpretive materials in engaging learners in critical environmental education processes. The way in which these materials are presented, their graphics, colours, language, writing style, use of pictures or diagrams are crucial to their effectiveness (*ibid.*).

The interpretive capital that we mobilised through organisational review visits (see section 4.2), clarifying environmental interpretation and education processes in workshops (see section 4.3) and reviewing interpretive materials with teachers (see section 4.4) enabled us to develop a more in-depth perspective on environmental interpretation and education processes. In the next section, I describe some of the environmental interpretation and education methods used in the five organisations we visited within their social and historical contexts.

#### **4.5 ENVIRONMENTAL INTERPRETATION AND EDUCATION PROCESSES**

Through focus group interviews with non-formal educators, we investigated the various environmental interpretation and education methods used in the non-formal education sector. This promoted an understanding in the teachers of how environmental interpretation and education processes are enhanced. This understanding proved useful for the teachers and I,

when identifying opportunities for environmental interpretation and education processes in the school grounds (see sections 5.2.4, 5.3.4). We identified various methods and approaches for enhancing environmental interpretation and education processes amongst school groups (AM 7-11) as a result of our organisational review visits (see section 4.21). The following journal entry summarises some of them:

The main reason for allowing learners to come into contact with wild animals is to get them to appreciate them more and take the initiative of conserving them. It is also for fun, especially the younger children. The group is then taken for a lecture where the importance of environmental conservation is taught. They are challenged to take action for the environment. Films are also shown depending on their needs. If time allows, the group is then taken around the nature trail where adaptations of animals and plants is discussed. An evaluation exercise is carried out to find out the impact of the programme (Journal entry p. 107, 7 March 2001).

These methods, which range from passive ones that require little interaction with the learner, to active ones that encourage learner participation, are further summarised (see Table 4.6 below). In Table 4.6, the occurrence and description of learning and teaching processes on the methods is indicated.

**Table 4.6** A summary of environmental interpretation and education methods

<b>Method/Approach</b>	<b>Occurrence</b>	<b>Description of learning and teaching processes</b>
<b>Film and video shows</b>	In all organisations	Used for off-site interpretation. Videos/films of wildlife provide knowledge about the environment. Use of mobile outreach education units noted at WCK and KWS.
<b>Illustrated talks and lectures</b>	In all except the Butterfly Centre	Educators give formal lectures with slide shows on various environmental themes.
<b>Self-mediated interpretation</b>	In all organisations	Learners read interpretive publications and signage on various themes or topics at interpretation resources.
<b>Guided tours/live interpretation</b>	In all organisations	Educators or interpreters take school groups around interpretation resources. In some cases, learners use interpretive publications to undertake simple activities.

<b>Ecological field studies and fieldwork</b>	NMK, KWS, WCK & Giraffe Centre	School groups are taken to sites for fieldwork activities. Educators or teachers design activity sheets for use by learners.
<b>Eco-trips for disadvantaged school groups</b>	Giraffe Centre	Disadvantaged school groups, for example, those from informal settlements are sponsored for ecological trips to the KWS Nairobi National Park.
<b>Use of games and interactive displays</b>	In all organisations	Learners are engaged in interactive activities that stimulate interest in a theme being presented through the use of simple activities or interactive displays.
<b>Feeding of giraffes</b>	Giraffe Centre	Learners encounter endangered giraffe species and are encouraged to feed them.
<b>Use of annual environmental competitions</b>	WCK and Giraffe Centre	Every year schools throughout the country are invited to participate in essay and art competitions focusing on environmental themes.
<b>Use of newsletters</b>	WCK and Giraffe Centre	Learners are invited to write articles on their school projects (KWS) and also share environmental stories.
<b>Action learning projects</b>	NMK, KWS, WCK and Giraffe Centre	Learners are encouraged to initiate projects like recycling, tree nurseries and nature trails in their schools by drawing on examples from the organisations.

From an interpretation perspective, many writers (for example Sharpe 1982, Beck and Cable 1998) have divided them (the above methods) into two approaches, personal and non-personal. Personal approaches to interpretation included illustrated talks, demonstrations on action projects, guided tours, ecological field tours, storytelling sessions and the use of simulation games. Self-guided tours, reading of interpretive signage, feeding of the giraffes, use of interactive displays, essay and art environmental competitions, exhibitions, use of multi-media and the use of environmental newsletters were some of the non-personal approaches we identified.

In the context of this study, I will examine these methods within the framework of three approaches to environmental interpretation and education processes. These are self-mediated, mediated and critical praxis-oriented. By drawing on relevant social and educational theories, I discuss these approaches in the sections that follow (see sections 4.5.1, 4.5.2, 4.5.3), as a

further exploration of the perspective on interpretation as an environmental education process introduced earlier in Chapter 2 (see section 2.3.2). However, these approaches are not as orderly they appear here. I have only used them as a framework for exploring the perspective of interpretation as an environmental education process and they should thus not be drawn on prescriptively.

#### **4.5.1 Self-mediated approaches**

In self-mediated approaches, learners only interact with interpretive materials that have been created by 'significant others' to foster environmental learning (see section 2.3.2.2). In the context of this study, self-mediated interpretation in the non-formal education sector was through interpretive signage and film and video shows (see Table 4.6). Reading of interpretive signage mainly occurs during unplanned visits by school groups to non-formal education organisations (see section 4.2.2.2). This is common at NMK, KWS and the Giraffe Centre (AM 7, AM 8, AM 10). Usually, learners read interpretive signs on their own and rarely discuss the messages with others (NMK and KWS 2002). As learners read interpretive labels or signage, a sort of conversation with the significant other (author of the text) is mediated through the text or language. The language is used to mediate cognitive activities within the learners. Solitary learners read and interact, bringing their own cultural capital to the fore, all mediated by their own social and cultural backgrounds (see section 2.3.2.2). The learner may then actively construct and find the situation and experience. However, research has shown that most people do not learn much from reading panels that in most cases use technical language (Bromley 2001 per. comm., see also section 4.2.2.1).

Many interpreters make the assumption that learning takes place as a consequence of reading interpretive panels. This explains why some people advocate a maximum number of words to be used in interpretive signage (see Honig 2000). The interpretive signage we found at the organisations (see section 4.4.3) had more technical information. In my view, they were informational rather than interpretive (see Tilden's second principle in section 2.3.2.1). There is therefore a need to develop interpretive signs that encourage social interactions among learners, that is, ones that may encourage learners to talk to each other about the contents. Such

‘social-interactive’ (Uzzell 1998c) interpretive materials may encourage more qualitative social and educational interactions. As Uzzell (*ibid.*) argued, it is not the interpretation that leads to environmental learning, but rather the discussion encouraged by the interpretation.

The use of multi-media presentations (films, slide shows, videos) to engage learners on conservation issues is also a form of self-mediated interpretation. From my experiences from NMK, learners are rarely engaged in discussions after film and video shows. Ballantyne (1998) doubted the efficacy of multi-media presentations and other modern interpretive methods in enabling the development of environmental conceptions. He has advocated the use of worksheet activities based on multi-media presentations in order to engage learners in higher order learning activities. Such worksheets (see section 4.4.2) should be designed to have follow-up activities (*ibid.*). The use of worksheets through guided questioning is a form of mediated approaches to environmental interpretation and education processes. This is described in the next section.

#### **4.5.2 Mediated approaches**

These approaches reflect those programmes that focus on the interactions between non-formal educators and the learners, and also interactions between the learners themselves. Some of these include guided tours of interpretation resources, illustrated talks and ecological field studies.

I draw on the guided tours we had during our review visits, to explore how mediated approaches to interpretation through guided questioning may enable critical environmental education processes.

During a guided tour at the Giraffe Centre, I observed how teachers as learners interacted with the more culturally knowledgeable guide as captured here:

I took the role of a participant observer and reflected on the approach taken by Nicholas during this personal interpretation. The other participants [Kenya High teachers] took notes and seemed to appreciate the serene surroundings. Nicholas would stop and make reference to plants of interest: “This is black-eyed Susan, named after Susan” or “This

is coffee bean plant, it is known to have some qualities of Viagra”. During this session, we encountered many different types of plants, birds and spectacular butterflies (Journal p. 92, 17 February 2001).

During this interpretive talk Nicholas avoided the use of scientific language when interpreting plants. He seemed to apply communication techniques that made his personal interpretation enjoyable, relevant and entertaining (see section 2.3.2.1). By relating the ‘coffee bean plant’ (instead of using its scientific name) to ‘viagra’ he was able to make the information on this plant meaningful and personal. Our cultural capital and ‘lived experiences’ were being drawn upon for meaning-making processes. We became connected to the plant through the story of ‘viagra’ that was familiar to all of us. It is through such social interactions that learners’ cultural capital may be mobilised into environmental learning that is action-oriented (for example, conserving the ‘coffee bean’ plant by planting more). This form of interpretation (mediated) had the advantage of being flexible and responsive to our needs as was not the case with the use of an interpretive text I described in section 4.2.2.2 (see also Figure 4.1).

In other guided tours, use of provoking questions to stimulate environmental learning was noted as illustrated in this example.

You know this one? It’s Euphorbia. This one I wouldn’t advise you to grow. It’s dangerous. The milk is poisonous, in fact if it gets into your eyes you go blind and it’s only breast milk that can neutralise it. There was a project on it to find out if it can produce fuel. It contains hydrocarbons ... (Musyoki 2001 pers. comm.)

Provoking learners to explore issues further through questions can be a worthwhile activity. It encourages an inquiry process to take place and may lead to critical and action-oriented environmental education processes. In the next section, I describe approaches that encourage critical reflection and action during meaning-making processes.

### **4.5.3 Critical praxis-oriented approaches**

Approaches oriented to critical praxis have a focus on educational and interpretive experiences that may lead to social change. These include ecological field studies, use of games and interactive displays, action learning projects, environmental competitions and feeding of the

giraffe. Common in all these approaches, are explicit action-oriented learning and teaching processes that encourage critical reflection in learners (see Table 4.6). For learners to become agents of such social change, attainment of some level of critical literacy is necessary (Stables and Bishop 2001). These approaches aim to combat dominance by the more knowledgeable adult (guide) and move towards self-organisation in the learners. As I have discussed elsewhere (see sections 2.3.1.3, 2.3.2.3), the term praxis may be used to mean the dialectical tension, the interaction, reflection and action that an environmental learning activity may provide. I will focus on the use of interactive displays at the Butterfly Centre (AM 11), the feeding of giraffes at the Giraffe Centre (AM 10) and the use of ecology pack at WCK (AM 9; see also section 4.4.2.2) to further illuminate this point.

Through interactive displays and worksheet activities opportunities for critical reflection and action are presented. As learners look at the objects together, read labels, manipulate interactives, watch others and talk to their guides at the Butterfly Centre, opportunities to accommodate new cultural capital and have a personal environmental learning experience are created. All these are important if successful meaning-making is to take place (see section 2.3.2.2). Depending on the *social habitus* (see section 2.3.2.2) and levels of critical environmental consciousness (see section 2.3.1.1) of the learner, the new cultural capital acquired may be further mobilised into taking actions for social change. However, Uzzell (1998a) has argued that interactive displays may be effective for environmental learning provided that the interaction illustrates concepts central to the object being interpreted.

As Gitonga (2001 pers. comm.) noted during one of our review visits to the Giraffe Centre, it is the encounter with real objects that may provoke learners to want to find out more information on their own. In feeding the giraffes, learners are actively engaged with a real object in a local interpretive setting. This active engagement as shown in Figure 4.3 below, presents opportunities for dialogue between the learners, educators and the giraffes. This has the potential of engaging the learners in critical reflection and action for social change (see section 2.3.2.3). In this context, the social change may be taking action to save habitats of the endangered Rothschild giraffes.



**Figure 4.3** Samaj teachers feeding giraffes at the Giraffe Centre  
(DS 24, 7 March 2001)

After feeding the giraffes, learners are usually encouraged to read a poster on giraffe facts displayed near the feeding area (Gitonga 2001 pers. comm.). This may engage them further in meaning-making processes.

By carrying out environmental learning activities using ecology pack at the WCK nature trail and Nairobi National Park, learners may be able to share their experiences within themselves or with the ‘significant others’. This can create opportunities for learners to engage in critical educational processes and may also encourage a perspective on democratic skills (see section 2.3.2.3). Social interactions may stimulate cooperative learning activities as learners freely explore a trail area on their own. Activities in the pack have the potential to enable learners to

adopt a critical view, thereby engaging an attitude of questioning, doubt, investigation and a will to illuminate and challenge the environment at the nature trail or National Park.

Having discussed approaches to environmental interpretation and education processes in the non-formal education sector, I critically reflect on my interactions with interactions with teachers and non-formal educators in mobilising interpretive capital in the section that follows.

## **4.6 REFLECTIONS ON PHASE ONE OF THE STUDY**

Following review visits to the five non-formal organisations (see section 4.2) with teachers, the interpretive capital that may be drawn on for educational processes was mobilised. In this section, I critically reflect on the actions of the teachers and non-formal educators in the process of mobilising this interpretive capital. These reflections are aimed at making sense of the mobilising processes, problems, issues and constraints that manifested during this review phase. I share a synthesis of useful insights on the mobilised interpretive capital and how this capital may be drawn on for educational processes.

I reflect on how the non-formal organisations have endeavoured to match their facilities, interpretation resources and materials (see section 4.6.1) to the curriculum needs of schools. This is done to highlight the contribution of the non-formal sector in the provision of formal environmental education processes (see section 2.2.2). Some of these reflections are based on reflective comments made by the teachers during focus groups (DS 20, DS 21), workshops (AM 14) and informal discussions during guided tours of the interpretation resources (see section 4.2.2). I will first reflect on the contribution of the non-formal education sector in supporting interpretive and educational experiences for school groups, and then describe the forms of interpretive capital mobilised by teachers for use within their school grounds. Finally, some of the constraints that I experienced during this phase of the study are shared.

### **4.6.1 Matching available resources and formal education needs**

Following the critical reflections made by the teachers during the 14 September 2001 workshop (DS 15; see also Table 4.5 for workshop task on the reflection of the study), it was

evident that the non-formal education sector plays a major role in supporting environmental interpretation and education processes amongst school groups. This role was perceived by the teachers as that of supporting both the objectives of the school curriculum and the development of environmental literacy and action competence in learners (DS 14; see also section 2.3.1). Ballantyne and Uzzell (1994) have argued that non-formal education organisations that prepared interpretation and education programmes that matched the needs of school groups were frequently visited. This seemed to be the case with organisations like NMK and the Giraffe Centre that have reported visits of large numbers of school groups. For example in 1999, the Giraffe Centre reported a record of 30, 000 school children (Musyoki 2001 pers. comm.). The NMK has always recorded annual visits of more than 150,000 schoolchildren (NMK and KWS 2002). These high numbers of school visits underscore the recognition by teachers of the potential role of the non-formal education sector in supporting environmental interpretation and education processes (see section 2.2.2). This also explains why non-formal education organisations have considered schools as their priority audience (see section 4.2.1). A number of factors were reflected on with teachers (see Table 4.5) with regard to ways in which non-formal education organisations have matched their available resources to the curriculum needs of schools. Some of these are now examined in the sections that follow.

#### *4.6.1.1 Provision of adequate educational resources*

In all the five organisations that we visited, we found adequate educational resources that tended to match the requirements of visiting school groups (see section 4.2.1.1, 4.2.1.4). These included a variety of interpretation resources (see section 4.2.2.1); lecture halls; audio-visual equipment; modern studios for the production of educational materials at both NMK and KWS (see sections 4.2.1.1, 4.2.1.2) an educational mobile unit at WCK (see section 4.2.1.3); interpretive centres (see sections 4.2.1.4, 4.2.1.5); and full-time interpreters and educators. With exception of the African Butterfly Research Institute (Butterfly Centre) where the interpreters (naturalists) had no educational training background (see section 4.2.1.5), all other non-formal educators with whom we interacted had teaching experience. Most of them, like myself, were former schoolteachers.

#### *4.6.1.2 Provision of a wide range of environmental learning opportunities*

The provision of ‘real’ learning experiences such as the opportunities for encountering and feeding the giraffe (see section 4.2.1.4; see also Figure 4.3); interacting with butterflies (see section 4.2.1.5); interacting with plants in their natural environments (see section 4.2.2.3) and interacting with artefacts at a museum (see section 4.2.2.1) was perceived by the teachers as a major strength of non-formal environmental interpretation and educational experiences (DS 15). These opportunities provided a variety of environmental interpretation and educational experiences (both indoors and outdoors) that involved more than looking and listening to content oriented inputs (see Table 4.6; also see Ballantyne and Uzzell 1994). As argued in section 4.2.2, effective interpretation (see also section 2.3.2) may enable critical environmental education processes if interpretive capital is mobilised in ways that encourage learners to, experience ‘The Thing Itself’ (Tilden 1977), ask critical questions and develop action competency (see section 2.3.1). Through a number of approaches and methods, non-formal educators are well placed to provide a range of learning opportunities for dialogue, encounters and reflection in the context of action taking (see section 4.5, see also Figure 2.1 in Chapter 2). Such opportunities may support learners in their discovery of real-life examples of principles, problems and issues (Ballantyne and Uzzell 1994; see also sections 2.3.2, 4.5) and the development of critical environmental literacy and action competencies (see sections 2.3.3, 5.2.4, 5.3.4).

#### *4.6.1.3 Existence of a variety of curriculum-oriented interpretive materials*

The teachers saw non-formal educators as playing a significant role in the development of materials that support environmental learning within schools and non-formal education organisations. These materials were responsive to the school curriculum (see section 4.4.4.4) and, from our interactions with the non-formal educators (DS 7), it was clear that environmental interpretation and education processes for school groups were curriculum-driven.

The teachers saw the availability of a variety of interpretive materials (see section 4.4) as another way in which the non-formal education organisations have endeavoured to match school curriculum needs. Some of these materials (see section 4.4.2.3) were specifically developed for use in schools. As discussed in the next chapter (see sections 5.2.1.4, 5.3.1.4)

prior to this study, the two schools (Samaj and Kenya High) relied heavily on the materials developed in the non-formal education sector. The trail booklets (see section 4.4.2.1), teachers packs with activity sheets (see section 4.4.2.2), interpretive signage (see section 4.4.3) and multi-media (films and videos) were largely developed with a school audience in mind and have explicit links to the school curricula (see section 4.4.4.4; see also Appendix 4). Nevertheless, one major shortcoming of these materials was found to be the limited participation of teachers (main users) during the development processes (see section 4.4.4.1). This shortcoming has been addressed in this study through its focus on a teacher-centred approach to interpretation resource and materials development as outlined in Chapter 5.

In the next section, I synthesise some of the interpretive capital we mobilised with teachers through our social interactions with non-formal educators and interpretation resources and materials. I briefly indicate how teachers may draw on this synthesised interpretive capital when transforming their school grounds for critical and action-oriented environmental education processes.

#### **4.6.2 A synthesis of the mobilised interpretive capital**

As stated at the beginning of this chapter, the process of mobilising interpretive capital with teachers may be related to that of a ‘circulatory system’ with a number of flows or interrelated processes. These flows were on the data generation techniques I applied, partnerships created with non-formal education organisations, the participation of the teachers, support from the two participating schools and the conceptual dimensions on interpretive capital (perspectives on environmental interpretation and environmental education). Various research techniques (see section 3.2.4) enabled me to keep track of the interpretive capital we mobilised. I have ascribed meanings to the mobilised interpretive capital through data analysis (see section 3.4). The mobilising process drew on what Habermas called communicative interaction, where individuals “... describe concerns, explore what others think, and probe to find what might be possible to do. In the discussion they decide what it is that it would be feasible to work on” (Kemmis and McTaggart 1998:9).

Apart from useful findings on the nature of materials development processes in the non-formal education sector, other useful information (interpretive capital) was derived from the review

phase of this study, which was used to inform the development phase discussed in the next chapter. I will reveal some of the findings that emerged from the review phase and briefly indicate their relevance in the next phase of this study. To this end, a synthesis of the interpretive capital that was mobilised is attempted.

### Possible themes for interpretation resources in the schools

Social interactions with non-formal educators during our organisational review visits (see section 4.2) revealed a number of possible themes for developing at the conceptualised interpretation resources at Samaj and Kenya High. For example, during visits with Samaj to the Giraffe Centre, aspects on succulents, medicinal plants and fishpond were identified as being themes applicable to their project context. When interpreting a certain species of the aloe plant (succulents) to the teachers, Musyoki (2001 pers. comm.) provided useful contacts for the teachers on where to find out more information on succulents. On the other hand, drawing on the information derived from the review visits to the Butterfly Centre, it is possible for the teachers to develop classification charts on butterflies, models on butterflies and interpretive signage on butterfly themes.

### Interpretive capital on the development of interpretive materials

Critical contextual reviews of interpretive materials with teachers provided insights into the practice of materials development (see section 4.4.4). Key shaping ideas such as the role of evaluation in materials development, underlying values, perspectives on the environment and educational theories provided a basis for developing interpretive materials in the two schools. Possible interpretive materials (see sections 4.4.2, 4.4.3) that may be developed for use in schools were also identified during critical contextual reviews of materials with the teachers (see sections 5.2.3, 5.2.4).

### Attracting butterflies to a school garden

Interpretive capital on how to attract butterflies to a garden was mobilised and made available as a result of touring the Flying House at the Butterfly Centre (see section 4.2.1.5). This can be done by growing at the developed interpretation resources both nectar and food plants. A list of nectar and food plant species was provided and the teachers became keener in developing butterfly theme gardens on their school grounds (see sections 5.2.2.2, 5.3.2.2).

### Interpretive planning processes

During the review of the development and use of the Nairobi Botanic Garden (see section 4.2.2.3) and nature trails at NMK, WCK and the Giraffe Centre (see section 4.2.2.4), insights into interpretive planning processes emerged. The guided tour of the Nairobi Botanic Garden revealed possible themes for development at the Samaj 'botanic garden' (see section 5.2.2.1). Guided tours of the Giraffe Centre and WCK nature trails provided an understanding on how to develop a nature trail in the school (see section 4.2.2.4). Ideas that were shared were useful in informing the development of a theme trail at Kenya High (see section 5.3.2.2).

### Insights into mediation processes

Methods and approaches to environmental interpretation and education were identified (see sections 4.2.2.2, 4.3.1, 4.5) and their applicability in school contexts underscored. This provided useful insights into the mediation processes of environmental interpretation and education processes. An understanding of interpretation as a meaning-making process with the potential of enabling the development of critical environmental literacy and action competence in the learners was enhanced in the teachers. This became beneficial during the identification of opportunities for critical environmental interpretation and education processes in their school grounds (see sections 5.2.4, 5.3.4).

### Ideas on environmental interpretation and environmental education

Clarification of environmental interpretation and education processes through workshops generated useful ideas on thematic interpretation, evaluation of interpretive materials, interpretation principles and socially critical approaches to environmental education (see section 4.3). Teachers later on drew from these ideas when developing and evaluating interpretive materials for use in their schools (see sections 5.2.3, 5.3.3). Qualities of interpretive materials that can mobilise learners' cultural capital through encounter with real objects in the school grounds to engage them further in socially critical environmental education processes were clarified (see section 4.3.2). Guidelines and advantages of practising interpretation in schools were also shared through workshop forums.

## Insights into materials development practices

Through workshops, organisational review visits and contextual critical reviews of materials, insights into materials development practices in the non-formal education sector (and applicable in school contexts) emerged. These included:

- interpretive materials (worksheets and trail booklets) that support an interdisciplinary approach to realising the school curriculum through environmental interpretation and education processes can be developed in schools (see section 4.4.4.4);
- basics on how to develop thematic interpretive trails for environmental education processes were learned (see section 4.2.2.4);
- it is important to involve other people in materials development processes (see section 4.4.4.1);
- it is feasible to produce materials in-house on small budgets and without relying on experts for technical information (see section 4.3.2);
- themes can be used to generate captivating interpretive signage titles (see Table 4.2); and
- the existence of diverse approaches and methods in realising environmental interpretation and education processes through use of a variety of interpretive materials (see section 4.5).

### 4.6.3 Constraints and tensions experienced

During this phase of the study, a number of constraints and tensions that included both logistical and methodological ones were experienced (DS 7). Methodologically, I experienced the problems in data generation (being a novice researcher) as reflected in this diary entry:

How can one capture important points during focus group discussions? I was having a feeling that during my review sessions, I do not capture useful points made. The tendency has been to jot down only points I thought were directly relevant to the research question or aim. This to some extent can lead to losing important insights (Diary, 1 February 2001).

At the start of this study, I experienced difficulties in recording my own conversations when taking on the role of a participant-informant (see section 3.2.4.1). The purchase of an audiotape however alleviated this problem. An initial narrow focus I had adopted in the review of

interpretive materials (see section 4.2.2) reflected a rather instrumental approach in the study. There was a tendency to impose my research design (research proposal) on the data generation. This however changed as I started gaining more experience in the research process. As a novice researcher, I had anticipated a neat progression of this phase of the study into the next one (the development phase). This never became the case as some of the research activities (workshop sessions) from this phase overlapped with those in the development phase. At the outset of the study, I had planned workshop sessions to constitute research events in the development phase. It later turned out that most of the workshop activities were towards mobilising interpretive capital for development actions in the schools. The following journal entry affirms this:

Although I have been calling the workshops ‘materials development workshops’, no actual materials development processes are carried out during the workshop sessions (Journal p. 231, 14 September 2001).

Logistically, I experienced a number of constraints related to time and transport. Finding suitable dates to make organisational visits with teachers was a challenging undertaking. A review visit to an organisation depended on the availability of both the teachers and non-formal educators. In some cases, we failed to make review visits (for example, visit to KWS with Samaj) due to the unavailability of non-formal educators or lack of time on the part of the teachers. It was very difficult to arrange review visits with Samaj due to strict schedules at the school. Being a private school, missing lessons on the part of the teachers was least tolerated by the school administration unlike at Kenya High. We only made three review visits with Samaj teachers out of the total twelve organisational visits made during the study (see section 3.3.2.2).

Organising the three workshops (DS 14, DS 15, DS 16) in which environmental interpretation and education processes were clarified (see section 4.3) had its own share of challenges. Negotiating for the participation of Samaj teachers was not always easy (see section 3.2.4.2). The principal of Samaj was always reluctant to allow more than three teachers from the school to attend our workshops. It was only during the 3 April 2002 workshop (this was towards the launch of the school’s ‘botanic garden’) that all the teachers on the project teacher were

allowed to attend. In all the three workshops, teachers from Samaj always reported late for the workshops as attested by the following two journal reflections:

Teachers from Samaj had not shown signs of coming. I became anxious and I had to ring the school. ... It was becoming clear that the workshop would start late. ... One is always in a state of anxiety when waiting for a start of a workshop. Will it be a success? I kept on reflecting on the question (Journal p. 175-6, 22 June 2001).

In spite of the uncertainties, this workshop took place. ... The workshop started without the Samaj teachers who reported late. Some of them had to take their lessons first (Journal p. 230, 14 September 2001).

Constraints and tensions shared above notwithstanding, the review phase of this study was judging from the amount of interpretive capital mobilised (see previous section).

#### **4.7 CONCLUSIONS**

In this chapter, I have described how in collaboration with teachers, interpretive capital within the non-formal education sector was mobilised and made available for the transformation of school grounds. This was achieved through three interrelated processes of making twelve review visits to five non-formal organisations, clarifying environmental interpretation and education processes in workshops and reviewing a sample of interpretive materials collected during our organisational visits. Organisational review visits revealed the social and historical contexts in which environmental interpretation and education processes were carried out in the non-formal education sector. The organisational profiles shared have indicated how non-formal education organisations have endeavoured to match their available educational resources to the needs of the schools. Some interpretation resources were reviewed on how they were developed and used to support environmental learning amongst school groups. This provided useful insights for the teachers on how to develop similar interpretation resources in their school grounds.

In workshops, the concepts of environmental interpretation and environmental education were clarified with teachers to provide a conceptual basis for mobilising interpretive capital. Social interactions during workshops enabled critical and praxiological examination of the

relationship between environmental interpretation and education processes. This fostered in teachers an understanding of interpretation as mutually reciprocal aspects of enabling the development of critical environmental literacy and action competence. Critical contextual reviews some interpretive materials with teachers further provided insights into the social and historical contexts in which interpretive materials were developed and used in the non-formal education sector. Themes on practices and key shaping ideas on materials development processes that emerged from these critical contextual reviews were examined.

Through processes of mobilising interpretive capital as outlined in this chapter, non-formal educators (including myself) and the teachers educated each other through social interactions and the mediation of the interpretation resources and materials in the organisations we visited. As this happened, the static interpretive capital within the organisations became mobile. It was no longer an abstract but, a means by which the teachers and I discovered our transformative potential. The mobilising processes were therefore, not reduced to acts in which non-formal educators deposited interpretive capital to teachers. Neither were they simple exchanges of interpretive capital to be consumed by uncritical teachers. Rather, they were encounters in which united reflection and action (critical praxis) were addressed to mobilise interpretive capital for school grounds transformation and the enhancement of professional competencies of the teachers in materials development, reflective thinking and research. Thus, mobilising interpretive capital with teachers became a means by which we dealt critically and creatively with the reality to discover how to act and change our educational practice, and the way school grounds may be used for environmental interpretation and education processes.

The process of mobilising interpretive with teachers has clearly illustrated that finding solutions with teachers is more empowering than finding solutions for them. I argue that time has come for us non-formal educators and interpreters to start sharing interpretive capital found within our organisations with teachers. This has the potential for enabling teachers to design their own interpretive and educational experiences in schools aimed at enhancing critical and action-oriented environmental education processes.

In the next chapter, I describe how teachers drew on the interpretive capital that we mobilised

to develop interpretation resources and materials in their schools. Described within a metaphorical framework of 'finding the shores', findings in Chapter 5 focus on two case studies of a teacher-centred approach to interpretation resource and materials development.

## PHASE TWO

### **DEVELOPMENT OF INTERPRETATION RESOURCES AND MATERIALS IN SAMAJ AND KENYA HIGH SCHOOLS**

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‘Changing the Tide’

## CHAPTER 5     A TEACHER-CENTRED APPROACH TO INTERPRETATION RESOURCE DEVELOPMENT

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Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. (Tilden 1977:9)

### 5.1     INTRODUCTION

In this Chapter, I present two case studies (see section 3.2.4.10) on school-based development of interpretation resources and materials for critical environmental education processes. The two ‘cases’ present the findings from the second cycle (development phase) of the participatory action research process (see Figure 3.1). The first case study (see section 5.2) describes how a site at Samaj School was transformed into a school-based thematic ‘botanic garden’ (see section 5.2.2). This development process also entailed developing five different types of interpretive materials to enable environmental learning at the site (see section 5.2.3). In the second case study (see section 5.3), I focus on the development of a theme trail within a site designated as the Kenya High ‘Arboretum’ (see section 5.3.2). Six teachers from the school actively participated in a process that yielded five different types of interpretive materials to foster environmental learning at the ‘arboretum’. The interpretation resources and materials that we developed were in response to a marginalisation of environmental education processes in the two schools. This marginalisation is made explicit in the school profiles of environmental education processes (see sections 5.2.1, 5.3.1) shared as a disclosure on some of the contextual factors that may limit critical environmental education processes.

This teacher-centred approach to interpretation resource and materials development is a challenge to conventional top-down approaches (see section 2.5) in which outside experts often ‘diagnose’ schools and develop prescriptions that guide and direct changes (Wals and Albas 1997). This challenge is described here within the metaphoric framework of ‘changing the tide’ (see sections 1.4, 3.3.3). In the two ‘cases’, I provide a detailed account of how teachers were engaged in a process of investigating their own practice within this metaphoric framing. The

approach to interpretation resource and materials development processes highlighted here is an example of contextualising curriculum activities with teachers (see section 2.5.1). I provide an account of these processes as they unfolded from a variety of perspectives. These are discussed by highlighting how interpretive plans in the two schools were formulated and implemented through critical praxis (Marsh 1987). This involved a spirally developing concurrent process of planning, action and reflection (see section 3.2.3.2). To this end, examples of how the interpretive capital mobilised within the non-formal education sector (see section 4.6.2) and in school grounds was drawn on are illuminated (see sections 5.2.2, 5.3.2). I have focused on the problematic aspects of transforming the school grounds and reflected on them from different points of view; those of teachers, school principals and myself (see sections 5.2.5, 5.3.5).

Throughout this chapter, the potential role of interpretation as a way of enabling socially critical environmental education processes in the two schools is articulated. Opportunities created for environmental interpretation and education processes as a result of transformations that occurred are briefly shared (see sections 5.2.4, 5.3.4). This is done by exploring interpretation as an environmental education process (see section 2.3.2). Underlying this is a focus on environmental interpretation and education processes as a response to pedagogical and curriculum tensions that arise within the teaching of critical environmental education processes in schools (see sections 2.2.2, 2.3.1). This response is an attempt to re-orient environmental education processes in schools by combining the language of critique with that of possibility as outlined in chapter two (see section 2.3.1). The efficacy of interpretive materials that were developed as a result of this response is critically examined (see sections 5.2.3, 5.3.3).

Finally, the implications for practising environmental interpretation and education processes in schools are presented in a conclusion that acknowledges the potential for re-conceptualising school grounds as sites for collaborative inquiry. First I present the ‘case’ on how a thematic ‘botanic garden’ and interpretive materials to enable environmental learning were collaboratively developed through critical reflection and action (praxis) at Samaj School.

## **5.2 DEVELOPMENT OF A 'BOTANIC GARDEN' AND MATERIALS FOR ENVIRONMENTAL LEARNING: THE CASE OF SAMAJ SCHOOL**

Samaj School is a private school that was established in 1994. It is managed by a charitable trust and is situated in the western suburbs of the City of Nairobi. The school has a population of 800 students, from nursery to form six, and fifty members of staff (DS 10). It is multi-cultural and multi-religious with individuals of various age groups using the same compound. A qualified horticulturalist (S7) maintains the school grounds, which are neat and well landscaped with a variety of ornamental plant species. The school is sandwiched between a river and a shopping complex with residential houses. This river is polluted with domestic wastes from a neighbouring informal settlement. The water hyacinth weed has also invaded the river. In terms of facilities, the school has well equipped science and computer laboratories, and also a well-stocked library with books on various subjects. Prior to this study, the school lacked an interpretation resource in its grounds for environmental learning.

### **5.2.1 School profile of environmental education processes**

To qualify the constraints to the teaching of socially critical environmental education processes in Kenyan schools as implied in this study (see section 2.2.2), it became necessary to develop a school profile on environmental education processes (DS4). I did this by engaging the six teacher participants from Samaj in a process of *problematising* their own teaching practice (Wals and Albas 1997). An inquiry into the status of environmental education processes (DS 4) at the school through a questionnaire (see section 3.2.4.9) and a semi-structured interview (see section 3.2.4.4) formed the basis of the profile that emerged. This inquiry and analysis of the contextual factors in the school, indicated issues that have, or may hinder critical environmental education processes. Analyses of the status of environmental education processes at the school focused on: environmental learning and teaching processes; use of the outdoors for environmental learning; and links with non-formal organisations. The analysis presents an attempt to reveal the contextual factors at play in the school. Useful insights into pedagogical and curriculum constraints, as these relate critical environmental education processes at the school are shared below.

### 5.2.1.1 *The teacher participants*

The six teachers (S1, S2, S3, S4, S5 and S6) who participated in the study assumed roles of co-researchers (see section 3.2.2). As actors in the research, I involved them in assessing and defining the situation at the school in terms of the status of environmental education processes. My co-researchers were drawn from various subject disciplines and held some responsibilities that reflected their social *habitus* (see section 2.3.2.2) within the school as a *field*<sup>23</sup> (Bourdieu 1993). All of them except S6 (who was still new at the school) had other responsibilities other than their teaching load.

Their details are as follows (DS 4):

S1 (project coordinator, patron science club) taught biology in the secondary section; S2 (assistant project coordinator, head of science) taught physics and mathematics in the secondary section; S3 (games teacher, wildlife club patron) taught physical education and Kiswahili in both primary and secondary sections; S4 (patron Presidential award scheme) taught geography and history; S5 (patron wildlife clubs) taught English and Literature in the primary section; S6 taught Kiswahili and French. S6 joined the team later as a replacement for S5 who left the School for further studies.

S1 and S2 were instrumental in initiating the idea of developing a school-based ‘botanic garden’ (see section 3.3.1.1) and like the other participants; they were active in the affairs of the school. Apart from S2 and S6, all the other participants were patrons of clubs that were involved in environmentally related activities at the school. In spite of their active involvement in environmentally related clubs, none of the teachers has received any form of in-service training in environmental education. Only S1, S2 and S6 claimed to have received some pre-service training in environmental education. This was in the form of modules during their undergraduate studies (see Wanaswa 1993 *et al.*, Karembu 2002). They however found this training inadequate for their teaching contexts. S6 noted that the module that she covered at the university only focused on the history and origin of environmental education. She, at that time, wondered how she was to apply the ‘capital of ideas’ acquired in her teaching career. As a result, the scope and nature of environmental education processes seemed to be poorly understood by the teachers at the time the study started. This confirms findings of a report on

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<sup>23</sup> I use Bourdieu’s (1993) concept of *field* to imply an account of the multidimensional space of positions and the position taking of teachers in the school. This position taking is determined by a teacher’s disposition and values, availability of the position at the school, and form of capital held (educational, social and cultural background).

*Review of formulation of the IGAD project on Environmental Education and Training (IGAD 1999).* This study has addressed aspects of in-service training in environmental education through workshop processes as outlined in the previous chapter (see section 4.3; see also Figure 6.1). During the workshops, the scope and nature of environmental education processes was discussed in some depth (DS 14; see also section 4.3.1).

#### *5.2.1.2 Environmental learning and teaching processes*

The teaching of environmental education at Samaj School is primarily both teacher-centred and discipline-oriented. All the teachers except S2 confirmed that they taught environmental education indirectly through their subjects. For example, S3 noted that in Kiswahili (one of the language subjects), students are taught about conservation and write essays on environmental issues. Beyond their subject disciples S1, S3, S4 and S5 have been involved in various club activities that sensitise learners to the need to care for the environment. These have included activities on tree labelling, bird watching, environmental debates and environmental clean-ups. These activities, which are learner-centred, involve taking action for the environment. They reflect a perspective of education *for* the environment that has been viewed in terms of trying to promote lifestyles compatible with the sustainable and equitable use of resources (see section 2.3.1; see also Fien 1993, Job 1996).

In spite of these initiatives, environmental education processes have not been officially recognised as an integral part of the school curriculum. As S2 put it: “The school administration insists on the teaching of what is in the curriculum and, since the curriculum ... does not include [EE] it is not recognised”. As a result, no guidelines on how to implement environmental education processes existed at the school. This was cited as the major contributing factor to the low profile of environmental education processes at the school. The teachers pointed out that since environmental education processes are not clearly specified in the curriculum, there is no motivation and rationale to emphasise them. They perceived that environmental education processes are not linked to any career prospects and are thus considered as not relevant. Parents, students and even teachers were said to be ignorant of the need to make environmental education processes an integral part of the curriculum. This seemed to reflect a view of education that puts emphasis on schooling as a way of preparing

learners for the place of work (see Fien 1993, Bourdieu 1999).

However, S3 observed that the school had the potential of integrating environmental education processes into the curriculum. This viewpoint was supported by responses from other participants as regards the potential role of their subjects in enabling environmental education processes. These were stated as follows:

Biology being the study of life has a big role to play in fulfilling the objectives of EE. The subject covers aspects such as pollution, ecology and conservation that are directly related to the environment (S1). Mathematics is required in making records related to environmental issues e.g. levels of pollution, numbers of endangered plant species, etc. (S2). Geography can enhance appreciation of economic opportunities provided by the physical environment (S4). English and Literature have a role; passages dealing with environmental issues can be selected and used to create awareness (S5).

While the potential of these subjects are key to enabling environmental education processes in schools, a too narrow focus on subject content can result in education *about* the environment (Robottom 1987, Huckle 1993, Fien 1993, Job 1996). Narrow approaches such as these have been criticised for being based on a technocratic approach (Fien 1997) to the teaching of environmental education processes (see section 2.2). By narrowing environmental education processes to content-based inputs, assumptions are made that by enabling learners to know more about their environment, a change in environmental behaviour may occur (Huckle 1993, Wals *et al.* 1999).

#### *5.2.1.3 Use of the outdoors for teaching*

All the participants except S2 have used the outdoors for teaching. For example, S1 has used the polluted river that passes through the school when teaching ecology; S3 has engaged students in writing essays in the outdoors; and S4 has used the school grounds when teaching about the local environment in geography. Group discussions, observations, project work and reporting were some of the strategies employed by the teachers in outdoor-based activities. Inadequate time due to a heavy workload (S1), lack of resources and the non-existence of an area developed for outdoor learning (S2, S3) were pointed out as some of the constraints to outdoor teaching.

Outdoor teaching activities cited by S1 and S3 are forms of fieldwork studies that advocate for an inquiry-based learning approach that may develop critical thinking and problem-solving skills (Fien 1993) amongst learners. Outdoor education strategies such as these have however, been critiqued for promoting a view of environmental problems as issues and risks that can be addressed through scientific and technical means (Robottom 1987, Fien 1993) at the expense of considerations of conflict and power (Huckle 1993).

#### *5.2.1.4 Links with non-formal education organisations*

Prior to this study, the school had linkages with the Wildlife Clubs of Kenya and NMK. Only S1 and S2 confirmed that they organised class trips to the non-formal education organisations for environmental learning. One such trip was to the NMK Nairobi Botanic Garden in November 2000 to find out how to set up a school-based 'botanic garden' that resulted in the school's participation in this study (see section 3.3.1.1). S1 noted that the tight schedules at the school constrain trips to non-formal education organisations (see also section 2.3.1). S1 and S2 further claimed to have had access to materials from outside the school through their visits to the non-formal education organisations. Important for this study, however, is the fact that none of the teachers seemed to have ever participated in the development of interpretive materials outside the school (see section 2.5). Environmental learning support materials that were used include textbooks, magazines and publicity brochures. Examples of these were found in the school library. Teachers indicated that they had used them for enhancing environmental education processes at the school. A few teachers confirmed the use of charts and models that are usually prepared in-house for teaching. Some trees in the school compound had labels that were developed by members of the wildlife club (S3). These labels were a form of interpretive materials (see section 1.4) that this study aimed to develop with teachers (see section 5.2.3).

Having shed some light on environmental education processes at Samaj School, I will discuss how teachers and other partners were engaged in transforming a site within the school grounds into a 'botanic garden'. This was aimed at enabling socially critical environmental education processes at the school (see section 5.2.4).

## **5.2.2 Transforming a school site into a ‘botanic garden’**

The transformation process started with the formulation of an interpretive plan (DS 9) with the teachers (see also sections 3.3.3, 4.2.2.3). This plan outlined the project goals, themes envisaged, methods and financial implications of the transformation process. I will first describe the interpretive planning process (see section 5.2.2.1), which provided a basis for our attempts to contextualise curriculum activities through a critical approach to materials development (Grundy 1987, Cornbleth 1990). I will then discuss how the formulated interpretive plan was implemented through critical praxis (see section 5.2.2.2).

Throughout this section, I will point out how the interpretive capital mobilised during our interactions with non-formal educators (see sections 4.2.2, 4.3, 4.6.2) was drawn on and also, how we further mobilised interpretive capital in the school grounds for their transformation. The potential of the various themes developed at the site in enabling critical environmental interpretation and education processes is later critically examined (see section 5.2.4).

### *5.2.2.1 Formulating an interpretive plan for Samaj*

Planning for the development of a themed ‘botanic garden’ was an open-ended process that developed throughout this phase of the study (see section 3.2.3.2). However, for the school management to approve the implementation of this project, a document (interpretive plan) that outlined the goals and how they were to be realised was required. We also needed the plan to guide us through the development process. I therefore engaged the teachers in a process of interpretive planning that was open-ended and participatory (Curthoys and Cuthbertson 2002). I will highlight here some of the steps that were followed.

In a meeting held on 14 March 2001 at Samaj, we brainstormed the objectives; title of the project; themes to be created; and activities envisaged to realise the development of a ‘botanic garden’ in the school grounds. This meeting served as our objective setting and data collection phase of the interpretive planning process (see Bradley 1982). To enhance the process, I provided notes from extracts of the NMK Nairobi Botanic Garden interpretive plan (see section

4.2.2.3). This stimulated meaningful interactions in which teachers brought in their ideas within their local contexts (Curthoys and Cuthbertson 2002). Assuming the role of a facilitator, I encouraged them to set their own goals within the critical perspective of this study. In this way, relevant information about the school and the interpretive resources we set out to develop was generated. From the conceptualisation of this project (see section 3.2.3.1), S1 and S2 were keen to model their school-based ‘botanic garden’ along the NMK Nairobi Botanic Garden (see section 2.4.3). We therefore drew on the interpretive capital that had been mobilised during the critical review of NMK Nairobi Botanic Garden on 14 February 2001 (AM 7; see also section 4.2.2.3). Drawing on this, and a consideration of the social and historical contexts at Samaj, eight themes outlining possible educational opportunities were proposed as illustrated in Table 5.1 below.

**Table 5.1** Themes proposed for the Samaj School ‘Botanic Garden’

<b>Proposed Themes</b>	<b>Description and some possible educational opportunities</b>
<b>Medicinal plant area</b>	Plants of medicinal value consisting of both exotic and indigenous species to be planted. Educational opportunities in this area will include the teaching of Chemistry and cultural values related to plants.
<b>Wetland Area</b>	A wetland plant community that will include papyrus and other wetland plants will be planted in the river to purify the polluted water. Educational opportunities here will include sewage treatment using plants and also plant adaptations.
<b>Butterfly Corner</b>	Food and nectar plants for butterflies will be planted here and models of butterflies erected. This area will be useful during the teaching of pollination and economic importance of butterflies can be emphasised. A small plot of silkworm farming will be part of this area.
<b>Orchard Area</b>	Various fruit plants will be planted teaching agriculture and the economic importance of plants.
<b>Succulent Area</b>	Plants that require less water will be planted for the teaching of plant adaptations and conservation of Kenyan succulents.
<b>Rare Plants Area</b>	Some of the rare and endangered plants in Kenya will form part of this area of the Garden for the teaching of plant conservation. A mixture of both potted and terrestrial plants will be displayed.
<b>Memorial Area</b>	Will be devoted to the founder of the school and both exotic and indigenous plants used to commemorate events will be planted.
<b>Recreation Corner</b>	A seating area with benches will be part of the Garden where students and visitors can relax and meditate on particular issues.

Based on a format we negotiated during the meeting, S1 later synthesised this information into a draft interpretive plan. Although I had expected the teachers to further revise this draft, it never happened as captured in this journal reflection almost three months later:

I had expected the teachers to have a major input and make the final draft but it was never to be! Working with teachers ... can be very demanding and the idea of participatory approach can be elusive at times (Journal p. 185, 10 July 2001).

I re-worked the draft S1 had produced and held another meeting (with S1 and S2) in which we made improvements to the draft. We discussed the financial implications of implementing the envisaged themes at the school. A budget was drawn up and included in the plans. To ensure that the plan we developed met its objectives, a strategy of monitoring and evaluating the proposed activities was included. Drawing all this information together, I further revised the draft plan to produce a final document (DS 9; see also Appendix 5) that was submitted by S1 to the school principal for approval.

The interpretive plan we created (DS 9) discusses the purposes of the 'botanic garden' and its significance to the school. The overriding goal for developing a 'botanic garden' was a response to the low profile of environmental education processes at Samaj as outlined in the previous section.

A number of outcomes were generated towards realising this goal. These were to (DS 9):

- provide an interpretation resource that may enable teachers utilise their school grounds for environmental education processes across the curriculum (see section 5.2.4);
- address some of the environmental issues and risks around the Samaj community (see section 5.2.4);
- develop a 'botanic garden' that can be used to share ideas and experiences with other schools on environmental interpretation and education processes;
- develop interpretive materials that may engage learners in critical environmental education processes at the 'botanic garden' (see section 5.2.3);

- contribute towards meaningful club activities through environmental action learning projects within the school grounds; and
- provide an additional recreational facility at the school.

The interpretive plan also articulates how the ‘botanic garden’ was implemented within a specified timeline; financial resources that were expected from the school, and NMK through my research budget (DS 32); and an evaluation strategy for the development process. The document that we created provided a framework around which development actions highlighted in the next section, were discussed and taken. We did not regard the plans as a set of procedures to be followed rigidly; rather, they were to be cyclic, continuous and open to revision and comment (see Bradley 1982). Unlike in more conventional top-down approaches (see section 2.5) where a specialist facilitates the process, I became part of the process as a co-learner (see section 6.3.1).

#### *5.2.2.2 Implementation of the formulated interpretive plan through praxis*

The actual development of the Samaj ‘botanic garden’ became a process of transforming an under-utilised area within the school grounds. It was a deliberate and controlled process that occurred in real time (between 11 July 2001 and 19 April 2002) through encounters with real constraints (Marsh 1997). The project plans were implemented through a series of focus groups and informal meetings (DS 20, DS 21; see also section 3.3.3) at the school. The sessions drew on the teachers’ theory and practice and on the interpretive capital mobilised within the non-formal education sector in the first phase of this study (see section 4.6.2). As the main researcher, I avoided dictating the development process but rather engaged the participants in a reflexive process of learning by doing (see section 3.2.3.1).

The implementation process started with a survey of the site whereby we measured the total area of the site and then discussed the location of each of the proposed themes (see Table 5.1). Drawing on his design skills, and a reading that I provided on ‘how to design a trail’ (see Honig 2000), S2 made a detailed site map on paper to indicate the proposed themes and pathways. The site map, like the interpretive plan we created (see previous section) was presented to the school management for approval. The availability at the school of a qualified

horticulturalist (S 7) and a member of the Board of Trustees (S 8) who had architectural design skills hastened the implementation of this project. NMK Nairobi Botanic Garden and other partners played a key role towards the realisation of the project outcomes. Transformation of the site into a 'botanic garden' required both hard and soft landscaping skills. During hard landscaping, the area was cleared, dug up and then filled with forest soil. To hasten the process, the school employed more people to assist S7. In soft landscaping, various plants species were sourced and planted according to the themes proposed at the site.

Since the teachers and I lacked sufficient 'horticultural capital' we closely worked with S7 and NMK Nairobi Botanic Garden horticultural staff to realise the development of a number of theme gardens. According to Honig (2000:15), an educator must work closely with a horticulturalist when developing a thematic garden. Honig (*ibid*) described a theme garden as an area in a botanic garden with a specific focus. In our case, the themes that we generated during the initial planning became our foci. We therefore mobilised more interpretive capital from our interactions with S7 and the NMK staff. The envisaged educational opportunities and purposes of the themes were first explained to them and the kinds of plants required to tell the story discussed. We drew on their 'horticultural capital' when choosing on what plant species would tell a story that may enable environmental learning. At the same time, the horticulturalists drew on some of our mobilised interpretive capital (see section 4.6.2) when deciding on what plant species with the intended education value would grow well at the theme gardens. Our social interactions involved negotiations and compromises on what 'capital of ideas' to apply. This produced theoretical accounts that enabled a shared *critical consciousness* (Marsh 1997). Within this perspective, the transformation of school grounds resulted in actions of collective wisdom, reflection by horticulturalists and teachers in action (*ibid.*).

On several occasions during the implementation period, I engaged the participants (both teachers and horticulturalists) in critical reflections that produced new plans for further action. These reflections on a consultative meeting at the site between NMK Nairobi Botanic Garden staff and the teachers provide proof of this:

Finer details of planting succulents at the site were recommended ... S8 said that there are immediate plans to plant creepers on the walls. I mentioned that some interpretive

panels would be placed on the walls. Vegetation along the river should be improved by planting more trees that may act as breeding areas for birds. ... S8 revealed that there were plans to expand the Garden during another phase of development. ... On soft landscaping, Wambugu recommended that an undulating landscape with a lawn be created. A flat landscape is not very appealing ... S1 said that he is to seek more advice from the Butterfly Centre regarding the implementation of the theme at the butterfly area (Journal p. 300, 20 December 2001).

The journal entry above confirms that during the implementation process, we observed and reflected on the effects of our actions (see section 3.2.3.2) in the context that they occurred in an open-minded way. This provided a basis for critical praxis (see section 2.3.1) that enabled further planning and action. In this way, I may claim that in our own little ways, we reflected a group of people working together for transformative action. We became a community sharing a common interest, that of transforming the site into a thematic 'botanic garden'. Through processes of action and reflection (praxis), we worked towards this transformative goal (Grundy 1987) and managed to develop seven themes at the site. These were on succulents, orchard, butterfly garden, memorial garden, medicinal garden, pond area and recreation area (see Table 5.1). The following interpretive account depicts the 'botanic garden' that emerged at Samaj.

Near the entrance is a rockery with juicy and fleshy plants, which ration water. These are succulents. Next to them are plants that manufacture vitamins. Ahead of the orchard, you meet brightly coloured plants. Butterflies are romantically attracted to these plants. The path around them leads you down the memory lane, a lane decorated with aromatic herbs of cultural significance. On this lane, you find the wonder plant *Tulsi* (Basil). It's a plant reputed to have cures for forty diseases. Leaving the memorial garden area, you run into 'living pharmacies'. One such pharmacy is a plant (*Prunus africana*) sought after for its prostrate cancer remedies. While still here, you will not fail to spot a plant regarded by many as a 'complete pharmacy'. This is the Neem tree. Nearby is a source of life (water pond). Its path leads to a remarkable landscape (recreation area) with an artificial waterfall. This may remind you of tourist attracting landscapes. The seating area at this area enables you to have a full view of the Garden. This Garden is divided from the main school area with a river in tears! It's a river suffocated with raw sewage and a persistent weed (Adapted from trail leaflet that was developed; see also Appendix 6).

In this short *provoking, relating and revealing* interpretive account (Tilden 1977), I have to some degree given a picture of the themes that emerged at the site. Construction of these themes entailed drawing on the interpretive capital that was mobilised within the non-formal

education sector and the school. Some examples are provided to illustrate this process.

The development of the succulent theme garden drew mainly on the interpretive capital mobilised during interactions at the site. The school horticulturalist (S7) in collaboration with NMK Nairobi Botanic Garden staff designed a rockery with some useful input from S8. Efforts to use natural rocks at the site were unsuccessful and as a solution to this, S8 advised that we use concrete to create artificial rocks. This was however, later criticised for its poor finish. Succulents for planting were provided by NMK. The butterfly garden concept had its origin from NMK and its implementation drew from the interpretive capital mobilised during teachers' visits to the Butterfly Centre (see section 4.6.2). On their own, S1, S2 and S7 further consulted the staff at Butterfly Centre for more ideas. Construction of the theme at the recreation area drew mainly from the interpretive capital mobilised at the site through interactions between S4, S7 and S8. S4 designed a model of a river showing stages of development. The idea of drilling a borehole from which water was pumped into this river model originated from S8. The river flowed into a pond that was conceptualised during a review visit to the Giraffe Centre (AM 10; see also section 4.6.2). S2 designed the pond and S7 ensured its construction.

Later in the development, a professional horticulturalist was engaged by the school at my request to polish up the constructed themes (AM 20). Throughout the development process, I strived to document our actions through photography (DS 24; see also section 3.2.4.8) as a basis of evaluating and monitoring changes at the site (DS 24, DS 25; see Figures 5.1, 5.2 and 5.3).

Figure 5.1 shows the area in its undeveloped form at the start of the project. Figures 5.2 and 5.3 show transformations that took place at the site after December 2001. In Figure 5.3, S1 is seen explaining to Prof. Pat Irwin<sup>24</sup> from Rhodes University, South Africa (who had visited Kenya to familiarise himself with my research project), the educational potential of the butterfly theme garden we developed at the site.

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<sup>24</sup> Prof. Pat Irwin who was one of my supervisors on this study, had travelled to Kenya to familiarise himself with the participatory action research project I was undertaking with Samaj and Kenya High teachers. He was particularly impressed with the transformation that had taken place at the Samaj school grounds (Irwin 2001 pers. comm.).



**Figure 5.1** The undeveloped site  
(DS 24, 11 July 2001)



**Figure 5.2** The transformed site after landscaping  
(DS 24, 20 December 2001)



**Figure 5.3** The butterfly theme garden that has emerged at the site  
(DS 24, 12 May 2002)

### 5.2.3 Developing materials that engage learners in critical educational processes

The process of developing interpretive materials started much earlier, even before themes at the site were constructed. The aim was to enable teachers to learn how to write interpretive texts (see section 4.3.2) by focusing on some of the plants that existed in the school compound. The process started by formulating plans in which materials to be developed were decided. The planning process was initiated during a materials development workshop that was held on 22 June 2001 (see Table 3.1 for group task). A more consultative planning session that involved all the teachers was later held at the school on 24 July 2001 (AM 18). In this session, we decided to develop two worksheets (one for junior classes and the other for senior classes); interpretive signage on three plants near the classes; one A4 publicity brochure; six interpretive labels for trees near the school canteen; and one trail booklet (was to be developed later).

Development of these materials followed a participatory and open-ended process that allowed

for changes when necessary. The emphasis was on the process, rather than the product, with an overriding aim of enabling teachers to become materials developers and interpreters (see section 6.4). In the sections that follow, I describe how teachers were involved in the process by drawing on some of the interpretive capital mobilised during the review phase (see sections 4.4.3, 4.6.2).

#### *5.2.3.1 Publicity brochure*

All the teachers were involved in the design and development of the publicity brochure. To hasten the process, I provided a sample of twelve assorted brochures from different organisations for the teachers to draw from. Jointly, we designed a simple six-page A4 brochure with three folds (DS 18) and brainstormed contents to go into each of the pages. Tasks on researching and writing texts for the brochure were shared (see section 4.4.2.3). Other than the facilitation role I assumed during this process, I also acted as a critical friend to the teachers.

To produce a first draft, S5 wrote texts for pages one and two. The first page had a welcome message that read: *Welcome to the SCLP Samaj School Botanic Garden: A resource for environmental learning and recreation*. The second page had background information on the 'botanic garden'. S1 wrote texts on the themes that were envisaged at the site on pages three and four. He specified educational opportunities at each theme. S3 provided texts on the envisaged functions of the 'botanic garden' and an orientation map for pages five and six respectively. Contact details were also provided (page six) for those who needed to find out more about the project. The teachers involved two students to assist with the design the brochure on the computer. The draft that emerged was edited by S1 and copies were produced for distribution to parents. It seemed that the teachers were eager to market the interpretive plans for the 'botanic garden' (see section 5.2.2.1). As a result, the first draft of the brochure that emerged was never subjected to a critical evaluation. Nevertheless, the teachers (S1, S2, S5) claimed that they had gained some useful insights into the process of designing and developing a publicity brochure. They further claimed that the brochure, together with the school newsletter, had to a great extent publicised the project to a wider audience.

In my view, the brochure that we developed was more informational than interpretive (see sections 2.3.2.1, 4.4.2). This view seems to be supported by Sutherland (2001 pers. comm.) when she remarked:

An informational brochure is different from an interpretive one. A brochure outlining the history and how a garden is divided is not interpretive. It does not aim to motivate people ... but rather, it provides factual information. An interpretive brochure must raise people's level of understanding about a natural or cultural environment so that they can start questioning and exploring it.

Our brochure only outlined what was to appear at the site and in the process became factual.

#### 5.2.3.2 *Interpretive plant labels*

An interpretive label is a type of interpretive signage (see section 4.4.3) that is used to interpret and identify objects (McIntosh 1982). They have slightly more details than simple labels, which are usually brief and simple (*ibid.*). More information that goes beyond identification of an object is provided in non-technical language.

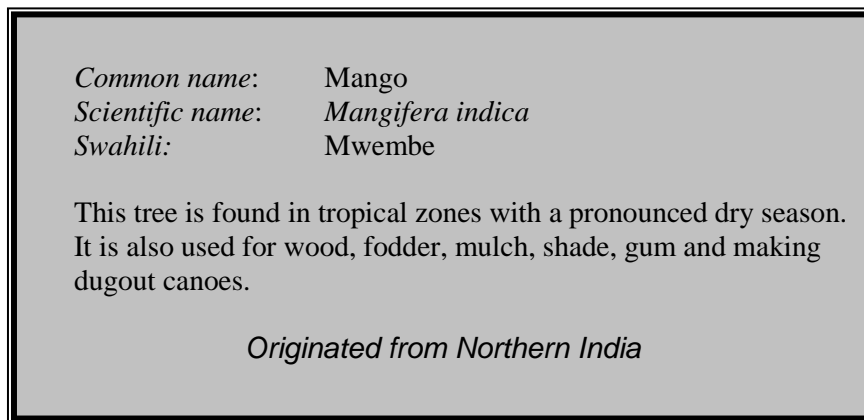
Although we had initially planned to develop six interpretive texts, we only managed to develop four (DS 18). These were developed on a pilot basis and focused on four plants that existed around the school canteen. To come up with the first drafts (DS 17), we first shared tasks on researching and writing the texts. S1 wrote the text on the red stinkwood; S2 researched the *Markhamia*; S3 wrote text on a mango; S4 provided text on the yellow fever tree; S6 researched local names of the plants; and I wrote a text on a sycamore fig tree. In addition, I edited and generated drafts on computer. The first drafts of the interpretive labels were laminated and then given to S1 to trial them at the school. I thus played the roles of a facilitator, critical friend, participant and editor at the same time. Each label contained information on plant names (local, common and scientific); a short description on the uses and ecology of the plant being interpreted; and its origin (whether exotic or indigenous).

S1 mounted the labels on the respective trees near the school canteen and using a checklist (see section 3.2.4.6) I had prepared; he involved three students in observing how other students used the labels. Observations made by the three students (DS 18) were drawn on to inform the

second cycle of development. For example, more colourful labels with catchy themes were recommended (see section 4.3.2); the font size was found too small; the labels had been mounted too high for smaller children; and more details on the label were required. On the other hand, some environmental learning seemed to have taken place. This claim may be supported by the following observations of the students (AM 18):

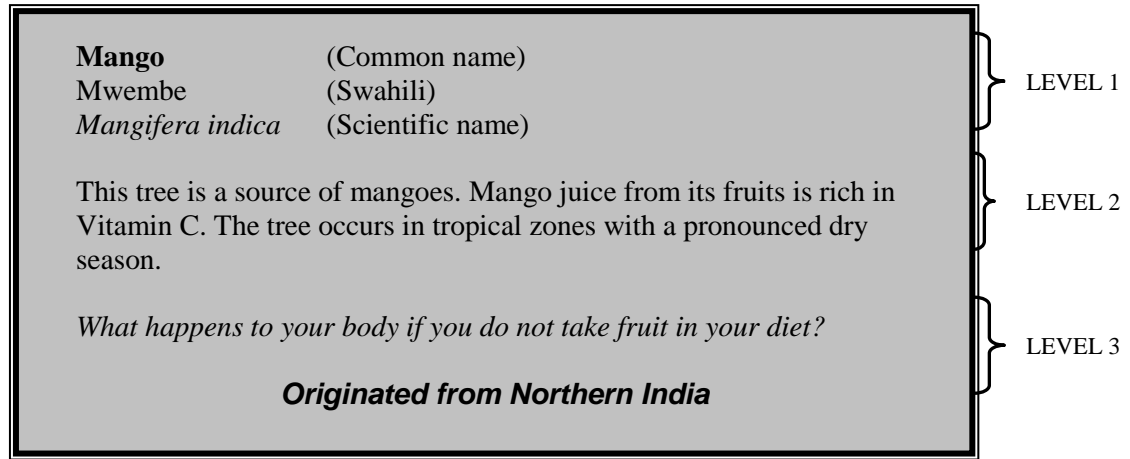
Some students created games out of the labels and asked others to name the plants in their mother tongues. They also asked them to give relevance of the tree to the society, e.g. uses. They went around to other trees without labels and attempted to name them.

Following observations made by the students during the trials, we critically reviewed the interpretive labels later as a group and made appropriate changes. These changes incorporated students' recommendations and focused on the design, flow of texts, links to the curriculum, levels of complexity, and suitability of follow-up activities. I will focus on the interpretive text generated by S3 on the mango and then trace the changes we made through critical praxis (see Figures 5.4 and 5.5). Figure 5.4 is the first draft of an interpretive label on the mango that was generated by S3. This interpretive label was criticised by S2 for having far-fetched uses. He further observed: "A focus on uses that the learners can easily identify with ... should be mentioned first. The ecology on the plant can be stated later. A follow-up question should be included on the label".



**Figure 5.4** First draft on the Mango interpretive signage

Suggestions made by S2 were later incorporated into the second draft (see Figure 5.5 below) during the second cycle of action. This second draft was further critically evaluated during the final workshop (DS 16; see also section 4.3.3) together with other materials.



**Figure 5.5** Second draft on the Mango interpretive signage

There are salient differences between the first (see Figure 5.4) and second (see Figure 5.5) drafts of the interpretive label on the mango. These differences are in the flow of names in terms of complexity, and the presence of a question that encourages learners to find out more (see section 2.3.2.3). The teachers felt that each interpretive label should start with a familiar name (common name) and then end with a more complex one (scientific). The degree of complexity of the names increases and the learner first reads the common name when his or her interest is still high. The question posed here although rather technocentric requires learners to find more information on their own. This may enable critical processes of knowing (see section 2.3.2.3) as learners' cultural capital is mobilised through engagement with the interpretive materials.

A critical examination of the interpretive text shown in Figure 5.5 reveals that the interpretive labels we developed (see also section 5.3.3.2) seem to consist of three levels of information. The first level contains information on the names of the plant; the second level is a thematic text that describes the plant; and the third level has a follow-up activity (problem-posing) that encourages learners to find out more on their own (see also section 5.3.3.4).

### *5.2.3.3 Worksheet for senior classes*

Initially, we had planned to develop two worksheets with the teachers. However, we only managed to develop a draft worksheet for senior classes. To initiate the process, I provided an outline of activities to guide the process. These activities were drawn from samples of activity sheets from other botanic gardens and focused on the themes at the site. Although I had chosen them with junior classes in mind, the teachers found them adequate for senior classes. As a group, we used them as a framework for co-constructing new activities for senior classes (secondary section) that were based on the themes created at the 'botanic garden'. S1, S2, S4 and S6 generated activities on plant adaptations (biology); estimating area of butterfly garden (mathematics); river development (geography) and identification of fruits plants (agriculture) respectively. These activities have the potential of actively engaging learners in meaning making processes at the 'botanic garden' that may lead to critical education processes (see section 2.3.2.3).

We then, as a group, designed the format of the worksheet by drawing on ideas mobilised during the review of teachers' packs (see section 4.4.2.1). A title for the worksheet was then chosen. Due to time constraints, we were unable to trial and critically evaluate the draft worksheet that we developed.

### *5.2.3.4 Trail leaflet*

A simple A4 trail leaflet was developed to enable self-guided tours for students and other visitors at the 'botanic garden' (see sections 4.2.2.4, 4.4.2.1). To come up with this interpretive material, we shared the tasks of finding information (research) on the eight stops that we decided to interpret. S1 researched the butterfly garden and medicinal garden themes; S2 covered the memorial garden and wetland themes; S3 wrote an interpretive text on the recreation area; S4 researched information for the river stop; S6 provided information on the orchard; and I offered to write interpretive texts on the introduction and succulent garden. To enable the process of writing texts, I provided the teachers with a reference book on interpretation (see Honig 2000); an example of an interpretive text from my work at NMK Nairobi Botanic Garden; and two readings on principles of interpretation and learning concepts (DS 11). The process also drew on the interpretive capital that we had mobilised during the

review phase of this study (see sections 4.3.2, 4.4.2.1, 4.6.2).

As a team we first decided on the overall theme for the trail (path around the themes at the site). This theme was to be supported by all the stops as a way of presenting a whole rather than a part (see Tilden's fifth principle in footnote 4). The theme is reflected in the introductory texts of the trail leaflet (see Appendix 6) and it provided a storyline that was supported by every stop (Veverka 1994). Taking on the role of an editor, I synthesised the interpretive texts that we generated for the eight stops into a first draft of the trail leaflet (DS 17).

The emerging draft was then critically evaluated using a checklist that we had generated before the development process (see also section 4.3.3). Theme titles were revised, graphics for stops suggested and information verified for its accuracy. Although we did not have a limit on the number of words for each theme, the texts were kept as short as possible (Ham 1992). Using the computer, I designed and produced an A4 trail leaflet with three folds (six pages) as a final draft. This was later further critically evaluated during the final workshop in April 2002 (see section 4.3.3). I submitted both electronic and hard copies to the school and encouraged the teachers, to make changes as it suited them.

Some key features of the trail leaflet that we developed are evident (see Appendix 6). The texts were written in a story form that revealed messages on the themes that were being interpreted at the stops (see Tilden 1977, Strauss 1996). Each stop has a theme title that may capture the attention of the learner (for example, 'plants vitamins are made here!'). Messages like "... without pollination, crop yields ... would decrease. ... Bring butterflies into your garden and save ... pollinators" (stop 3) may provoke learners into taking some action to start butterfly gardens in their homes (see section 2.3.2.3). Curriculum links are explicit in the texts with various subjects being covered. The use of simple language is clearly reflected in the texts (see Veverka 1994). All the eight themes seem to support an overall theme on the value of conserving the environment (see Appendix 6).

Near to the launch of the Samaj 'botanic garden' (DS 19), the teachers decided to have interpretive signage at the site in addition to the trail leaflet. The same interpretive story in the

trail leaflet was used when installing interpretive signs along the trail (path). This is what Sharpe (1982:315) termed as “the sign-in-place trail” (see Figure 5.6; see also section 4.4.3). This however, required designing panels and adding more graphics to the texts that appeared in the trail leaflet (see Appendix 6 for a sample of interpretive text).



**Figure 5.6** S1 showing one of the interpretive signs at the pond area  
(DS 24, 12 May 2002)

To enhance this, two more teachers (arts and design) joined us in mobilising ideas on design. The two teachers together with arts and design students ensured the mounting of interpretive texts on A3 metallic panels. The students made graphics that accompanied the texts (see Appendix 6).

In the next section, I discuss the potential of the ‘botanic garden’ that was developed in enhancing environmental interpretation and education processes at Samaj. These are further attempts to explore the perspective of interpretation as an environmental education process (see also sections 2.3.2, 4.2.2.2, 4.5).

#### 5.2.4 Opportunities for critical environmental interpretation and education processes

As I have highlighted in Chapter 2 (see sections 2.4.1 and 2.4.2), botanic gardens are playing a major role in communicating the critical need to use plant resources sustainably (BGCI 1998). Although the ‘botanic garden’ that we created at Samaj does not meet most of the defining characteristics (see sections 1.3.1, 4.2.2.3) of botanic gardens that were outlined in *The Botanic Gardens Conservation Strategy* (IUCN, BGCS and WWF 1989), in my view it may marginally be described as one. The ‘botanic garden’ has already started performing the functions of education and conservation (DS 21). In addition, through the assistance of NMK Nairobi Botanic, most of the plants at the site have been labelled (AM 18). S7 (horticulturalist) has received some skills on how to accession and label plants within the context of the school. Interpretation of the themes at the site has commenced with installation of a number of interpretive panels. The ‘botanic garden’ may be termed as a ‘community’ garden (see section 2.4.2) since it is managed and maintained by a school community of teachers, students and parents. Furthermore, it has been designed to serve educational and interpretive needs in a localised area as witnessed during its launch (DS 19) on 19 April 2002. As a community garden, it has a key role in teaching cultural values that promote plant conservation (see Atiti 2001c).

Plants and other features at the ‘botanic garden’ present many opportunities for critical environmental interpretation and education processes. For example, a plant with cultural significance like the Basil (see Appendix 6 for trail leaflet) may be used to engage learners in reflecting critically upon their cultural assumptions, values and social relations with plants (Tilbury 2002 in press). Learning activities with a focus on cultural uses (indigenous knowledge) of plants at the memorial theme garden may be used in a process of raising awareness on the loss of indigenous knowledge and how modernism is threatening traditional and indigenous cultures (*ibid.*). This can enable learners recognise their true cultural perceptions and identities. This may contribute to their capacity to build a more sustainable community. Many of the plants at the memorial theme garden may be used to celebrate multiculturalism and deal with issues of globalisation (Ashwell 2001).

The polluted river at the site offers opportunities for actively engaging learners in critical problem solving of real problems through co-operative processes of inquiry (see section 2.3.1.3). The interpretive signage that was installed near the river (see Appendix 6 for trail leaflet) was aimed at mobilising learners' cultural capital towards such processes. The theme title 'A river in tears!' may capture the attention of learners to find out more about the issue embedded in the theme title. The interpretive text developed on this theme may engage learners in reflecting on what they know and do not know about sources of water pollution. Depending on their levels of critical consciousness (see section 2.3.1.1), the learners may act critically as a group to solve the environmental issue being communicated. The question ('What can you do to save this river?') posed in the material is aimed at mobilising them into action and reflection. Such problem posing involves challenge, discontinuity and change that may lead to critical environmental education processes (see section 2.3.2.3). It is aimed at 'problematizing' the situation with a view of rousing 'critical consciousness' in learners (Freire 1985). Through processes of action and reflection, learners may adopt an attitude of questioning, doubt, investigation and a will to illuminate and address the pollution problem (see section 2.3.2.3; see also Greenall Gough and Robottom 1993).

Involving learners in responding to such real problems and risks in their local environments can be regarded as an effective way of developing the action skills needed to investigate, evaluate and implement solutions to environmental issues (Fien and Tilbury 1998). However, the learners should not only be involved in real environmental problems and issues, they should also be challenged on a personal level to change parts of their lives and engage in more sustainable lifestyles (*ibid*). Teachers at Samaj have plans to encourage their learners to take responsibility for the river through active engagement in action projects and as informed and concerned individuals and community members (see section 2.3.1.3). Already, some teachers have started using the 'botanic garden' to fulfil aspects of the school curriculum (see Figure 5.7). In Figure 5.7, S1 is seen conducting an outdoor learning with a group of students. This was before the 'botanic garden' had been officially launched. The new 'botanic garden' has the potential to provide learners with opportunities for critical environmental interpretation and education processes.



**Figure 5.7** An environmental learning activity at the ‘botanic garden’  
(DS 24, 14 February 2002)

Through the envisaged annual open days (S1), the ‘botanic garden’ will open its doors to the parents and others community members. As a result, it will become a place for social and cultural interactions between learners and community members. Such interactions may contribute to socio-cultural sustainability (see Huckle 2000) in this multi-cultural and multi-religious school (see section 5.2).

### **5.2.5 Reflections on the transformation of the school grounds at Samaj**

The process of developing a school-based ‘botanic garden’ and associated interpretive materials at Samaj was by all means a successful endeavour judging from the events at its launch on 19 April 2002 (DS 19). In preparation for this event, the entire school became involved in a project that had only been hitherto associated with a few teachers (see 5.2.1.1). This example of catalytic validity (Lather 1986) is a clear indication of the extent to which the whole school were prepared to ‘own’ the project. However, before the project showed signs of fruition, the principal of the school was rather sceptical about the project. He had viewed it as a

‘time robber’ as it demanded a lot of time from the teachers who sometimes had to miss classes.

### **5.3 DEVELOPMENT OF AN‘ARBORETUM’ WITH THEME TRAILS: THE CASE OF KENYA HIGH SCHOOL**

Kenya High school is a national school that was started in 1910 as a ‘whites only’ institution. Until 1937, it was known as ‘The Nairobi European School’. It is categorised as a high cost school due to its excellent facilities and as a result of its history. The School is situated within the city of Nairobi on Kileleshwa Hill. Currently it has a population of 800 girls drawn from all over the country, and a teaching staff of sixty. The school occupies about 100 acres of land of which twenty-five acres comprised of mature woody plants. This is the area that is being transformed into an interpretation resource to foster environmental learning. It has been designated as the Kenya High ‘Arboretum’ (see section 1.3.1 for a definition on arboretum).

Most of this area is currently under-utilised apart from limited farming activities in some sections. There exists a stream, an orchard, a disused open-air theatre and a swampy area (wetland) and many different species of plants at the site. Prior to this study, the school had embarked on efforts to create a nature trail in this area in collaboration with NMK Nairobi Botanic Garden. A plant survey had been undertaken by a plant taxonomist from NMK to determine the plant species found at the site. This revealed an existence of more than 100 species of both exotic and indigenous plants. The school is a member of the eco-school project that was initiated by a local non-governmental organisation, Kenya Organisation of Environmental Education (KOE) (see section 2.5.3). The six teachers who participated in this study were members of the eco-school project committee.

#### **5.3.1 School profile of environmental education processes**

The profile of environmental education processes (DS 5) that I describe in this section was developed after administering a questionnaire (see section 3.2.4.9) to six teachers (K1, K2, K3, K4, K5, K6) who were my co-researchers, and interviewing (see section 3.2.4.4) one teacher

(K7) and a farm manager (K8) from the school. Through the questionnaire, I involved the teachers in a form of self-reflective inquiry into their own practice in order to understand and improve it (Carr and Kemmis 1986). Semi-structured interviews with K7 and K8 further provided insights into the status of environmental education processes at the school. An analysis of the questionnaire and interview data revealed some contextual factors at the school that may affect the teaching of critical environmental education processes (see sections 2.2.2; 2.3.1).

To provide some insights into the status of environmental education processes at Kenya High, I examine teachers' responses to: environmental learning and teaching processes at the school, use of the outdoors for environmental learning and links with non-formal education organisations. First, I provide some details on the teachers who participated in this study.

#### *5.3.1.1 The teacher participants*

My six co-researchers (K1, K2, K3, K4, K5, K6) were drawn from various subject areas and as mentioned all were members of the eco-school committee. The farm manager (K8) was a member of the team during the initial stages of the study and K7 was only involved as an informant during an interview held on 19 September 2001. K7 is a senior head of the science department and taught biology. Although she had wide teaching experience, she had only been at the school for one year. The details of the other teachers are as follows (DS 3):

K1 (project coordinator) and K3 (patron wildlife club) taught biology; K2 (head chemistry department) and K6 taught chemistry and mathematics; K4 taught Kiswahili and history; and K5 taught Christian religious education and social ethics education. K1 and K2 had been at the school for more than twelve years.

All the participants except K5 covered a unit on environmental education at the university during their education courses (see Karembu 2002). The unit covered aspects on human activities and the environment. Except for K4 who thought that the unit "... created a positive approach to the environment and reinforced the need to conserve it", the other participants found the pre-service training rather inadequate. They felt that objectives of environmental education were not covered in ways that reflect the school curriculum. With regards to in-service training, the participants confirmed having participated in workshops (K1 and K2) and

study tours (K2, K3 and K5). This was necessary because of their participation in the eco-schools project. The teachers found the in-service training relevant as they have used knowledge that they gained to carry out environmental activities at the club level.

#### *5.3.1.2 Environmental learning and teaching processes*

Most of the teachers (K2, K4, K5 and K6) were of the opinion that environment education processes were recognised and highly rated as an integral part of the curriculum at the school. Four reasons were put forward to support this argument (DS 10):

There exists an award scheme for environmental cleanliness; the school is a member of the eco-school project; existence of a number of clubs that involve learners in action-oriented environmental activities; and the school's initiative to develop a nature trail on its grounds in collaboration with NMK prior to this study.

Nonetheless, environmental education processes were still marginally taught and depended a lot on initiatives from the non-formal education sector as evident in the implementation of the eco-school project through KOEE. As K4 put it, "... it is in the non-formal education sector where [human] resources and materials to enable environmental education processes [in schools] are found". For example, through the eco-school project there had been attempts to develop an environmental policy (K1) to guide the school in the teaching of environmental processes. However, at the time of this study, no evidence for the existence of such a policy was found. The lack of clear guidelines on how environmental education processes may be enhanced at the school emerged as one of the constraints. Interestingly, not all teachers at the school were aware of the objectives of the eco-school project, as captured here during an interview session with K7 (DS 3):

Although Kenya High has been declared as an eco-school, I am not aware of what an eco-school entails in terms of its objectives and relevance to the school curriculum. I am of the opinion that this applies to many of the teachers who view the eco-school project as belonging to [K1] ... many of them, are not involved.

This observation reflected poor communication channels in the school that I later experienced during the development of interpretation resources and materials (see section 5.3.5).

The teachers perceived environmental education processes as an integral part of the school curriculum. All subjects were noted to have a role in raising awareness of environmental issues; for example, chemistry had a role in sensitising learners about their immediate environment (K2, K6). It has a topic on pollution and ways of curbing it. Social ethics education covers responsible disposal of wastes and how to take care of the environment (K5). In Kiswahili “... students write poems on environmental issues and the need to conserve the environment” (K4). However, this subject content approach to the teaching of environmental education has been criticised for having a narrow focus (see also section 5.2.1.2).

In this approach, environmental education processes are informed by a *technical* cognitive interest (Habermas 1962) that emphasises knowledge about natural systems and processes (see also section 2.2). This is at the expense of ecological, political, economic and social factors that influence decisions on how people use the environment (Fien 1993). A subject content approach to the teaching of environmental education (see Greenall Gough 1997) reflects a perspective on education *about* the environment (see Robottom 1987, Huckle 1993, Fien 1993 and Job 1996). This perspective has been generally interpreted as promoting a technocratic approach (Job 1996) that does not promote critical praxis (see sections 2.3.1, 2.3.2.3). As a result, the teaching and learning processes that take place do not enable the development of critical thinking and problem-solving skills (see section 2.3.1, see also Fien 1993, Tilbury 2002 in press).

#### 5.3.1.3 Use of the outdoors for teaching

All the teachers except K7 confirmed to have used the outdoors for teaching. This was through a number of activities, which provided opportunities for learners to acquire a wide range of practical skills. Some of these activities included (DS 3):

Ecological activities, soil conservation, writing poems, reproduction in plants (K1, K3); keeping the environment clean by separating litter, recycling wastes (K2, K6, K5); naming of plants and animals, classifying the animals and plants, soil conservation activities (K4).

To enable environmental learning in the outdoors, the teachers drew on various methods of learning and teaching. These were: cooperative learning, reporting, individual tasks, project

work, role-plays, and demonstration. Fien (1993) argued that such methods might develop skills for data collection, observation, sketching, photography, interviewing and using scientific instruments. Social skills such as cooperation and group responsibility may also be enhanced.

Outdoor teaching has been seen as an approach to education *through* the environment in which learners are offered reality, relevance and first hand experience, as well as being enabled to develop an appreciation of nature (see Fien 1993, Job 1996). Learner's experiences in the environment are used as a medium for education (Fien 1993; see also section 4.4.4.5). Education *through* the environment is a learner-centred approach that may cultivate environmental concern if teachers engage their learners in the values of conflict over an environmental issue (Fien 1993). However, Huckle (1983) has critiqued this approach to environmental education processes. He argued that education *through* the environment tends to stress personal values at the expense of conflict and power. Most of the methods employed by the teachers during outdoor teaching do not consider the social context, the political aspects of environmental decision-making, or the 'vested interests' that may exist in the environmental activities being undertaken (Huckle 1993, Fien 1993). A re-orientation to environmental education processes (see section 2.3) in schools was aimed at addressing this shortcoming (see section 5.3.4).

On the other hand, teachers have experienced a number of constraints in their efforts to teach through the outdoors. These were captured as follows (DS 3):

Tight school schedules; lack of a developed area for outdoor teaching (prior to the study); poor planning on the part of the teachers (K7 noted that there was normally individual planning as opposed to departmental planning); and large class sizes.

These constraints have also been experienced by other teachers elsewhere (see NMK and KWS 2002). They reflect some of the pedagogical and curriculum tensions between schooling and the teaching of environmental education processes that I highlighted in section 2.3.1. Creating a school-based 'arboretum' to enhance environmental interpretation and education processes (see section 5.3.2) was a response to some of these constraints.

#### *5.3.1.4 Links with non-formal education organisations*

Kenya High was noted to have strong links with a number of non-formal education organisations. As I have already mentioned, the school is a member of the eco-school project that is coordinated by KOEE. The school also participates in a variety of environmental education programmes organised by NMK, United Nations Environmental Programme (UNEP) and the Giraffe Centre. Half of the participants (K1, K3, K4) confirmed to have organised class trips to NMK and the Giraffe Centre for environmental learning activities. However, planning and organising for such trips faced similar challenges like those that I have outlined in the previous section.

A number of environmental learning support materials occurred at the school. These included charts, posters, books, magazines and pamphlets. The materials were kept in a well-stocked school library that is accessible to both teachers and learners. Through its links with the non-formal education sector, the school has been able to receive environmental learning support materials. Materials have been received from the Giraffe Centre, NMK, KOEE and UNEP. Central to this study is the fact that none of the participants had ever been involved in the development of these materials. This implies that the teachers used materials developed by others elsewhere with no say in their evaluation (see sections 2.5, 4.4.4.1). I have challenged this top-down approach to materials development ('changing the tide') as outlined in the sections that follow.

### **5.3.2 Transforming a school site into an 'arboretum' with theme trails**

In this section, I provide a detailed account of our efforts to transform a site into a school-based 'arboretum' with theme trails at Kenya High. This was a follow up to earlier efforts to create a nature trail at the site (see sections 1.1, 2.5.3). The transformation started with a process of developing an open-ended interpretive plan (see section 5.3.2.1). This process is described within a critical perspective of contextualising curriculum activities with teachers (see Grundy 1986, Cornbleth 1990). Some components of the interpretive plan that emerged are presented. Attempts made to implement part of the plan through creation of one theme trail are shared

(see section 5.3.2.2). These attempts proved to be time-consuming and required flexible schedules that allowed the teachers the time to be involved within their busy school routines (AM 19). Other challenges that I faced during the process are presented.

#### *5.3.2.1 Developing an interpretive plan for a school-based 'arboretum'*

Our attempt to transform a site at Kenya High into an arboretum started with a process of developing an interpretive plan (see section 4.2.2.3). This was "... a contextualised social process" (Cornbleth 1990:12), in which I actively engaged the participation of all six teachers. Initially, the teachers were reluctant to participate in the process citing lack of skills in interpretive planning. They viewed me as an expert with a capital of ideas to be relied on for the task (see section 2.5). I challenged this technocratic view and managed to convince the teachers to participate in the planning process that was held in their school on 8 March 2001 (DS 21). During this meeting, I played the role of a facilitator and encouraged the teachers to assume active, reflective and responsible roles in the construction of components of the interpretive plan. This involved the formulation of objectives, title, methods, action plans, activities and financial inputs. K1 (project coordinator) took notes that she later used to produce a draft document (see also 5.2.2.1).

The planning process drew on some notes that I had extracted from the NMK Nairobi Botanic Garden interpretive plan (see section 4.2.2.3) and information from the previous interpretive inventory prior to the study (see section 5.3). During the inventory, a plant taxonomist from NMK identified plants at the site; K8 (school farm manager) identified other resources at the site; and also made a representation of existing and envisaged themes on paper. My interactions with the teachers produced more information on educational objectives of the arboretum, background information on the project, possible themes to be developed and an implementation plan. In later meetings (on 15 May 2001 and 13 July 2001), we further reflected on the planning process and made revisions based on new information I had collected on budget estimates. I edited the draft that emerged and produced copies for the teachers and school principal (DS 10).

The interpretive plan that we formulated (DS 10; see also Appendix 5), outlined specific

objectives to re-orient environmental education processes at Kenya High (see section 2.3) through the development of an arboretum. To fulfil these objectives a number of themes were proposed. Table 5.2 below summarises these themes and outlines possible environmental learning activities (see also section 5.3.4).

**Table 5.2** Proposed themes at the arboretum site

<b>Themes</b>	<b>Features planned and possible environmental learning opportunities</b>
<b>Waste management</b>	Theme trail (silkworm trail), recycling and compost area, water fountain, orientation office, soil conservation area, botanical area.
<b>Open air theatre</b>	Exists but requires renovation and landscaping, has opportunities for educational theatre (environmental drama and debates), Theme trail on history of the school.
<b>Picnic and camping area</b>	Theme trail, water fountain, bird hides; may be used to teach values.
<b>Wetland area</b>	Theme trail (wetland trail), fishpond, a stream found at the site, river studies.
<b>Orchard and tree nursery</b>	Already exists and will only require adding new fruit plants, nursery to be revived. Organic farming activities, food sustainability.
<b>Forest area</b>	Forest trail, bird hides; area suitable for teaching forest ecology and biodiversity.

Implementation of the interpretive plan we developed required financial resources beyond the reach of the school. The plan also required a horticulturalist (see section 5.2.2.2), which the school was lacking at that time. On these two grounds, the plan failed to conform to the structure and operational constraints of the school (see Bradley 1982). K1 had expected the school to use the document (interpretive plan) to fundraise for the project.

Since the transformation assumed proportions of a long-term project that required more time and financial resources beyond the scope of my study, we decided to focus on the creation of one theme trail that we ‘christened’ *The Silkworm Trail*. Four others at the wetlands, forest, picnic and camping, and open-air theatre areas were to be developed later (see Table 5.2). The process we undertook to develop the Silkworm trail is described in the next section.

### 5.3.2.2 *The Silkworm Trail: A theme trail within the Arboretum*

Through a series of seven focus group meetings with teachers between 3 August 2001 and 27 February 2002 we initiated the development of a theme trail at the Kenya High Arboretum. We first translated an action plan from the interpretive plan (DS 10) that focused on the ‘initial development of interpretive trails’ (see Appendix 5) into various activities for critical reflection and action. These activities included: designing a map for the trail; identifying features for interpretation; preparing a plant checklist and landscaping some areas (see sections 4.2.2.3, 4.2.2.4).

A decision was made after a survey of the site with the teachers, to develop a circular trail (closed loop) that started and ended near the main school gate on a theme of waste management. The closed loop design was aimed at enabling learners to follow the sequential stops selected for interpretation in one direction only (Sharpe 1982, Honig 2000). It was to bring learners back to their starting point without retracing the route (Sharpe 1982). This may reduce monotony, as every stop becomes a new encounter for mobilising their cultural capital in meaning making processes (see section 2.3.2.2, 4.2.2.2). Locating the trail at a section near the main school gate had the advantage of making the arboretum accessible to a wider audience, thereby publicising the school project.

During the reconnaissance survey (audit of the area), interpretive possibilities at the site were identified (AM 19). Features of interest we selected as fourteen stopping points included an aged bougainvillea tree, tall Indian ash trees, a compost area, an acacia tree, and a soil conservation area among others. In order to support our intended theme on waste management (recycling) more features were planned for at the site. A recycling unit, a botanical garden, a picnic area with seats and a mulberry garden were suggested as additions. A botanical garden was needed to act as a source for plant specimens during biology and agriculture practical sessions (K1). A recycling unit was needed to manage solid waste produced in the school. However, development of these features required financial resources and horticultural skills the school lacked at the time of the study (see previous section). We decided to act on activities that required less financial inputs and mobilised the necessary interpretive capital towards this end. The school provided labour for the initial work at the site that entailed clearing the site of

unwanted weeds and cutting the trail under the supervision of K8 (see section 4.2.2.4). This was done after we had marked everything that we wanted to be removed along the way after an undertaking of protection of ecological integrity during the planning process (see Curthoys and Cuthbertson 2002). Efforts were made to wind the trail so that only short sections were visible during a walk along it (Sharpe 1982). Sharp bends were avoided and loops kept as far apart as possible, to discourage learners from making short cuts across the trail when in use.

However, the progress of transformation at the site was very slow. At one point the area reverted to its former state as reflected in this journal entry:

My first immediate observation was that the trail had become overgrown with bushes and the initial efforts to create a path had been reduced to zero. I wondered whether the project would take off if maintaining a trail has already not been achieved at this initial stage.... It was difficult walking on the trail because of the bushes (Journal p. 279, 16 November 2001).

On 8 February 2002, we had a review meeting in which we reflected on the slow transformation at the site. We further revised our development plans and made suggestions on how some of the features were to be implemented with minimal cost. To create a temporary recycling unit, K1 was asked to purchase three large plastic containers that non-biodegradable solid wastes (glass, paper, can) would be separated into. All organic biodegradable materials were to be deposited at the compost heap next to the area earmarked for the recycling unit. Involvement of the entire school community in managing solid wastes was recommended. The teachers were therefore required to sensitise the school community to consider waste management issues. At the soil conservation area, K3 was asked to involve the students in constructing three gabions to provide an example of good environmental practice on soil conservation. All that was needed were stones and wire mesh. The recreation area that formed a central part of the trail required terracing, planting a lawn and putting in seats. I argued that this was within the reach of the school financially through the eco-school canteen project. The water fountain that had been earlier proposed at the area was to be implemented later. The botanical garden area required landscaping (see section 5.2.2.2) and planting of appropriate herbs and shrubs for practical sessions. NMK Nairobi Botanic Garden was ready to support this process.

I shared these revised plans with the school principal a week later (15 February 2002). She was eager to have something in the grounds and wondered why it had taken so long for the project to take off. From our discussions, I sensed a communication barrier between the principal and K1 (see section 5.3.5). I also learned from her that the school had been managing its solid wastes some years back. While she had no problems with the students being involved in the project, my co-researchers made little efforts in involving them. According to the principal, the students had been eager to see the project take off. Although financial commitment from the school towards the transformation at the site was not forthcoming, the principal agreed to employ someone (arboretum assistant) to maintain the trail. This came into fruition in April 2002 when I had ended my data collection phase. In spite of the constraints experienced, we were able to make some visible changes at the site other than marking a footpath (trail). A mulberry garden was created and the area was cleared up once more. Figure 5.8 below shows K1 standing at the section of the arboretum where the Silkworm Trail was created.



**Figure 5.8** A section of the Silkworm Trail at the Kenya High Arboretum  
(DS 24, 20 December 2001)

Initially, we had named the trail *Indian Ash Trail* with reference to the numerous Indian ash trees (*Acrocarpus fraxinifolius*) at the site. This later changed to *Silkworm Trail* with reference to the mulberry garden that emerged at the site later. This garden was to supply mulberry leaves for indoor rearing of silkworms at the school. It was developed in collaboration with the International Centre of Insect Physiology and Ecology (ICIPE) through its sericulture project. This required me to mobilise interpretive capital on sericulture<sup>24</sup> through interactions with research scientists at ICIPE. This was made available to teachers in form of a handout (DS 11). NMK Nairobi Botanic Garden staff provided the horticultural skills we required in setting up the garden. Mulberry cuttings for planting were provided by ICIPE. The teachers found the name ‘Silkworm’ interesting as it had the potential for stimulating learners’ curiosity to find out more on sericulture (K3, K5).

We developed a number of interpretive materials (DS 18, AM 19) that may engage learners in critical and action-oriented environmental education processes at the ‘Silkworm Trail’. In the next section, I highlight the actions that we undertook in developing some of these materials.

### **5.3.3 Developing materials that engage learners in critical education processes**

The actions that I am about to describe were accomplished through eleven focus groups and informal meetings at Kenya High between 3 August 2001 and 5 March 2002 (AM 19). These entailed developing five different types of interpretive materials with teachers (DS 18).

Evidence of how interpretive capital mobilised during our interactions with non-formal educators (see sections 4.2.2, 4.4.2, 4.6.2) was drawn on during the development processes is provided. There were also instances when new interpretive capital was mobilised in the school to further inform our materials development processes. Characteristic of this participatory action research, materials development processes started with planning sessions (see section 3.2.3.2).

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<sup>24</sup> Sericulture is the rearing of silkworms (larvae of silk moths) for the purpose of silk production. Mulberry plants are grown to provide food (leaves) for the domesticated silk moths larvae (caterpillars). ICIPE is currently involved in a project of rearing wild silk moths for silk production as an incentive for rural communities. To realise this potential, conservation of natural ecosystems where the silk moths occur is implied. Linking the project with schools is aimed at marketing this income generating initiative and at the same time, supporting the conservation of natural ecosystems.

On 3 August 2001, we jointly planned for the development of one trail booklet, four interpretive labels, one worksheet, two interpretive signs and one publicity brochure (DS 21). The planning session drew on the 22 June 2001 workshop activity (see Table 3.1 for workshop task). To ensure that the development process was participatory, we shared tasks on the development of the materials. K1 worked on an initial draft of the trail booklet; K5 and K6 prepared interpretive labels; K2 drafted the activities for the worksheet; K3 designed the publicity brochure; and K4 developed interpretive signs. I played the roles of a facilitator, editor, photographer and that of critical friend to the teachers. As an editor, I designed final drafts of the materials on computer. Although the school had a computer laboratory, none of the teachers except K3 seemed to be computer literate. K3 effectively utilised his computer skills during the development of the publicity brochure used to publicise the interpretive plan we developed (see section 5.3.2.1).

Apart from drawing on the interpretive capital we had earlier mobilised (see section 4.6.2), readings (and notes) on environmental interpretation (DS 11) and samples of interpretive materials from other botanic gardens (DS 21) were made available to the teachers. Samples of interpretive materials included an assortment of brochures, activity sheets, interpretive signs, interpretive booklets and a book on *Making Your Garden Come Alive* (Honig 2000). All these sources of interpretive capital enabled the teachers to develop the materials (DS 18) that are described in the sections that follow.

#### *5.3.3.1 Trail booklet*

With reference to the NMK Oloolua trail booklet (see section 4.4.2.1), K1 chose provisional themes at the Silkworm Trail and then interpreted them. She designed the layout of the trail booklet and produced a draft, which provided the basis for further critical reflection and action. As a team, we reviewed the work of K1 and revised her draft in light of the changes in stops that had been made at the trail (see section 5.3.2.2). “You have changed everything”, K1 remarked, after the critical review.

In the second cycle of developing the trail booklet, we shared the task of writing thematic texts for the fourteen stops at the trail. For example, K3 wrote texts for stops 10-12 and also

designed the trail map. Teachers were however, not always sure of what to include in the text for a thematic stop as reflected in this question by S2: “What happens when you take a stop?” To support writing of the interpretive texts, I provided some guidelines on the same (see Veverka 1994). However, K3 thought otherwise: “If you give someone a line of thinking, it might block other things”. In other words, such guidelines may be adopted as a ‘recipe’ (reflecting a technocratic approach). I therefore challenged the teachers to create new texts by providing a few tips and an example of an interpretive text from my work at NMK. I further referred them to the various readings issued earlier on environmental interpretation (AM 12; see also section 4.3.2). Choosing an overall theme that each of the stops was expected to relate to (see section 5.2.3.4), helped to provide a focus for the writing process. In our case, a theme on ‘how nutrients and materials are recycled in nature’ was chosen. This theme became the storyline that each stop was supposed to relate to (Honig 2000). Thus, each stop was able to “... present a whole rather than a part” (Tilden 1977:9) on the story of ‘how nutrients and materials are recycled’ at the Silkworm Trail.

During the final cycle of development, the texts generated by the teachers (draft trail booklet) were critically reflected on and new action was taken. Although most of the texts supported the overall theme at the site, they lacked theme titles (see section 4.3.2). The texts did not encourage learners to find out more information or take action for social change on their own (see section 2.3.2.3). The idea of using a “text hierarchy” to make the information easier to read (Honig 2000:37; see also Ham 1992) was introduced to the teachers. Figure 5.9 shows an example of different information levels at the first stop of the trail (see also section 5.2.3.2). In this figure, the theme title forms the first level of information. The information contained in levels two and three is on the main ideas on recycling. This information aims at mobilising learners’ cultural capital for meaning-making processes for critical reflection and action. Learners may be engaged in further reflection and action taking by the information in level four.

As a team, we reviewed the texts for a number of the stops and produced a second draft of the trail booklet. Due to time constraints, we were unable to revise the information for all the stops. Although we had planned to incorporate illustrations, the final draft did not have any except for

a photograph on the first page. K3 had taken some photographs for use and I encouraged the teachers to involve of learners in making simple illustrations.

<b>Recycling should be our way of life</b>	}	LEVEL 1
Think of the load of rubbish that you help generate everyday in the form of drink cans, bottles, newspapers, left over food, not to mention all the rubbish produced by factories. Where does it go? In most cases we dump it on our environment.	}	LEVEL 2
Here at Kenya High, we recycle our rubbish. It's absolutely true ... recycling our 'rubbish' cuts down the amount we dump in the environment. You need to get active and make other people active about recycling!		
<ul style="list-style-type: none"> <li>• Plan a recycling campaign at your neighborhood.</li> <li>• Design a pamphlet on recycled paper telling people why recycling is important and how they can recycle.</li> </ul>	}	LEVEL 3
<i>What else can you do to make our environment garbage free?</i>	}	LEVEL 4

**Figure 5.9** Levels of information at Stop 2

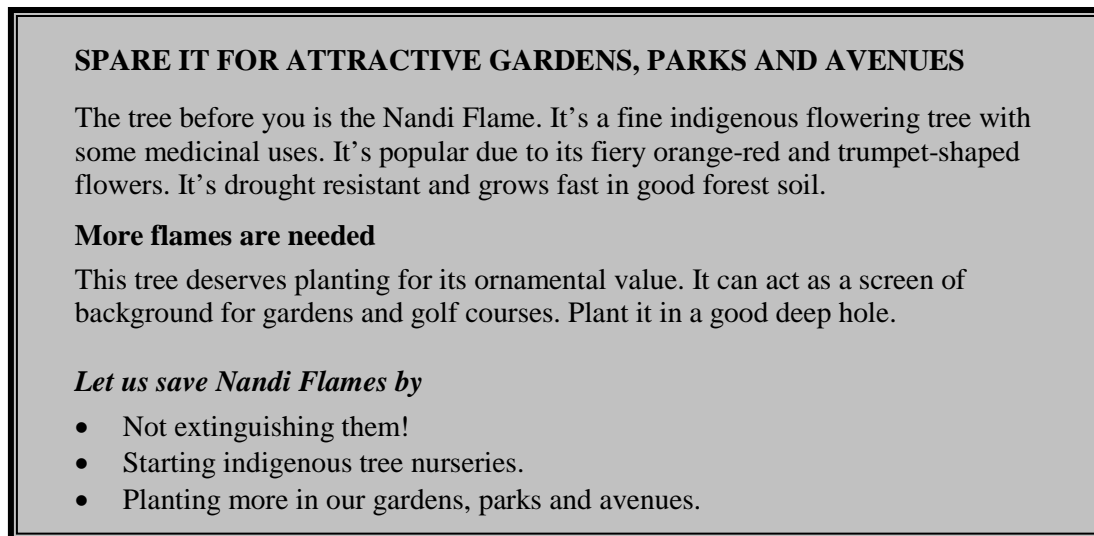
The final draft was a twelve-page A5 trail booklet that had background information on the Silkworm Trail with a photograph of the site on the first page. The second page had an introduction that 'advertised' the trail (Honig 2000:49). The back page contained environmental education objectives for the arboretum and contacts for more information. The inner pages had interpretive texts for fourteen stops. This trail leaflet was further critically evaluated during the 3 April 2002 workshop (DS 16).

#### 5.3.3.2 Interpretive signage

Two interpretive signs had been planned for development (see section 5.3.3) on the Nandi Flame (*Spathodea campunulata*) and Bougainvillea plants that existed at the Silkworm Trail. K4 managed to generate interpretive text on only one of them (Nandi Flame). Reflecting on the process during a review session at the school, K4 reported: "I am not sure of what I wrote, I need to go back to my notes to improve on this draft". Most of the teachers (K2, K5) similarly lacked confidence in their work (see also section 5.3.3.3). This may be attributed to the fact that the teachers were being challenged to apply knowledge (interpretive capital) in practical

action-oriented ways (see section 6.3.2). This was in contrast with traditional ways of processing knowledge in schools (see sections 2.3.1, 5.3.1.2) and hence the ‘discomfort’. This discomfort provided some of the impetus for change contributed to the construction of ‘new knowledge’ (Wells 2000) and critical praxis (see section 2.3.2.3).

K4 was one of the teachers who indicated (prior to the study) that her subject (Kiswahili) had no contribution to make in the teaching of environmental education. So when asked to write an interpretive text on a plant based on scientific information, she felt at loss. Drawing on the interpretive capital we had mobilised during workshops (see section 4.3.2, see also Ham 1992, Veverka 1994, Honig 2000), K4 gained confidence and generated the interpretive text shown in Figure 5.10 below (DS 18).



**Figure 5.10** Interpretive signage on Nandi Flame

K4 never managed to revise the first draft as promised. As a group we critically evaluated it during our final workshop on 3 April 2002 (DS 16; see also section 4.3.3). Critical evaluative comments from the group are presented in Table 5.3 below.

Although the material seems to encourage learners to take further action for the environmental, information presented was found to be factual and less interpretive (see Ham 1992). The material does not encourage learners to find more information on their own. However, the

material was found relevant in the teaching of biology (flowering plants), agriculture and the English language. In terms of environmental learning, the text may enable the development of an environmental ethic and social action in the form of planting more trees (see section 2.3.1).

**Table 5.3** Critical evaluation of interpretive signage on the Nandi Flame.

	<b>Critical comments</b>
<b>Design</b>	The material is attractive. Different fonts have been used to highlight different levels of information.
<b>Curriculum links</b>	The material is relevant to the school curriculum, may be used to cover some biological concepts.
<b>Durability</b>	In its present form not very durable. Needs lamination.
<b>Costs</b>	It is cheap to produce.
<b>Content</b>	It has accurate information, but needs more editing. Information contained is self-explanatory, i.e. no technical words have been used.
<b>Provocation</b>	Does not encourage learners to find out more information or explore on their own. Most of the information has been given hence factual. This makes it less enjoyable to read.
<b>Environmental learning</b>	The material is engaging and demands some response in terms of taking some action for the environment, i.e. planting more trees.
<b>Flexibility</b>	Not flexible since it is site specific. Nevertheless, it is easy to use.

#### 5.3.3.3 *Development of a worksheet*

A draft worksheet (DS 18) to enable environmental learning at the Silkworm Trail (see section 5.3.2.2) was developed by K2. To come up with activities for this material, K2 consulted other teachers at the school (non-participants) for learning activities (agriculture, mathematics and religious education) that reflected the themes at the Trail. K4 also drew on the interpretive capital that was mobilised during an informal interactive session at the site on 16 November 2001. K2, K4, K5 and K6 attended the session, and a number of activities were suggested for the worksheet. These included activities on soil, bird life, poetry, plant classification, grasses and invasive plants. K2 also drew on the interpretive capital we mobilised during the review phase of this study (see sections 4.4.2.2, 4.6.2). A sample of activity sheets I had provided from other botanic gardens also proved useful sources of information for K2.

In the second cycle of development, K4 reconstructed activities in the worksheet to reflect stops at the Trail. For example, at stop 1, she focused on how mathematics could be applied to estimate tree height. The activity she wrote for stop 5 drew on the interpretive capital we mobilised during a guided tour at the WCK nature trail on grass identification. The activities that emerged were critically evaluated during a focus group meeting at the school. A general theme for the worksheet was suggested (see section 5.3.3.1). Theme titles (see section 4.3.2) for activities at the stops (for example, ‘applying mathematics at the trail’ at stop 1) were proposed. K2 acted on the new plans based on these reflections. In my role as the editor, I designed the worksheet on computer.

K2 was a co-researcher who was serious about her work but like K4 (see previous section), lacked confidence in what she was doing as reflected in the journal entry that follows.

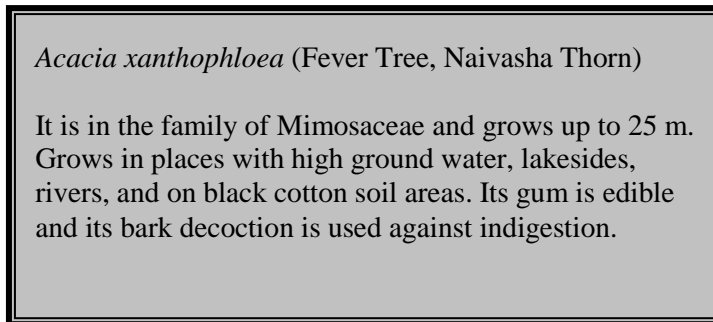
I spotted [K4] busy writing at her desk and out of curiosity, went to find out what she was engaged in. I had thought that she was doing her schoolwork. To my surprise, she was working on the worksheet. ... She confessed that it had been difficult getting the input of other teachers because of the holidays. She gave me the draft worksheet. ... She said that all along she had not been sure of what she was doing. I however assured her that the worksheet was adequate. This seemed to raise her confidence (Journal p. 307, 18 January 2002).

The activities contained in the draft worksheet are in the form of questions that require learners to find information on their own (see Appendix 6). They have the ability to engage the capacity of learners to explore and imagine alternatives (see Fien 1994). The activities are inquiry-based and have the potential to develop critical thinking and problem-solving skills (Fien 1993 and 1997) amongst learners (see also section 2.3.1.1). However, the activities were mainly designed to mobilise learners’ cultural capital for meaning-making processes through encounter with real objects at the Trail (see section 2.3.2.2). Their ability to engage learners in an attitude of questioning, doubt, investigation and a will to illuminate and challenge the environment at the school and Silkworm trail is limited (see section 2.3.2.3).

#### *5.3.3.4 Development of interpretive labels*

Four interpretive labels on trees at the Trail were developed by K5 and K6. Information for the

interpretive texts was drawn from relevant botany books and readings that I provided. The initial drafts were informational (see Figure 5.11) and lacked qualities of interpretation (see Ham 1992). Figure 5.11 below shows the initial interpretive label that we developed on the Naivasha Thorn tree. In this draft, there was no theme title and the information displayed, lacked interpretive qualities (see section 4.3.2). However, the information has curriculum links to biology, geography and chemistry.



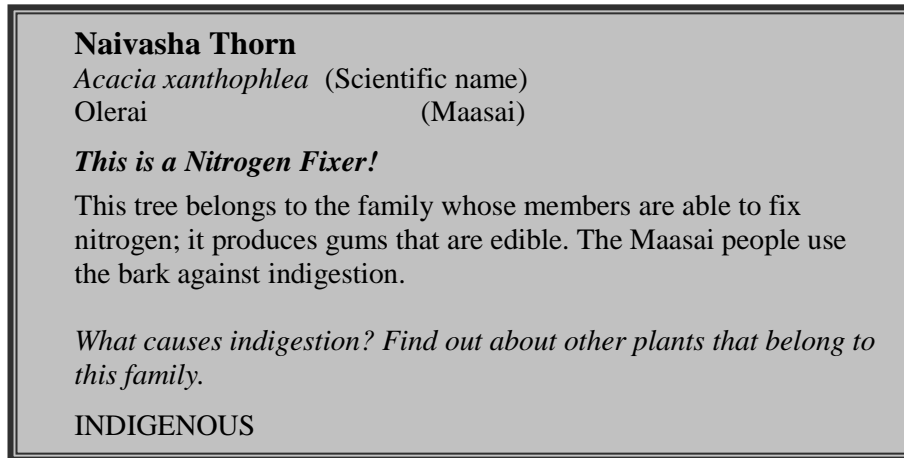
**Figure 5.11** Initial draft on Naivasha Thorn label

Initial drafts (DS 17) were critically reviewed during a focus group meeting that was attended by K2, K4, K5 and K6. Our interactions mobilised new interpretive capital that was drawn on to improve on the drafts. Apart from a thematic text, each label was to have a question that can engage learners in critical reflection and action (see section 2.3.2.3). K5 and K6 acted on these changes to produce a second set of draft labels.

After editing and laminating the drafts, I presented them to teachers for critical evaluation during a focus group meeting (8 February 2002) attended by K1, K3 and K5. This became the third cycle of development (see section 3.2.3.2). Efforts to have K1 trial the labels were not successful (DS 21). I attributed this to a lack of a checklist (see sections 3.2.4.6, 5.3.3.2) and guidance on the trialling process. The format and design of the labels were discussed during this evaluation session. A theme title for each label was suggested. A bigger font and bolder texts were recommended. I made the changes and the final drafts, were further critically evaluated during the April workshop (DS 15).

Figure 5.12 below shows the final draft we developed of the Naivasha Thorn. It has a theme

title and a question that may provoke learners to find out more on their own. An aspect of indigenous knowledge (cultural values of plants) has been brought out in the text. The medicinal value of the plant is highlighted and links to the biology school curriculum is made.



**Figure 5.12** Final draft on Naivasha Thorn label

In the next section, I explore some of the opportunities of environmental interpretation and education processes at the Silkworm Trail, open-air theatre (to be renovated) and the orchard.

#### **5.3.4 Opportunities for critical environmental interpretation and education processes**

The various themes proposed at the Kenya High ‘arboretum’ (see Table 5.2) and the emerging Silkworm Trail at the site (see section 5.3.2.2) have the potential of re-orienting environmental education processes at the school. The theme on the orchard has been implemented and plans are underway to renovate the open-air theatre (K1 and K8). Through use of the interpretive materials we developed (see section 5.3.3), learners may be engaged in critical environmental interpretation and education processes (see section 2.3.3). Instead of sitting in their classrooms learning biology, mathematics, home-science, history or languages from books (see section 5.3.1.2) learners at Kenya High may now start using the arboretum to encounter real objects

and problems. The potential role for the emerging arboretum to enable critical and action-oriented environmental education processes at the school may be summarised as follows:

If children are to learn how to solve problems, learn to love learning, and learn to work cooperatively amongst themselves and with adults, then they must be given opportunities to ask questions and be part of the search for solutions. If children are to learn about the environment that sustains the human race, to develop a sense of wonder and place, then they need to be offered places to stimulate their natural curiosity and compassion (Murray 2001:45).

One such place where learners' natural curiosity and compassion may be stimulated is at the compost area (Silkworm Trail stop 3). As the learners, experience how the smelly rubbish heaps (a common sight around Nairobi) are reduced into organic manure through composting, they may be mobilised into taking similar action-based initiatives (composting) for the environment. Learning activities (for example, 'how to make a compost') if well designed at the area may engage learners in further meaning-making processes (see section 2.3.2.2) through their interactions with teachers, fellow learners, interpretive materials and real objects (compost). During these interactions, knowledge on composting may be socially constructed and will enable a shift from the classroom learning to outdoor learning in context. Such shifts are likely to produce changes in learners' consciousness (Berger and Luckmann 1966). This may result into critical and action-oriented environmental education processes (see section 2.3.3). Depending on their social *habitus* (see section 2.3.2.2), the learners may later contribute to composting initiatives outside the school setting. In this way, the capacity of such learners to clarify their views on management of garbage within their social settings will have been developed (see section 2.3.1.2). Furthermore, environmental learning activities on composting entail developing skills of inquiry, problem solving and action in learners (see section 2.3.1.2, 2.3.1.3). This may lead to the development of critical thinking skills and action competence (see section 2.3.1).

Renovation of the existing open-air theatre at the arboretum (K1) will provide an ideal site for storytelling sessions (see section 2.3.2.1), role-plays and environmental theatre for the learners at the school. Storytelling sessions have the potential of inspiring learners to acquire a lifelong interest in the environment (Strauss 1996). Through storytelling projects (Graham 2001 pers.

comm.) learners may be involved in collating indigenous stories on some of the trees that occur at the site. This can form part of their language curriculum using poetry and literature learning activities. The stories can be written in a booklet designed by the learners themselves to be retold during sessions at the open-air theatre. Encountering a tree whose story is being retold presents an opportunity for ‘dialogue’ in which the united reflection and action (praxis) of the learners may be mobilised for social transformation (Freire 1996). Dialogue becomes an encounter between the learners and trees, mediated by the stories. Storytelling sessions at the open-air theatre therefore, become moments where learners may meet to critically reflect upon cultural assumptions, values and social relations with plants as they cover their school curriculum (Tilbury 2002 in press). The sessions may also contribute to raising awareness on the loss of indigenous knowledge on plants (see Atiti 2001a). During our review visit to WCK K1 and K2 showed interest in a project that the organisation had involved learners in compiling myths and stories on plants (DS 21).

Before the open-air theatre was neglected into disuse, it used to be a venue for drama performances at the school (K1). Its renovation will therefore enable it become an ideal venue for outdoor debates and “education theatre”<sup>25</sup> (Honig 2000:61) on environmental issues. Through debates and role-plays learners may be engaged in democratic processes at the school and surrounding local community. Decisions made by the learners may be passed on to the local leaders for consideration (Graham 2001 pers. comm.). This may lead to political literacy, which has been identified as a key to the development of action competence in learners (see section 2.3.1.3). Through debates and educational theatre, learners can understand the underlying complexity of environmental issues as different viewpoints on the environment are articulated (see section 2.3.1.1).

The orchard theme at the school presents opportunities for the practical pursuit of agriculture (K8). Already the theme is being implemented and learners are involved in agricultural activities towards realising goals of the school curriculum (K1). It illustrates “... how educational it can be to get good earth under one’s finger nails!” and presents opportunities for sustained action in a social context (Ashwell 2001:17). Learners are already being provided with opportunities to learn useful action skills that may support the development of critical

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<sup>25</sup> Education theatre is a lively, engaging form of interpretation that can enable the exploration of environmental issues (Honig 2000). An issue like ‘grabbing’ part of the school land where the arboretum is being developed, by a powerful politician may be debated from different points of view through role-playing.

praxis (see section 2.3.1.3). In this context, they are being involved in active decision-making and action to improve food sustainability in the school. Learners working together (as they propagate various fruit plants) may contribute to critical environmental education processes at the school. The learners at the school are likely to develop and practise essential life-skills of communication, problem solving, negotiation and patience (see section 2.3.1.1) as a result of their participation in propagation activities at the orchard (DS 21).

From the foregoing, there is no doubt that the creation of an arboretum at Kenya High will provide diverse opportunities for critical environmental interpretation and education processes to learners. Through problem solving, learners will discover that they can improve the environment through their actions. This may enable them get beyond the helplessness and despair they might feel if they for example, only study the destruction of forests or the waste management problem around Nairobi. By learning that their actions may make a difference, there are possibilities of them becoming better citizens of democracy willing to take further action for social change (Fien 1993).

### **5.3.5 Reflections on the transformation of school grounds at Kenya High**

In spite of the fact that efforts to transform the school grounds at Kenya High into an interpretation resource to foster environmental learning started before the study commenced, the pace was much slower than at Samaj (see section 5.2.2). By assuming the position of an *insider* in the transformation process, I was able to unmask some aspects of the school context that frustrated our efforts to create a themed trail within the period of this study (DS 10). The lack of someone (arboretum assistant) responsible for maintaining the area and the lack of a financial commitment by the school, in the transformation of the school grounds were some of the constraints we experienced. While the teachers made attempts to act on them, other constraints occurred within social structures over which they had little or no direct control. The decision to employ the arboretum assistant depended on availability of funds and also the justification of such a post at the school. It required the approval of the school management. By the time such decision was made, I had already wound up my data collection phase. While efforts had been made to fundraise for the project through the running of an eco-school canteen

(K1), I learned of an event that affected the morale of the teachers in this pursuit. A decision by the school management to relocate the canteen from near the school gate to a rather non-strategic position without consulting the project coordinator (K1) was not well received. The losses realised as a result of this relocation dampened the enthusiasm the teachers had in fundraising for the project.

On the other hand, although the interpretive plans (see section 5.3.2.1) we had formulated were shared with the parents and members of the board of governors during a speech day, in my opinion these plans were never approved or 'owned' beyond the principal's office. In consequence, the efforts remained relegated to an eco-school project initiative. Many teachers at the school also viewed the project as belonging to the eco-school committee (see section 5.3.1.1). The support from the principal stemmed from the fact that she was also a member of the committee. While her support was needed for the project to be owned by the school, its implementation relied on the approval of the school board due to the large amount of financial resources required (DS 10).

Generally, the teachers failed to involve the students in the development of the trail despite my requests. As K5 observed, there was a danger of developing a resource that may not be appreciated by students for its relevance. It may be perceived as teachers' work. Involving students in some aspects of the trail development may have made a lot of difference.

#### **5.4 CONCLUSIONS**

The two case studies that I have discussed here can provide a practical foundation for sharing experiences on the development of interpretation resources and materials to enable socially critical environmental education processes in schools. In many aspects, they have reflected the process of what transforming the schools grounds was like. To some degree, they provide a capital of ideas that can be drawn on by others in similar contexts to develop interpretation resources and materials. They have illustrated a wide range of contextual and social factors that contributed to, and impeded the success of this study. In both cases, factors that constrain socially critical environmental education processes in the schools were identified. The purpose

of presenting findings from this phase of my study as two case studies was to provide in-depth insights into the development processes drawing on teacher perspectives. In a great measure it provided an opportunity for the 'voices' of the teachers to be heard. These cases, have illustrated how the development of interpretation resources and materials was flexible and responsive to the expectations, contexts and needs of the two schools. Although the transformation of school grounds was inspired by interpretive capital from the non-formal education sector, there was an acknowledgment of the interpretive capital mobilised in schools. By applying the mobilised interpretive capital, teachers demonstrated their potential to become transformative intellectuals and interpreters in their own right.

The development process as reflected in this chapter was dynamic and it required us to engage critically, both individually and together so that themes, materials and approaches remained socially relevant. The development actions were retrospectively informed by reflection through planning (Grundy 1987). This continuous 'retrospectivity and prospectivity' of our development actions (*ibid.*) meant that the process of transforming school grounds into interpretive resources was never a linear one. Rather, it was a cyclical process in which teachers acted strategically in the light of mobilised interpretive capital. During this process, the traditional expert driven approach to materials development was challenged within a metaphoric framework of 'changing the tide'. This critical view took into account the reflexive process in which we constructed and reconstructed the plans within a context of multiple interacting concerns.

This chapter has pointed out that the transformed sites have the potential to enable critical and action-oriented environmental education processes in the two schools. As the students learn about and relate to the environment through the school curriculum, they may begin to develop a sense of place in their schools. They may then act as stewards of the environment and begin to develop the attitudes, knowledge and skills necessary to become active citizens (Fien 1993). This will hopefully not occur at the cost of the school curriculum. The interpretation resources created have been designed to provide a meaningful context for aspects of the subject content that teachers already cover in the classroom. School grounds can therefore provide a much-needed unifying framework for inquiry-based environmental learning across classes and

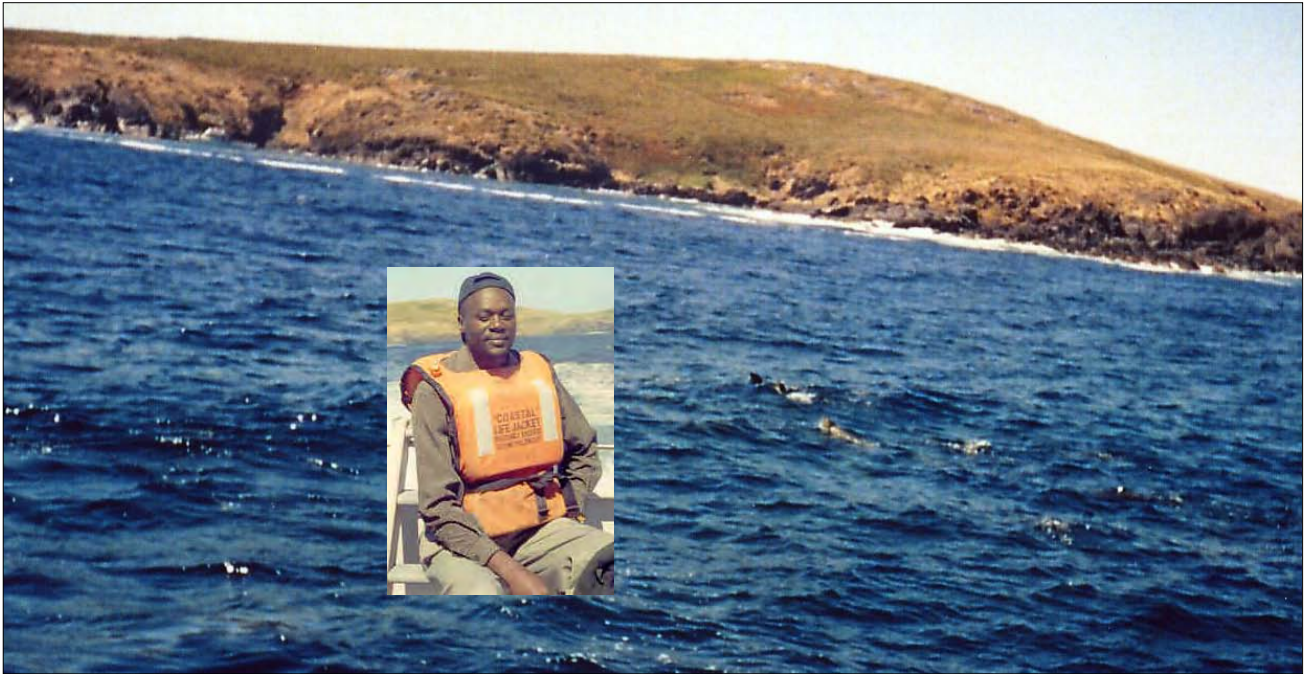
subjects. Rather than teachers using scattered activities in different subjects that require different materials and background knowledge, an interpretation resource may provide a broad context in which to enable critical environmental interpretation and education processes.

In the next chapter, I share and examine some of the practical outcomes of this study. These are discussed with a metaphorical framework of 'finding the shores'. Findings beyond the two phases described in the previous chapters (4 and 5) are also shared.

BEYOND PHASES ONE AND TWO

**PRACTICAL OUTCOMES OF THE STUDY**

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‘Finding the Shores’

## CHAPTER 6 TOWARDS SOCIALLY TRANSFORMATIVE EXPERIENCES

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I started the research as a novice ‘voyager’. The waters were deep and at times I lost a sense of direction. ... The action was slow and the research sometimes unclear. Along the voyage however, I have steadily progressed. Voyaging skills that I never had before have been acquired. I consulted other voyagers who provided me with useful tips on how to remain afloat when waters were turbulent. The destiny is near; the shores are becoming visible from a distance. Soon I will start logging in what I have learned on this voyage. (Diary 31 December 2001)

### 6.1 INTRODUCTION

Within a metaphorical framework of ‘finding the shores’ and a critical orientation to educational research, I share and discuss some of the practical outcomes that have emerged from this study in the form of conclusions and recommendations. As explained earlier in this study, ‘finding the shores’ (see section 3.3.4) is a metaphor I have applied to describe the sense of confidence that I started experiencing as some practical outcomes became evident (see Figure 1.1). This sense of confidence is embedded in the socially transformative experiences and practical outcomes shared in this chapter. An opportunity to experience this metaphor in a ‘real world’ context (see picture on previous page) presented itself during a ‘voyage’ to Montague Island in Australia<sup>26</sup>. The boat trip to the Island provided me with a ‘lived reality’ from which I managed to reflect on my study within its metaphoric framework of ‘Research as a voyage’ (see sections 1.1, 3.3.2, 3.3.3). I relate the euphoric experience of sighting the shores (‘finding the shores’) on this occasion, to the confidence I started feeling near the end of this study (see section 6.3.1) when some practical outcomes became evident.

The practical outcomes examined here are the transformation of school grounds; improved environmental interpretation and education practice; improved professional competencies amongst teachers; new interpretive materials in schools; and the establishment of partnerships.

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<sup>26</sup> This voyage was part of a post-congress tour I participated in after attending the BGCI’s fifth International Congress on Education in Botanic Gardens in Sydney where I presented a paper on *Joint Interpretive Processes in Schools* (DS 30; see also Appendix 2 for paper). Montague Island was first operated as a lighthouse in the late 1800’s. It is now an important flora reserve and wildlife sanctuary. It features the world’s second largest colony of little penguins.

However, as indicated in my opening reflection, it was never easy ‘sailing’. I was often uncertain of the path the cycles in this participatory action research would take. Consequently, the practical outcomes shared here are not based on a set of rules and precise regulations as they might have been if I was the disinterested ‘objective’ researcher of natural science or the empathetic observer of interpretive science (Carr and Kemmis 1986).

The main thesis of this study was an attempt to re-orient environmental education processes in schools through the development of interpretation resources and materials with teachers. As I have argued in the previous chapters, teachers from Samaj and Kenya High were involved in a process of mobilising interpretive capital to inform the development of interpretation in their schools. A framework on which this may be extended to other school contexts is suggested (see section 6.2). The study not only improved my environmental interpretation and education practice at NMK (see section 6.3), but it also enhanced the professional competencies of the teachers who participated in it (see section 6.4). This is explored within the context of improved professional competencies in research, reflective thinking and materials (curriculum) development (see sections 6.4.1 and 6.4.2). Central to this discussion is the argument that school contexts are shaped in part by teachers who work in them.

I offer some tentative perspectives on the development of interpretation resources and materials in schools (see section 6.5) to stimulate discussions that may contribute to an expansion of possibilities of re-conceptualising school grounds as sites for critical environmental education processes. I then examine the partnerships that emerged from this study (see section 6.6) by discussing formal/non-formal and interpretation/environmental education partnerships. Finally, I critically reflect on the research goals and focus of this study (see section 6.7), before synthesising some recommendations, which may open up new possibilities for further research (see section 6.8).

## **6.2 A FRAMEWORK FOR THE TRANSFORMATION OF SCHOOL GROUNDS**

Some of the sociological perspectives on reality and social change drawn on in this study (Fay 1987, Latour 1999) enabled me to conceptually reconcile the oppositional thinking around

environmental interpretation and environmental education processes (see sections 2.3.3). In Chapter 2, I suggested that environmental interpretation and environmental education processes should be viewed as reciprocally necessary aspects of enabling critical environmental education processes in schools. It is a view I recommend to other practitioners often caught up in oppositional reasoning, which manifests in a social and intellectual framing of two mutually exclusive ‘fields’ (see Table 2.1). The term *environmental interpretation and education processes* has been applied to capture this view (see sections 1.3, 2.3.3). In this view, a framework for transforming school grounds through social and educative interactions amongst teachers and non-formal educators is discussed.

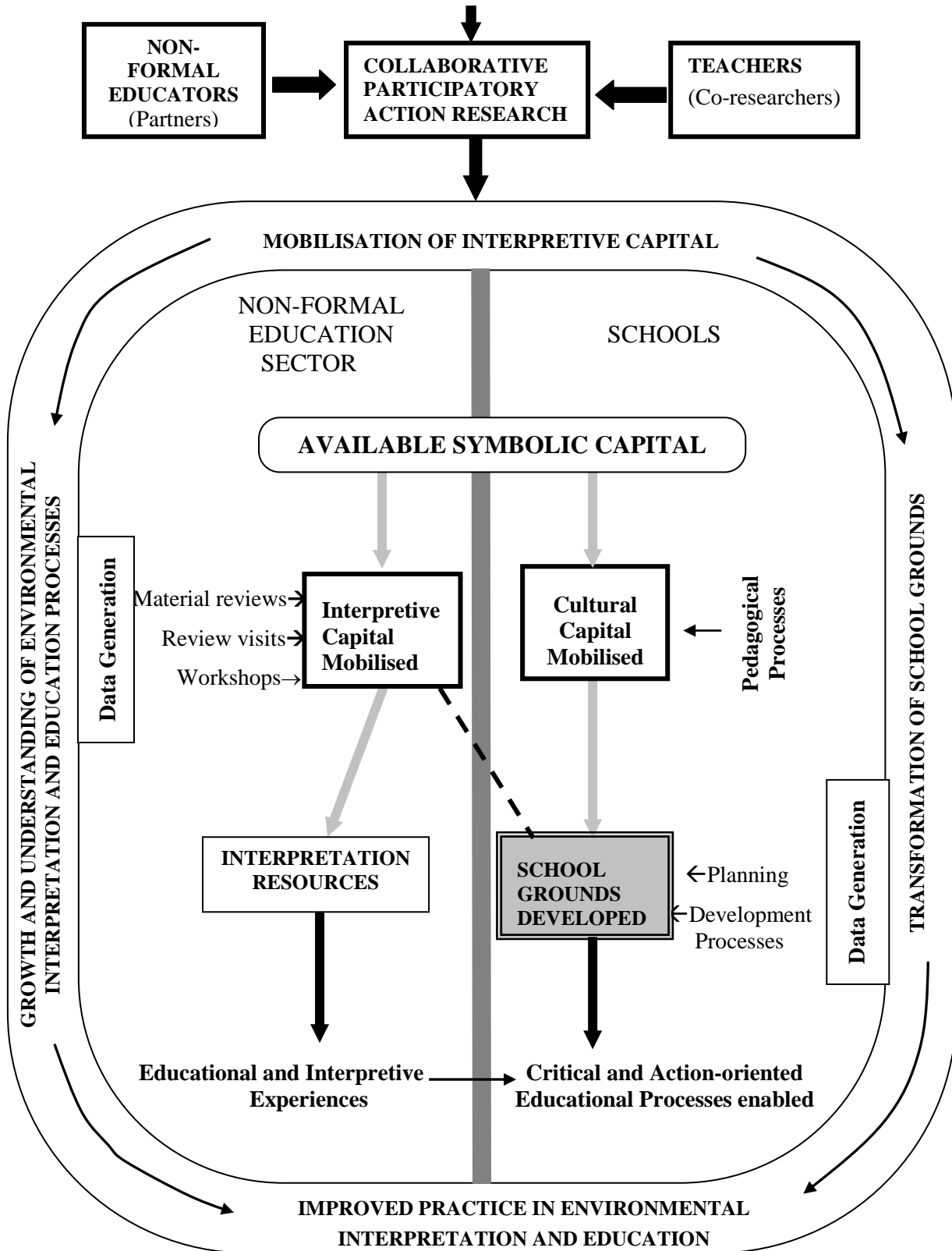
As Latour (1999:24) observed (in the context of his work in science studies):

The only way to understand the reality of science studies is to follow what science does best, that is, paying close attention to the details of scientific practice. Once we have described this practice ... we will be able to raise ... the classic question ... how do we pack the *world* into *words*? [Emphasis mine].

In my context, to understand the reality of environmental interpretation and education processes, I chose to ‘follow’ the practice in five non-formal education organisations (see section 4.2). This practice, as described in Chapter 4, drew on our social and educative interactions with non-formal educators. Through these interactions, interpretive capital was mobilised (see section 4.6.2). The question that we raised was: ‘How can we, drawing on this capital, develop interpretation resources and materials in schools to enable critical environmental educational processes?’ The two cases studies presented in Chapter 5 (see sections 5.2 and 5.3) contain some answers to this question.

As a practitioner involved in the provision of environmental interpretation and education processes with schools (see section 1.1), I have always been faced with the challenge of ‘packing’ our NMK Botanic Garden (Latour’s *world*, mentioned above) into participatory interpretive and educational experiences that may enable critical educational processes (Latour’s *words*, or symbolic interactions, mentioned above). It was in this professional impasse that I found Bruno Latour’s (1999) social theory on the ‘situatedness of knowledge production’ particularly useful in enabling me realise this study (see Figure 6.1 for details).

**REVIEW AND DEVELOPMENT PROCESSES**



**Figure 6.1** An inquiry-oriented approach to the transformation of school grounds

Figure 6.1 above shows my attempts to represent schematically the overall structure of the critical inquiry-oriented approach I adopted. This schematic diagram is only a ‘tool’ that I use to describe the conceptualisation and thinking contained in this study. It should therefore not be drawn on prescriptively. As illustrated in the figure, non-formal education organisations and schools are reproductive sites for symbolic capital (see section 2.2.2). In Chapter 2, I argued that cultural capital (in schools) and interpretive capital (in non-formal education sector) could be mobilised through meaning making processes in interpretation acts that may enable critical educational processes (see section 2.3.1). It was on this premise that I involved a group of teachers in a process of *mobilising interpretive capital* within the non-formal education sector (see section 4.1). This was aimed at transforming their school grounds into sites for critical environmental interpretation and education processes (see sections 5.2.4, 5.3.4).

I may relate the process of mobilising interpretive capital for transformation of school grounds to that of a ‘circulatory system’ (Latour 1999) with a number of ‘flows’. These flows are what actually enabled the ‘voyaging into the unknown’ in this study (see sections 3.3.2, 4.2). They contributed to the ‘changing of the tide’, (see sections 3.3.3, 5.1) and further hastened the ‘finding of the shores’ described in this chapter. These flows were (see Figure 6.1): Data generation techniques; mobilising of interpretive capital; partners (the non-formal educators); teachers (co-researchers) and the two schools that provided grounds to be transformed.

Each of these five components (‘flows’) was equally important. Without our social interactions with the non-formal educators, no interpretive capital would have been mobilised; without the teachers, access to the schools (see section 3.3.1.1) would have been denied, and thus no collaborative participatory action research would have occurred. The research techniques that I applied to generate ‘text’ were equally important (see section 3.2.4). Through them, I was able to document the interpretive capital that we mobilised. This was then made available (see section 4.6.2) for the transformation of school grounds (see sections 5.2.2, 5.3.2). The implication of this argument is thus: when one is working with others to transform sites into interpretation resources, various factors that come into play need to be given equal attention from the onset of the activity. Paying more attention to one at the expense of the others may prove counterproductive (see section 5.3.5). It is the interaction between these components that

defines the transformation.

I further provide more insights into the process of mobilising interpretive capital within the non-formal education sector and schools for interpretation acts by drawing on some of the findings I presented in Chapters four and five. During the social interactions between teachers and non-formal educators (see section 4.3), there was a sharing of interpretive capital with an emphasis on its immediate use in the school grounds (see section 6.3.2). As a result, what the teachers learned in the non-formal education sector interactions contributed to the transformation of school grounds at Samaj and Kenya High (see sections 5.2, 5.3). This was done within socially and historically embedded contexts of the two schools. By drawing on the mobilised interpretive capital (see section 4.6.2), teachers became more creative and further mobilised interpretive capital on their own within the school grounds (see sections 5.2.2.3, 5.3.2.2) through more socially meaningful interactions. In this learning process, "... creativity and originality [were] as much the object of education as [was] the reproduction of the existing order" (Wells 2000:158).

As a facilitator and participant in this mobilising process, I engaged teachers (see sections 4.3, 5.2.2, 5.3.2) in activities to which they were committed, and provided assistance and guidance that enabled them to challenge their existing knowledge frameworks (Vygotsky 1978, Wells 2000). It was through collaborative structuring of these interactions that most of the interpretive capital was mobilised. This provided opportunities for teachers to make systematic progress towards mastery of some of the "tools and skills of interpretation" (Uzzell 1989) as revealed in the two stories shared in this chapter (see section 6.4.1), and in the outcomes reported in Chapters 4 and 5. In this sense, the 'interpretive capital' we mobilised (see section 4.6.2) was a form of critical knowledge. This is because it was practical and action-oriented knowledge that catalysed social change as illustrated by the transformation of school grounds at Samaj and Kenya High (see sections 5.2.4, 5.3.4). For us, it was not a matter of accumulating the interpretive capital as we immediately put it into use (Wells 2000). Critical theorists have challenged the notion of 'knowledge accumulation' as one that functions to reify conditions within which that knowledge was produced (see Giroux 1988, Popkewitz 1999).

In the following section, I examine how my environmental interpretation and education practice at NMK was improved as a result of undertaking this critical educational research. A critical approach to environmental interpretation and education processes in schools and the non-formal education sector is advocated.

### **6.3 IMPROVED ENVIRONMENTAL INTERPRETATION AND EDUCATION PRACTICE**

In this section, I draw on a number of qualities of critical educational research (see Carr and Kemmis 1986, Fay 1987, Burbules and Berk 1999) that contributed to an improvement of my own practice and that of teachers (see section 6.4). These are shared as a way of advocating for a critical perspective in educational research with the aim of improving one's educational practice and that of others involved in the process. Drawing on Fay's (1987) critical social science, I suggest a critical approach to environmental interpretation and education processes (see section 6.3.2).

#### **6.3.1 Improving on own practice in critical educational research**

Some of the questions I asked at the start of this study (DS 1; see section 2.3.3) were: Does interpretation have a role to play in preparing learners to address environmental issues facing their local community? Can interpretation be used to enhance a school's environmental practices and support socially critical environmental education processes? What role can teachers play in enabling socially critical environmental processes through interpretation? Locating this study in a critical orientation (see section 3.2.2) not only provided me with a framework (see Figure 6.1) for answering these questions; even more importantly, it enabled the teachers and me to analyse the causes and consequences of some of the problems embedded in the questions and it enabled us to work towards a range of possible solutions (Fien and Hillcoat 1996).

By adopting a socially critical view of education (see section 2.3.1), I saw knowledge and learning as a social activity and accepted the many viewpoints that emerged during our social

interactions. I acknowledged the diversity of perspectives in the formation of a ‘community’ of reflective practitioners (see section 6.4.2). I have come to understand that there is never a comprehensive way of developing interpretation resources and materials in schools (see sections 5.2, 5.3). In the same vein, there is no perfect way of practising environmental interpretation and education processes (see sections 4.4, 4.6) that cannot be challenged or subject to critique and change (see sections 4.5).

Throughout the study, I assumed a sense of humility in my intellectual pursuit, as I had to work with interpretive capital produced by others (AM 7-11). I viewed the review and development of interpretation resources and materials as part of a social process, which was limited in many ways. I did not assume the detached approach of an expert trying to offer objective advice on how to transform school grounds for environmental interpretation and education processes. The notion of “... learning by doing and learning with others” (Kemmis and Wilkinson 1999:24) was as important to me as it was to the enhancement of the professional competencies of teachers in this study (see section 6.4.1).

My commitment to doing this critical research was not simply a professional or academic pursuit (see section 3.2.3.1) as I participated in a community effort towards school grounds transformation (see sections 5.2, 5.3). In this transformation pursuit, I paid much attention to the process, less than I did to the products of the research activities (see sections 5.2.3, 5.3.3). In other words, the research was process-driven as opposed to product-driven. In this way I actively participated in the study by facilitating the mobilising and application of interpretive capital during the entire study. There were times when my own practice was under investigation and thus I became faced with the challenges of holding one’s own ideas up for scrutiny (see sections 4.4.2.2). I accepted critique and worked hard with teachers through establishing an “authentic union of action and reflection” (Freire 1996:48). An understanding that there were challenges that maintained the dynamic and responsive nature of improving one’s own educational practice proved beneficial (Ashwell 2001).

Our social interactions during review visits and workshops provided me with new perspectives and insights into environmental interpretation and education processes (see section 4.6.2). This

to some extent has enabled me improve my environmental interpretation and education practice at the NMK Nairobi Botanic Garden (DS 39). The following journal reflection may justify this claim:

Pangani Girls School has requested assistance in developing their grounds for environmental learning. ... I experienced a new dimension in my research as my confidence to provide support on the use of school grounds for environmental learning has increased. ... We toured two sites the school has set aside for development. The first area ... has a number of plants and we brainstormed possible themes that could be developed at the area. The second area is large and requires a lot of planning before being transformed into an outdoor classroom. After touring the two sites, ... we discussed how to develop themes at them in the school laboratory with [three teachers] (Journal pp. 348-9, 20 February 2002).

In this case, we went ahead and identified various themes with three teachers at the school. The students were eager to be involved in the development. In less than a month, we had identified plants at the school with the teachers. I assisted the teachers in developing interpretive labels (see sections 5.2.3.2 and 5.3.3.4). Other than sharing my interpretive capital with teachers from Pangani Girls, I also developed and implemented a new garden-based environmental education programme, *Plants in our Environment* for primary schools at NMK (DS 39). An activity sheet that was developed through a participatory approach was shared as a case study during the 14 September 2001 workshop (DS 15). The development process differed from approaches I followed in previous cases (see section 4.4.2.2) in its open-ended and participatory orientation. This change may be attributed to the impact of this study on my environmental interpretation and education practice.

Locating this study within a participatory action research framework (see sections 3.2.2, 3.2.3) has to some extent, enabled me to become more reflective of my own educational practice. In the course of the study, I managed to gain useful tools for reflection. These included cycles of systematic engagement (see section 3.2.3.2 and Figure 3.1), journal and diary writing (DS 21-23; see also section 3.2.4.2) and collaboration with others (see sections 4.2, 4.3). Journal and diary writing enabled me to “hang onto” thoughts long enough to analyse them and systematically translate them into appropriate action (see section 3.2.4.1). Conversely, collaboration with teachers and fellow non-formal educators challenged me to deal with

different contexts (see section 5.2, 5.3) and examine my own assumptions on environmental interpretation and education processes as I have already pointed out.

I do acknowledge that critical educational research has its own limitations (see Lotz 1996) in spite of the foregoing. The ability of reflection to bring about social change has been questioned (for example, Usher and Bryant 1989, Elliot 1991, Walker 1997, Cohen *et al.* 2000). For instance, it was not possible as the main researcher to establish conditions for continuous reflection during the period of this study. My earlier efforts to introduce reflective journal writing to the teachers failed to take off (see section 3.2.4.2). Some of the teachers (for example K2) turned their journals into notebooks. Although critical research is expected to be an empowering activity that is collective (Elliot 1991, Smith 1993), I came to realise that the issue of power is sometimes understated (Cohen et al 2000). Throughout the study I continued to play a dominant role, and efforts to change the dynamic of this power relationship, through co-chairing of meetings in schools were sometimes fruitless as illustrated in this journal entry:

I have always been chairing meetings and in most cases teachers expect me to show the direction. Is it possible to change this role? I tried to ask [K1] to chair today's meeting, but she declined (Journal p. 308, 18 January 2002).

In this example, I failed to change this dynamic (see also section 3.2.3) in spite of my efforts to adopt more facilitative and democratic leadership approaches.

### **6.3.2 A critical orientation to environmental interpretation and education processes**

To recommend a critical approach to environmental interpretation and education processes in schools and in the non-formal education sector (interpretive sites), I draw on Fay's (1987, see also Fien 1993) critical social science theory (see section 3.2.2). Fay (1987:23) proposed three related requirements of *scientific understanding*, *social critique*, and *social transformation* in his critical social science theory. The critical orientation I adopted in this study (review and development of interpretation resources and materials) reflects some of these perspectives.

Following Fay (1987), a critical social science perspective on environmental interpretation and

education processes may therefore be *scientific* in providing explanations of mobilising interpretive capital and its relations to environmental education processes. These explanations can be subjected to public critique and empirical evidence. To fulfil Fay's requirement for *social critique*, it may be *critical* in challenging some contextual and other factors that hinder critical environmental education processes in schools. To enable *social transformation*, it may be *practical* in the sense of stimulating teachers, non-formal educators, learners and their community to transform aspects of their reality and social conditions (the school grounds as sites for environmental learning). This may occur through enabling them to access and further develop, interpretive capital that may serve as a basis for this transformation.

I argue that the work presented in this study has in some ways (not entirely) fulfilled these three requirements of a critical theory of environmental interpretation and education processes. It was:

- *Scientific* as it provided some explanations that I subjected to public scrutiny and based on empirical evidence (DS 7, DS 20; see also sections 3.2.4, 3.4) on how interpretive capital was mobilised with teachers within the non-formal education sector (see sections 4.2.2, 4.3, 4.4) and school grounds (5.2.2, 5.3.2).
- *Critical* in that it exposed some of the contextual factors that frustrate the teaching of critical environmental education processes in the two schools (see sections 5.2.1, 5.3.1).
- *Practical* in that it provided us with interpretive capital (see section 4.3) and the motivation we needed to bring about the transformation of school grounds for critical environmental education processes in two case study contexts.

Fay (1987) outlined four primary theories of *crisis*, *education*, *transformative action* and *false consciousness* as the basis of a fully developed critical theory (see section 3.2.2). I draw on these theories to further illustrate that this study has, to some degree, provided some understanding of the marginalisation of environmental education processes in Kenya (see section 2.2.2) through its focus on two schools. To this end, the pedagogical and curriculum tensions between schooling and the enhancement of critical environmental education processes were spelt out (see sections 5.2.1, 5.3.1) as dimensions of *a theory of crisis*. To address these

tensions, a re-orientation of environmental education processes in the two schools through a language of critique and possibility was undertaken (see section 2.3). This became my attempt to offer an account of the processes and conditions necessary for an educational dimension to environmental interpretation. In articulating dimensions of *a theory of education*, I outlined learning processes associated with the social construction of meaning, and associated mediation possibilities (see sections 2.3.2, 3.2.2, 4.3).

Teachers in the two schools were involved in developing interpretive plans towards the transformation of their school grounds for environmental learning (see sections 5.2.2.1, 5.3.2.1). In this process, the teachers and I were active as transformative intellectuals who mobilised interpretive capital within the non-formal education sector (see section 4.2) to inform the transformation of the school grounds, thus reflecting dimensions of *a theory of transformative action*. Through the processes of mobilising interpretive capital (see sections 4.2.2, 4.3, 4.4) and acting on the interpretive plans (see sections 5.2.2, 5.3.2), educators were able to begin articulating new pedagogical practice. Previously held views about environmental education practice were challenged, thus reflecting some dimensions of *a theory of false consciousness*. During workshops and critical reviews of interpretive materials, teachers were enabled to extend their consciousness about themselves and understand their own potential to become *transformative intellectuals*. In addition they were also enabled to understand how and why materials were developed in the non-formal education sector (see section 4.4), and understand how those had been shaped by historical and contextual factors.

In the next section, I discuss how the participatory action research method of inquiry I applied in this study (see section 3.2.3) within a critical perspective (see section 3.2.3) enhanced teachers' professional competencies (see Robottom 1987, Fien and Rawling 1996).

#### **6.4 ENHANCING PROFESSIONAL COMPETENCIES OF TEACHERS**

Participatory action research as a form of critical research provided a suitable medium for enhancing the professional competencies of teachers (see Robottom 1987, Robottom and Hart 1993). As argued earlier (see sections 2.5.2, 4.3), professional development was not something

‘done’ to the teachers. They were able to contribute to the process through collective planning, action and reflection (see section 3.2.3.2). Under normal circumstances, teachers are afforded little time, if any at all, to be involved in activities aimed at enhancing their professional competencies (see sections 5.2.1.1, 5.3.1.1). Only K1 and K2 from the group had attended an in-service workshop prior to this study. None of the teachers, except K4 found their pre-service training in environmental education adequate for their teaching needs (see section 5.3.1.1).

As Kincheloe (1995:76) argued, “... if knowledge is a form of cultural capital, then lack of access to it spells major problems for those on the margins of the culture of knowledge”. This participatory action research study provided a framework (see Figure 6.1) for making interpretive capital accessible to teachers (see sections 4.2.2, 4.3, 4.4). Within this framework, I can conclude that this research reflected the five guiding principles on professional development as delineated by Robottom (1987):

- It was *inquiry-based* in its attempts to encourage teachers to conduct research into their own teaching practices. This enabled them to expose and where possible, respond to contextual factors that constrained the teaching of environmental education processes in their schools (see sections 5.2.1 and 5.3.1).
- It was *collaborative*, action-oriented and grew out of the teachers’ own specific contexts. The teachers worked collaboratively with non-formal education organisations to develop their school grounds (see sections 5.2.3, 5.3.2) for critical environmental interpretation and education processes (see sections 5.2.4, 5.3.4).
- It was *participatory and practice based*, as teachers were involved in mobilising interpretive capital within the non-formal education sector for interpretation acts in their school grounds (see sections 4.2.2, 4.3).
- Within a *critical* perspective, teachers critically analysed underlying values, environmental methods, education ideas and views on the environment that informed the development and use of interpretive materials in non-formal education organisations (see section 4.4; see also Appendix 4).
- It was *community based* and involved teachers in the development of interpretation resources and materials towards re-orienting the teaching of environmental education

processes in their schools (see sections 5.2.2, 5.2.3, 5.3.2, 5.3.3).

Drawing on the above-mentioned guiding principles, I examine in the next sections how professional competencies of the teachers were enhanced as a result of their participation in this collaborative participatory action research study. Two stories of teacher empowerment are shared to illustrate how professional competencies in reflective thinking, research skills and materials development were enhanced.

#### 6.4.1 Two stories of teacher empowerment

Collaborative participatory action research as pointed out by Kemmis and McTaggart (1998:44) concerns "... helping people to become more conscious and critical of their agency in processes of historical change". As a form of critical research, this study was done (see section 3.2.2) not just to "... explain or *understand* social reality but to *change* it" (Smith 1993:77). While emancipatory potential was not guaranteed in this intent, some degree of *empowerment*<sup>27</sup> amongst the teachers is evident. Two stories by K2 and S1 that represent 'teachers' voices' (see Lotz 1996) are examined to qualify this point (see Tables 6.1 and 6.2).

**Table 6.1** A reflective story by K2

##### **Story one: Empowerment as self-growth**

During our two visits to WCK, ideas on how to develop a nature trail and what to include in a stop were shared. I learned what a nature trail is. My perception of a nature trail changed as a result of these visits. I had always associated it with a tourist attraction and not an environmental learning resource. The review visits also provided avenues for sharing ideas, approaches and tensions on the implementation of environmental education processes in schools.

I have learned that environmental education processes are also relevant in non-science subjects like history and English. This understanding helped me during my development of the worksheet because I was able to involve other teachers at our school. Through this study, I have also learned how to develop and use a trail booklet. The 14 September 2001 workshop provided an enriching experience especially during the presentation on thematic interpretation. It clearly brought out the relationship between themes and topics. It was an experience for me because I was able to learn how interpretive signage and posters may be developed (DS 16, 3 April 2002 workshop report).

<sup>27</sup> In his proposition and examination that critical educational research is potentially empowering because of its emancipatory intent, Robert Smith (1993:78) argued for three potentially related constructions of empowerment. These are empowerment as self-growth; empowerment as political consciousness raising; and empowerment as collective action (*ibid.*).

**Table 6.2** A reflective story by S1**Story two: Empowerment as collective action**

Our team has gained an understanding of participatory research methodologies. Prior to this study, members of our team were not conversant with participatory action research. We have also gained interpretive planning skills. The study provided a useful opportunity of writing down plans, implementing them and later evaluating the results. Working within such a framework has enabled us to grasp aspects of project management and evaluation.

A lot has been learned on how to develop materials for environmental learning at our 'botanic garden'. Skills on how to develop specific materials – brochures; worksheets; trail leaflets; interpretive signage and labels have been learned. Aspects of materials development that we learned included how to design materials and make them effective; how to use the materials at school; how to display interpretive signage and advantages of different interpretive materials.

The team has learned how to develop school-based environmental education programmes. Previously, we had this mentality that not all subjects can benefit from the 'botanic garden' that we developed. Using the knowledge gained from the study, we have now embarked on developing environmental education programmes that cut across the curriculum. We have learned that all subjects can effectively be taught at our 'botanic garden'. It will be a relief for us when we use the developed botanic garden everyday. It will create opportunities for our learners to be involved collaborative processes of inquiry that require minimal guidance. Through this new interpretation resource, we shall be able to integrate classroom teaching with outdoor teaching.

Through the study, Samaj School has created useful links with a number of organisations – NMK, KWS, Giraffe Centre, Butterfly Centre and KOEE. As a result of these links, we were able to develop our botanic garden within a much shorter time than anticipated. The links have also made it easier for us to utilise educational resources at some of these organisations to support environmental learning amongst our learners.

Workshops we attended during the study have professionally enriched us. Specifically, useful knowledge and skills have been gained on writing proposals; critical thinking; workshop presentations; waste management and environmental interpretation.

At a personal level, I have been motivated into furthering my studies in environmental education. My general view of the environment has been widened through the exposure that the study has given me (DS 16, 3 April 2002 workshop report).

I am however aware that empowerment is a long-term process and more time, is required to undertake a critical reading of this evidence. While important as an 'outcome', an in-depth analysis would fall beyond the scope of this particular study.

The stories by K2 and S1 were shared during the 3 April 2002 workshop (DS 16). Encouraging

teachers share their ‘stories’ during workshops (see section 4.3) and focus groups served two purposes. It enabled me to collect data about research outcomes and the impact of the study on the enhancing of teachers professional competencies. At the same time, it was in itself a “... form of intervention, a kind of treatment that other teachers, in and through their hearing, receive and can decide to adopt or experiment with” (Fontes 2002).

The first story (see Table 6.1) reveals how K2 was able to review her understanding on what a nature trail is, through meaning making processes (see section 2.3.2.2) during interactions with non-formal educators (see section 4.2.2.4). Her perception of environmental education processes in the school curriculum also changed. This story is an example of empowerment as self-growth (Smith 1993). The changes in self-knowledge, the acquisition of interpretive capital and a sense of competence to develop materials, as revealed in K1’s story provide evidence of this self-growth. In the second story (see Table 6.2), S1 provides a more detailed account on how the research benefited the teachers as a group.

In S1’s story, empowerment is not presented as an individualised benefit like in story one. Rather, it reflects a collective action where teachers worked collaboratively with partners to realise their goals. Creating new links and transforming school grounds resulted from collective actions that were designed to change social conditions (Kincheloe 1991, Smith 1993). This story highlights the participation of the teachers in trying to transform the conditions in their school that tend to promote the reproduction of didactic forms of instruction (see section 2.3.1). S1’s interest in pursuing further studies in environmental education as a result of his participation in the research is an indication of catalytic validity (see section 3.4.2).

Nevertheless, I must mention that the experiences of K2 and S1 are embedded in different social and political contexts (see sections 5.2.1.1, 5.3.1.1) that may not have been reflected when telling their stories. No assumptions have thus been made that these portrayals are authentic (see Day 1999). As indicated earlier, a more critical reading of this evidence would be required to make conclusive statements based on it.

Drawing on these two stories, and other findings from the study (see sections 4.3, 4.4, 5.2.2, 5.2.3, 5.3.2, 5.3.3), it seems evident that the consciousness of teachers about themselves as transformative intellectuals (Giroux and McClaren 1986) was to some degree enhanced. The evidence reported in Chapters 4 and 5 indicates that this study has enhanced professional competencies of teachers. These are competencies in reflective thinking (Schön 1983, Fien and Rawling 1996, Day 1999), research skills (Carr and Kemmis 1986, Kincheloe 1991, Lotz and Robottom 1998), interpretation resource and materials development (see sections 4.4, 5.2, 5.3) and curriculum development. This point is examined further in the section that follows.

#### **6.4.2 Teachers as reflective practitioners and researchers**

The concept of reflective practice is embodied in the principles of participatory action research and critical reflection (Fien and Rawling 1996, Day 1999). It entails "... using ethical and contextual considerations in professional decision making rather than making such decisions on the basis of habit, intuition, impulse, and tradition" (Fien and Rawling 1996:10). According to Schön (1983:40), reflective practitioners reflect 'in' and 'on' action. *Reflection-in-action* refers to the process of decision-making by teachers while teaching (Day 1999:26; see also Schön 1983). *Reflection-on-action* occurs outside of the practice being reflected upon, it happens both before and after an action (Day 1999). Teachers as professional practitioners not only reflect *in* and *on* action, but they also reflect *about* the action (*ibid.*). *Reflection about action* has been regarded by Day (1999:29) as a broader, critical stance that "... involves inquiry into the moral, ethical, political and instrumental issues embedded in teachers' everyday thinking and practice". This is what may be required of teachers to be regarded as reflective practitioners.

In the context of this study, the teachers and I were engaged in *reflection-in-action* (Schön 1983) during workshops (see section 4.3.2) and when implementing the formulated plans (see sections 5.2.2.2, 5.2.3, 5.3.3). As reflective practitioners, we mobilised new interpretive capital during the development of interpretation resources and materials in their schools (see sections 5.2.2.2, 5.2.3.2). In *reflection-in-action*, means and ends were brought together in the transformation of school grounds through learning by doing (Fien and Rawling 1996).

*Reflection-on-action* occurred mainly during interpretive planning processes (see sections 5.2.2.1, 5.3.2.1) and during the sharing of ‘stories’ in workshop sessions (see previous section). The relationship between the transformed school grounds and the re-orientation of environmental education processes in the schools was addressed through critical reflections (see section 5.2.4) as a basis for reflection *about* action. Fien and Rawling (1996) regard critical reflection as the practical application of reflection-in-action (see also Schön 1983, Day 1999).

In our roles as researchers, the teachers and I were able ‘to solve their own problems’ (Kemmis and McTaggart 2000) and to improve our environmental interpretation and educational practice to some degree (see sections 5.2.4, 5.3.4). In our own ways we changed, shaped and influenced the ‘world’ around us, regardless of scope or scale. Participatory action research enabled us to reflect on our different own roles, teaching practice and our potential roles as curriculum developers (see sections 5.2.3, 5.3.3) and in the words of Freire (1985:16), on the “... very power of reflection”. Using powers of reflection and action, we were able to challenge environmental learning in schools that was characterised by a lack of interest in the use of the outdoors (see section 5.2.1.3); a technocratic approach to the teaching of environmental education processes (see sections 5.2.1.2, 5.3.1.2); poor links with non-formal education organisations (see section 5.2.1.4); a lack of interpretive materials and non-participation of teachers in development of these materials (see sections 5.2.1.4, 5.3.1.4).

This study confirms the importance of developing interpretation resources and materials ‘with’ teachers and not ‘for’ them or imposed upon them (see sections 2.5, 5.2, 5.3) as a way of enabling them to become transformative intellectuals and active and engaged practitioners (Giroux and McClaren 1986). It has also illustrated the benefits of contextualising environmental learning activities (curriculum) in schools through a critical approach to materials development (see sections 2.5.1, 5.2.3, 5.3.3). As critical researchers and reflective practitioners, teachers and I started seeing school grounds as fertile avenues for critical environmental interpretation and education processes (see section 5.2.4, 5.3.4).

In order to enhance the professional status of teachers as reflective practitioners, researchers

and curriculum developers, I recommend research designs that:

- combine the language of critique with the language of possibility (see section 2.3) so as to stimulate the development of alternative practices for environmental education in schools (see section 2.3.3);
- engage teachers in critical reflection (see section 4.3.2), decision-making (see section 5.2.2.1) and strategic action (see Smith 1993);
- incorporate reciprocity and reflexivity in the research process not just as a method to verify data, but in order to enable teachers become change agents (Carr and Kemmis 1986, Smith 1993); and
- strengthen teachers' views about themselves through 'telling their stories' (see Smith 1993, Lotz 1996 and 2002, Day 1999, Hart 2002, Fontes 2002).

Central to the above is the development of research designs that support the enhancing of teacher professional competencies in their socially and historically located contexts. In the next section, I offer some tentative perspectives on the development of interpretation resources and materials in schools with teachers.

## **6.5 TOWARDS GUIDELINES FOR INTERPRETATION RESOURCES AND MATERIALS DEVELOPMENT**

This study has argued for a teacher-centred approach to interpretation resource and materials development that seeks to respect the needs of schools within their social and historical contexts (see sections 2.5.1, 5.2, 5.3). This approach calls for a flexible and responsive interpretive planning process (see sections 5.2.2.1, 5.3.2.1) that occurs throughout the development process (Bradley 1982). The planning process needs to be open to many interpretive possibilities that invite teachers to reflect on, and share their stories (Curthoys and Cuthbertson 2002). As illustrated in the two case studies presented in the previous chapter (see sections 5.2.2.1, 5.3.2.1), interpretive planning processes were responsive to the changing needs of the schools. They provided opportunities to engage the teachers in 'dialogue'<sup>28</sup> about their school grounds. This fostered respect for the interpretive capital that was mobilised by the

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<sup>28</sup> I use the term 'dialogue' here to imply "... sharing information, exploring ideas, openness to emergent properties that flow from creative interactions, and the freedom not to be an expert" (Curthoys and Cuthbertson 2002).

teachers and in the process, empowered them to make their own decisions (see sections 5.2.2.2, 6.4.1).

The development of interpretation resources and materials with teachers was not a sequential, linear process (see sections 3.2.3.2, 4.2.2.3). Rather, it was a complex endeavour with numerous pathways (see sections 5.2.3.4, 5.3.2.2). The development process was not viewed as an end in itself, but it was open to comment, critique and revision (Bradley 1982). Like other participant-centred approaches, the teacher-centred approach shared here was more time-consuming than conventional approaches (Curthoys and Cuthbertson 2002).

While the teacher-centred approach to development of interpretation resource and materials breaks away from conventional approaches, I do not present it as a perfect approach without limitations. For example, I found it to be more time-consuming than top-down approaches (see section 4.2.2.3). Taking proactive steps to transform school grounds, engaging teachers in an ongoing dialogue within their schools, and encouraging them to mobilise interpretive capital to inform the transformation, were all time-consuming endeavours. It required flexible schedules that allowed teachers the time to be involved within their busy school routines. Asking the school principals to permit such flexibility was one of the challenges that I experienced (see section 5.3.2). The other limitation within the school contexts is in the availability of financial resources. As was in the 'case' of Kenya High (see section 5.3.2.1), the limitations in budget had implications for developing theme trails at the school arboretum (see section 5.3.2.2).

However, I recommend that efforts towards developing interpretation resources and materials to foster environmental learning in schools incorporate open, teacher-centred, and critical perspectives. In making this recommendation, I aim to stimulate discussions that can contribute to an expansion of the possibilities on how interpretation resources and materials may further be developed in schools.

Drawing on the findings discussed in Chapters 4 and 5, a research meeting with Doyle (2001 pers. comm.) and literature (see Lucas 1997, Uzzell 1998c, BGCI 2000); guidelines that may inform the development of interpretation resources and materials in schools are proposed

below (see sections 6.5.1, 6.5.2). As already argued, the development process should involve an open-ended framework in which teachers in consultation with more culturally knowledgeable peers choose and plan their own themes and approaches, drawing on available interpretive capital. First, I suggest guidelines on how school grounds may be transformed into interpretation resources through a teacher-centred approach.

### **6.5.1 Developing interpretation resources in school grounds**

School grounds in Kenya as elsewhere (see Lucas 1997), are potential sites for critical environmental interpretation and education processes (see sections 5.2.4, 5.3.4). They are a public outdoor space to which learners have regular access and can offer learners sustained environmental learning experiences (*ibid.*). Through this study, two interpretation resources (see sections 5.2.3, 5.3.2) were developed in school grounds at Samaj and Kenya High. A number of benefits may be associated with their development and use at the two schools (see section 4.3.2). These include, an enhanced image and sense of pride in the school community (see section 5.2.5); improved relationships between teachers and school management (see section 5.2.5); effective management and use of school grounds (see section 4.3.2); and more effective teaching and learning (see also sections 5.2.4, 5.3.4).

Many schools in Kenya have areas within their grounds that may be easily transformed into interpretation resources. Their transformation may take two approaches. For schools with large grounds, specific themes within selected areas may be developed as presented in this study (see sections 5.2, 5.3). Those with limited open spaces may adopt a whole school grounds development approach like in the initiatives of Learning through Landscape in Britain (Doyle 2001 pers. comm.). Whichever the approach, some guidelines to guide the process are necessary. I recommend, such guidelines should emphasise on the development process, rather than the development itself (Doyle 2001 pers. comm.; see also sections 5.2.2, 5.3.2). Process-oriented guidelines that may lead to the development of interpretation resources in the school grounds through participant-centred approaches are now recommended.

### Conceptualising the development idea

The development of an interpretation resource may be conceptualised at either a club level (see section 3.3.1.1) or school level (see section 5.3). The conceptualised idea should be shared with others not involved in the conceptualisation such as; teachers, learners, parents and school managers. The sharing may be done through a brochure, school newsletter or school meetings (see section 5.2.3.1). This has the potential of realising a whole-school approach to the implementation of the conceptualised idea (see section 5.2.5).

### Forming an implementation team

A team comprising of teachers drawn from various subject disciplines (see sections 5.2.1.1, 5.3.1.1) can be formed to mobilise interpretive capital for the development process (see section 4.2). In an ideal situation, such a team may comprise of teachers, learners, parents and school managers. At this stage of team formation, a management structure should be set up with a project coordinator being chosen to oversee the development process.

### Surveying of the site to establish interpretive possibilities (research stage)

During this process, it is important to involve learners in establishing the way school grounds may be developed and used. In this way, learners can be viewed as agents for producing interpretive capital through interaction with their teachers (more knowledgeable adults) in socially significant tasks (Greenall Gough and Robottom 1993). Ideas around the interpretive possibilities and not, the facilities and resources required, should be the guiding principle during this process. This is to ensure that the development process conforms to the structure and operational constraints of the school (see section 5.3.2.1). Involving the learners in the survey of the area is a way of engaging them in collaborative reflection and action (Greenall Gough and Robottom 1993). This has the potential of developing in them a critical environmental consciousness (Fien 1993; see also section 2.3.1.1).

### Developing an interpretive plan

Based on the interpretive possibilities and resources in the school, a broad interpretive plan that may be translated into specific action plans should be developed (see section 5.2.2.1, 5.3.2.1). The planning should be done within a critical perspective as outlined above (see section 6.5).

### Implementing the interpretive plan through a holistic approach

Implementation of the interpretive plan should involve the whole site, the whole school community and all aspects of the curricula (Lucas 1997). This process needs to focus on developing ideas around activities and involving learners in working with the teachers.

Through a holistic approach, teachers and learners may be viewed as active members of society who, through critical praxis (see section 2.3.1) can create an interpretive resource for enhancing environmental interpretation and education processes in the school (see sections 5.2, 5.3). This approach has the potential of enabling learners (and even the teachers) to actively discover the significance and meaning of their local environment. This may develop in them, an understanding of how to contribute to social change through critical reflection and action (see section 2.3.1.3).

### Monitoring and evaluation of the development process

It is important to monitor and evaluate the development of an interpretation resource in the school grounds. Teachers and learners should be involved in socially shared assumptions (Lotz-Sisitka 2001a) underlying their development actions. Monitoring and evaluation should be an ongoing and participatory process. Ideally, it should involve both teachers and their learners. Collaborative reflexive processes have the potential of shaping different ways of seeing school grounds (see section 5.2.2.2) with greater chances of re-conceptualising them as sites for critical and action-oriented environmental education processes (see sections 2.5.3, 5.2.4, 5.3.4).

In this study, the involvement of learners in the transformation of school grounds was minimal as the focus was on teacher participation (see section 1.2). I recommend that learners be fully involved in decision-making (planning process) and the actual development of their school grounds. When learners get involved, it may build ownership and make the whole process enjoyable (Doyle 2001 pers. comm.). It may also improve relationships between learners and their teachers (Lucas 1997). Involving learners in the development of interpretation resources in the school grounds may provide opportunities to engage them in "... activities that are consistent with building a responsive democratic society" (Greenall Gough and Robottom

1993:307; see also section 2.3.1).

Environmental interpretation and education processes at the developed school grounds require materials that can mobilise learners' cultural capital for meaning making processes through social or cultural interactions (see sections 2.3.2.2, 2.3.2.3). Such mobilising acts may further engage learners in investigation, social critique, informational finding, action taking and reporting to participate in social change at the school (see section 2.3.3). In the section that follows, I offer some guiding principles that may be drawn on by teachers when developing such materials (see sections 5.2.3, 5.3.3).

## **6.5.2 Developing interpretive materials for use within school grounds**

A number of new interpretive materials (both publications and interpretive signage) were developed during the study to enable environmental learning at the Samaj 'botanic garden' and Kenya High 'arboretum' (see section 5.2.3, 5.3.3). During development of these materials, potential learning processes were placed at the centre of the materials development process. In this sense, learners became the co-authors of the materials as we expected them to bring to the interpretation resources (see Uzzell 1998c) cultural capital acquired in different classroom settings and their social context and (see section 2.3.2.2). The learners' understanding of the relationship between language and the environment, between the use of words, and the history of their school and social contexts were also considered during the development processes (see section 2.3.2.3).

Based on this learner-centred approach, I now suggest some guiding principles (see Ballantyne and Uzzell 1994, BGCI 2000; see also section 4.3.2) that may be drawn on by teachers when developing interpretive materials for use in their school grounds (see sections 5.2.3, 5.3.3). These guidelines emphasise both the process of development and contents of the materials. The guidelines are as follows:

- materials should reflect principles and qualities of interpretation within a communicative perspective (see section 4.3.2);

- efforts should be made to ensure that the development process is inclusive, participatory (see sections 5.2.3.4, 5.3.3.1) and draw on appropriate educational ideas (see section 2.3.2);
- materials should engage learners in problem posing (through follow-up activities) to enable them critique and challenge what is being interpreted;
- materials should allow for a mobilising of learners' cultural capital for critical and action-oriented environmental learning activities (see sections 2.3.1.1, 2.3.1.3);
- materials should enable learners to explore values that promote ecological sustainability and social justice within local and global contexts (see section 2.3.1.2, 4.4.4.6);
- information in the materials should be accurate and up-to-date and should enable learners to relate the subject being interpreted (see section 4.3.2);
- materials should propose diverse learning and teaching approaches in their texts (see section 4.5); and
- materials should be easy to use and appropriate to the levels of the learners. They should be flexible for use both at the interpretation resource and in the classroom.

These guidelines are no more than tentative insights gained from this study and are subject to revision because of continuous contextual change and divergence of differing interpretive experiences and approaches. They are not to be used in a prescriptive manner. Rather, they only serve as a starting point to be drawn on by teachers interested in enhancing socially critical environmental education processes in their schools.

Teachers alone may not re-orient environmental education processes in schools through the development of interpretation resources and materials. It is important that they work with non-formal education organisations (see sections 4.2, 6.2; see also Figure 6.1) to enhance environmental interpretation and education processes in their school grounds. This however, requires the formation of meaningful partnerships that I examine in the next section. The partnerships, which emerged are examined at two levels: those that were formed between NMK and other organisations, and those between schools and non-formal organisations.

## **6.6 EMERGING PARTNERSHIPS FROM THE STUDY**

Partnerships imply an equality of commitment and involvement (BGCI 2000). At the onset of this study, there was a tendency in the two schools to view relationships between teachers and non-formal educators as an unequal one, with the teachers being dependent on the expertise and materials from the non-formal educators (see section 1.2). It became clear to them that all of us (both teachers and non-formal educators) were learners capable of generating new interpretive capital together through meaningful social interactions (see sections 4.3, 4.4, 5.2.2). This led to new partnerships between teachers and non-formal educators. In my own professional context, I had regarded my practice at NMK Nairobi Botanic Garden as having little in common with that in other non-formal organisations. The tendency prior to this study had been to confine myself to botanic gardens-related networks. Through this study, it became evident that similar environmental interpretation and education methods are applied in the non-formal education sector (section 4.5). In this section, I examine partnerships in two dimensions, NMK/other non-formal education organisations and schools/non-formal education sector partnerships.

### **6.6.1 Enhanced partnerships between NMK and other organisations**

Although NMK had working relationships with some of the organisations (KWS, WCK and the Giraffe Centre) I involved in this study, new aspects of partnerships emerged (see section 3.3.4). These were reflected in the joint workshop for teachers with KWS (DS 38), the review of interpretive materials for a theme trail at WCK (DS 36; see also section 4.2.2.4), and my invitation to facilitate workshops at the Giraffe Centre and WCK (DS 37). These were new dimensions in my work at the NMK Nairobi Botanic Garden. I will provide some insights into these new partnerships.

The review visits I made with teachers to KWS, WCK and the Giraffe Centre (see sections 4.2) enabled me to share aspects of my work at NMK with fellow non-formal educators. My research focus (see section 1.2) exposed aspects of materials development processes that required revision and review (see section 4.4; see also Appendix 4). Sharing my interim

findings from the review phase with educators at WCK may have contributed to the review of the trail booklet that had been developed in 1984 (see section 4.4.2.1). The review occurred several months later (25 October 2001) after our visits with the Kenya High teachers. The invitation of K1 and myself to the review ‘seminar’ (materials development session) at WCK demonstrated new dimensions to our previous partnership and also represented a form of catalytic validity (see section 3.4.2). Apart from K1, three other teachers were part of the review team. A colleague from NMK (plant taxonomist) assisted in the identification of plants. For more than three months I was engaged in the re-development of materials we had critically reviewed with teachers (see sections 4.4.2.1, 4.4.2.2). This was only possible as a result of the collegiality that grew out of the study. WCK further invited me to facilitate a workshop for national club coordinators that was held on 8-9 March 2002 (DS 37). The re-developed interpretive materials were piloted during this workshop in which I made two presentations. I used this opportunity to share some of the interpretive capital that I had mobilised during this study (see section 4.6.2).

As mentioned in Chapter 4 (see section 4.3, 4.4), I drew on the resourcefulness of non-formal educators from KWS and the Giraffe Centre (Gitonga, Musyoki and Mbogo) when mobilising interpretive capital through workshops with teachers. This trend of drawing on each other’s ‘capital of ideas’ (within the non-formal education sector) seemed to have taken root when reciprocally, Musyoki (2001 pers. comm.) invited me to assist in the facilitation of a national teachers’ workshop that was held at the Giraffe Centre in December 2001 (DS 37). K1 and S2 were also invited to participate in this workshop, as a result of this study. Our collaborative links (NMK and the Giraffe Centre) have since been strengthened as a result of interactions in this study.

With KWS, a joint workshop for teachers was held on 31 January and 1 February 2001. The following extract from a letter that I wrote to the Senior Warden Education (KWS) highlights the new partnership that was shaped by this study.

I am writing to explore the possibilities of NMK Nairobi Botanic Garden running this workshop jointly with the KWS Education Department. Such an eventuality will further nurture the collaborative links that are now emerging through Mbogo’s work with us. As you may be aware, on June 22 this year Mbogo helped facilitate a one-day

workshop for teachers on materials development at the NMK Nairobi Botanic Garden where she underscored the role of Nairobi Safari Walk in Environmental Interpretation. Exposing more teachers to this very useful interpretation resource and the work of KWS may be invaluable in enhancing environmental education processes for schools (DS 38, Letter to Senior Warden Education at KWS 21 December 2001).

This letter was positively responded to and a joint workshop, attended by twenty-five teachers including K1, S1 and S2, was held (DS 38). The workshop was alternately held at NMK and KWS. The head of our Education Department opened the workshop on behalf of the NMK Director-General during the first day (31 January 2002) at NMK. At KWS, the Director of the organisation closed the workshop. This confirmed the importance both NMK and KWS management placed on the workshop that managed to expose a group of teachers to two new interpretation resources at the organisations. Through this workshop, interpretive capital was mobilised with the teachers through social interactions with non-formal educators from KWS and NMK with the teachers. Opportunities for environmental interpretation and education processes at both NMK Nairobi Botanic Garden and KWS Nairobi Safari Walk were explored through guided tours, group tasks and presentations (DS 38). To some extent, the workshop contributed to enhancing the environmental interpretation and education profiles of NMK and KWS. Its multiplier potential was immediately felt when one of the participants (a teacher from Pangani Girls) later sought the support of NMK in developing their school grounds for environmental learning processes twenty days later (see section 6.3.1). She further encouraged some of her students to visit both NMK Nairobi Botanic Garden and KWS Nairobi Safari Walk. A group of forty-five girls from the school (Pangani) managed to visit the NMK Nairobi Botanic Garden during the first week of April 2002 on their own.

Reflecting on of these new dimensions of partnerships between NMK, KWS, WCK and the Giraffe Centre (DS 40, AM 24), a number of benefits may be noted. Through joint environmental interpretation and education programmes, duplication of efforts that may arise when enabling environmental learning with school groups can be minimised. School-based projects that may promote critical environmental literacy and action competence in learners may be jointly initiated schools. Through collaborative efforts, non-formal education organisations may work together in supporting schools develop interpretation resources and materials for critical environmental education processes in their grounds (see sections 5.2 and

5.3). Joint interpretive materials development processes (DS 36) may help improve environmental interpretation and education practice in non-formal education sector.

### **6.6.2 Formal and non-formal education partnerships**

Formal school environmental education programmes have much to gain through visits to non-formal education organisations (Ballantyne 1998; see also section 4.5). Educational visits to non-formal organisations can enable learners apply cultural capital acquired in classrooms and other socio-cultural contexts when engaging in meaning making processes through encounter with real objects (see sections 2.3.2, 4.5). Through social interactions with more culturally knowledgeable adults, peers and interpretive materials, critical environmental literacy and action competence in the learners may be enhanced (see sections 2.3.1, 4.5.3). But as found through critical reviews of interpretive materials from the five organisations we visited (see section 4.4.4), the development of some of these materials is done without the active involvement of the teachers (see section 4.4.4.1). This has often tended to separate the environmental education work of teachers in schools from that of educators in the non-formal education sector (environmental interpretation). Active partnerships between teachers and non-formal educators may address this separation (see Atiti 2002). This study provided opportunities for teachers from Samaj and Kenya High to initiate new partnerships with non-formal education organisations (see sections 3.3.4, 4.2). Prior to the study, Samaj had links with only WCK (see section 5.2.1.4). The scenario changed as the school established more new partnership links with NMK, KWS, African Butterfly Research Centre, the Giraffe Centre and KOEE (see Table 6.2). Links between Samaj and KOEE were established during a workshop at the Giraffe Centre (DS 37) in which S1 met and shared their school project with the KOEE coordinator. S1 and S2 were later invited to a workshop organised by KOEE as result of this encounter. As outlined in Chapter 5, it was through collaborative partnerships that a new ‘botanic garden’ emerged at Samaj (see section 5.2.2.2). Although Kenya High had reported linkages with a number of non-formal organisations (see section 5.3.1.4), new partnership with ICIPE (see section 5.3.2.2) and KWS were developed.

Developing partnerships between formal and non-formal education organisations may begin to

address the weaknesses of interpretation as an environmental education process (Ballantyne 1998; see also section 2.3.3). Through the partnerships, a view of regarding environmental interpretation and environmental education as reciprocally necessary aspects of enabling critical environmental literacy and action competency may take root (see section 2.3.3). By working in partnerships, non-formal educators may provide enjoyable and motivating experiences that may foster action-oriented environmental learning (see section 4.5). Teachers may, through visits to interpretation resources in the non-formal education organisations, enable critical environmental education processes in their schools. Through joint materials development processes between teachers and non-formal educators, interpretive materials that can engage learners in critical praxis and response to environmental problems may be realised (see sections 5.2.3, 5.3.3). This may be achieved by drawing on relevant communication and educational perspectives (Atiti 2002; see also section 2.3.2) and by placing learning processes at the centre of materials development and other interactions.

Having shared and examined the practical outcomes of this study, I critically reflect on how they were achieved through my re-conceptualised research goals and focus (see section 1.2.1).

## **6.7 REFLECTIONS ON RESEARCH GOALS AND FOCUS**

In Chapter 1 (see section 1.2), I discussed how my initial research goals and focus were re-conceptualised by drawing on the works of Bourdieu (1998) and Latour (1999). They were also broadened to incorporate the review and development of interpretation resources in non-formal education organisations and schools respectively. Although the goals were in my opinion adequately realised, an incorporation of developing interpretation resources in the two schools (see sections 5.2.2, 5.3.2) made this study too broad. This may be reflected in the amount of data that was generated during the study period (see Appendix 1). As a result, it was not possible to critically engage with all the data that was generated, in this report. Each of the three research goals will now be critically reflected on.

### 6.7.1 Mobilising interpretive capital with teachers

The research focus on mobilising interpretive capital with teachers entailed reviewing a sample of interpretation resources and materials that occurred in five organisations (see sections 4.2, 4.4). A variety of interpretation resources and materials were found in the organisations (see sections 4.2.2, 4.4.2, 4.4.3; see also Appendix 4). We however only managed to review a sample of them within the time frame of this study. Only three interpretation resources (NMK Nairobi Botanic Garden, WCK nature trail and NMK Ololua nature trail) were reviewed. Due to time constraints, an in-depth review of these interpretation resources was not possible. More reviews of other interpretation resources like the KWS Nairobi Safari Walk may have provided more insights into interpretive planning and development (see section 4.2.2.3). The review process was to some extent dependent on the needs of the two schools (see section 1.2.2). Although I had planned for review visits to all the organisations with teachers from two schools, we only managed to visit NMK, the Butterfly Centre and the Giraffe Centre with Samaj teachers. Kenya High teachers visited all five organisations. Paradoxically, teachers from Samaj were more able to effectively maximise the review visits in terms of formation of partnerships (see section 6.6.2) and realisation of their project goals (see section 5.2), compared to their colleagues from Kenya High (see section 5.3).

A critical review of materials through workshops and focus groups was successfully conducted (see Appendix 4). However, workshop sessions proved rather short for in-depth reviews. Gaps that were identified in the reviews that needed more investigation were never filled due to time constraints. In spite of this, a substantial amount of interpretive capital was mobilised and made available for use by the teachers (see section 4.6.2, 5.2, 5.3). The mobilising of interpretive capital with teachers further provided useful insights into environmental interpretation and education methods used in the organisations visited. The social and historical contexts in which these methods were applied were revealed (see section 4.5), and their potential for use in school grounds discussed (see sections 5.2.4, 5.3.4).

As indicated in Chapter 1 (see section 1.2.1), my research focus on mobilising interpretive capital with teachers was re-conceptualised within Latour's (1999) social theory on the

*situatedness of knowledge production* and Bourdieu's (1998) *theory of action*. This provided me with a basis on which to re-orient environmental education processes in schools through a language of critique and possibility (see section 2.3). In this re-orientation, the concept of 'environmental interpretation and education processes' was embraced (see sections 1.3.1, 2.3.3). This enabled me to break away from oppositional reasoning in which environmental interpretation and environmental education are regarded as two distinct fields with little in common (see Table 2.1).

Mobilisation of interpretive capital within the non-formal education sector also, provided a basis for realising my second and third research goals, which I critically reflect on in the next sections.

### **6.7.2 Development of interpretation resources and materials with teachers**

Although these cannot be separated, I found this research goal very broad and time consuming compared to the one described above. The development of interpretive materials that had been an earlier focus of this study (see section 1.2) was dependent on the transformation of school grounds. In the case of Kenya High (see section 5.3), this transformation was constrained by social structures and contextual factors that I was not able to control. This created an impasse that nearly jeopardised the development of interpretive materials at the school. The story was however different at Samaj where the interpretive plan for development of a school-based 'botanic garden' was implemented on schedule.

This being a collaborative research process, I had to rely on others when implementing the research activities associated with this goal. For example, during school holidays, I could not do much with teachers in their schools. Focus group meetings sometimes failed to take off due to tight schedules in the schools. The following journal reflections indicate some of the difficulties that stifled the development of interpretation resources and materials in schools.

I arrived at the school ... and found that the teachers were in the class. As usual, it is still very hard to schedule a meeting with all the teachers present. The venue for the meeting was a problem and some time was wasted moving up and down (Journal p. 322, 5 February 2002).

I had really anticipated this meeting at Samaj, so when I arrived ... and found S2 not in the school, my hopes was dashed. I had relied on S2 to ensure that all the other teachers were present. The purpose of today's meeting was to critically review the Samaj plans. New plans on materials development were to be reformulated (Journal p. 312, 21 January 2002).

I arrived at the school and found most of the teachers in class. I was welcomed by K2 who informed me that the lunchtime had been shifted. ... Teachers are rather busy, although this is second week of opening the school term; I learned that schemes of work were required on this particular day (Journal p. 307, 18 January 2002).

As a result of some of the difficulties reported above, it was not possible to undergo many cycles of development with the teachers. In many of the interpretive materials that we developed (see sections 5.2.3, 5.3.3) only one cycle was successfully completed.

### **6.7.3 Exploring interpretation as an environmental education process**

This was the most challenging research goal to meet. The process of critically reflecting on interpretation as an environmental education process was marginally done with teachers. Environmental interpretation being a new concept to them, they lacked the knowledge base from which to undertake such a critique. Interpretive capital that was mobilised during workshops (see section 4.3) was not sufficient enough to enable them engage in the kind of critical reflection required for this research goal. Although I gave out a number of readings on environmental interpretation (DS 11), very few teachers demonstrated evidence of having read them. The teachers however perceived interpretation and environmental education as reciprocal aspects of enabling critical and action-oriented environmental education processes in schools (DS 16).

In the final analysis, this research goal was accomplished through a critical engagement with relevant literature on sociological and educational perspectives on social reality and change (see section 2.3.2) and through research interviews, which focused on these conceptual issues (for example, O'Donoghue 2001 pers. comm., Sutherland 2001 pers. comm.). Educational ideas associated with, how learners may socially construct meaning in environmental interpretation and education processes, have been applied. This is within theoretical

frameworks drawn from symbolic interactionism (Charon 2001), social constructionism (Schutz 1967), Vygotskian social constructivism (Vygotsky 1981) and critical pedagogy (Freire 1996). I have drawn on these perspectives when describing environmental interpretation and education processes in the non-formal education sector (see section 4.2.2.2, 4.5). I have also applied them when examining opportunities for critical environmental education processes in the transformed school grounds (see sections 5.2.4, 5.3.4).

In this chapter, I have suggested a number of recommendations based on the practical outcomes of this study. In the next section, I make a synthesis of these recommendations with an aim of opening up new possibilities for further research in environmental interpretation and education.

## **6.8 OPENING UP NEW POSSIBILITIES**

In the preceding sections of this chapter I have examined the practical outcomes of this study and suggested some recommendations that may further open up new possibilities for further research. In this section, I wish to further synthesise these recommendations as practical considerations for opening up new possibilities for interpretation resources and materials development in schools through further research.

### **Transformation of school grounds**

Drawing on the framework for transformation of school grounds discussed in section 6.2, an inquiry-oriented approach to the development of interpretation resources (see Figure 6.1) may be taken further to develop more school grounds (and other sites) for critical and action-oriented environmental education processes. This has the potential of minimising the oppositional reasoning that have been associated with environmental interpretation and environmental education in the literature (see sections 1.3, 2.3.3). However, more research is required to further broaden the theoretical base of interpretation as an environmental education process (see section 2.3.2). The research may include investigating how learners socially construct meanings through interactions with peers, 'significant others' and objects. Non-formal educators may investigate within their work contexts how learners use both

interpretation resources and materials for environmental learning.

### Improving environmental interpretation and education practice

Through a critical orientation to environmental interpretation and education processes (see section 6.3.2), non-formal educators and teachers may collaboratively work to improve their practice within their social and historical contexts. Teachers may in collaboration with their learners design action research projects in the school grounds aimed at addressing local environmental issues and problems. Issues such as waste management; river pollution and use of school grounds may be investigated into. African perspectives of interpretation within the context of interactive mediated folklore storytelling processes offer a rich area for future research. Drawing on research findings from the African folklore storytelling processes has the potential of improving environmental interpretation and education practice.

### Enhancing professional competencies of teachers

To enhance professional competencies of teachers (and other practitioners) in research skills, reflective thinking and curriculum development, research designs that combine the language of critique with the language of possibility; engage teachers in critical praxis; incorporate reciprocity and reflexivity in the research process; and strengthen teachers views through ‘telling their stories’ are recommended (see section 6.4). One example of such research design is the participatory action research form of inquiry process I applied in this study. Non-formal educators may engage teachers in collaborative projects such as long-term evaluation of environmental interpretation and education programmes in the non-formal organisations. In this way, teacher competencies in evaluation may be improved.

### Development of interpretation resources and materials

The development of interpretation resources and materials for critical and action-orientated environmental education processes may follow an open-ended, participant-centred and critical framework in which the participants in consultation with more culturally knowledgeable peers choose and plan their own themes and approaches by drawing on the available interpretive capital. This may draw on process-oriented guidelines as outlined in sections 6.5.1 and 6.5.2. More research on how to design environmental interpretation and educational experiences that

can enable learners to find their own meaning through critical reflection is required. School-based research may focus on exploring the potential of school grounds as sites for collaborative inquiry. Another research possibility is in investigating into the benefits of using school grounds for environmental learning amongst learners. The challenges experienced in the non-formal education sector in designing more durable outdoor interpretive panels offer another possibility for research. This may be carried out in collaboration with graphic designers and interpreters.

### Formation of partnerships

Through formation of active partnerships between formal and non-formal educators, an understanding of interpretation as an environmental process that has the potential to enable critical environmental education processes may be explored. Research into how to develop sustaining partnerships between schools and non-formal education organisations may be pursued. Such research efforts may focus on how to establish and maintain partnerships as a way of enabling environmental interpretation and education processes in both schools and non-formal education organisations. Principles of effective partnerships between schools and non-formal education organisations can also be investigated into. This has the potential of creating learning partnerships that involve teachers and non-formal educators.

## 6.9 CONCLUSIONS

This study has produced evidence within the contexts of partnerships between a group of non-formal education organisations and two schools on how teachers may be involved in mobilising interpretive capital, circulating it, reconstructing it and then making it available (Latour 1999; see also sections 1.2.1, 4.2) for the development of interpretation resources and materials in school grounds. Its major outcome is teacher participation in the transformation of school grounds and development of materials that may engage learners in critical environmental interpretation and education processes.

The participatory action research framework provided a useful framework (see section 3.2.3.1; Kemmis and Wilkinson 1999, Kemmis and McTaggart 2000) around which actions

surrounding the review and development of interpretation resources and materials were designed. Its implications in enhancing professional competencies of teachers in reflective thinking, research and materials development have been underscored. Participatory action research as a form of critical education research enabled both improvement and involvement. Improvement focused on three areas: my own educational practice at the NMK Nairobi Botanic Garden; teachers educational practice in schools; and an understanding of environmental interpretation and education practice within the non-formal education sector. With regards to involvement, the teachers and I were actively engaged in processes of planning, acting and reflecting in order to improve our educational practice.

Through the study, a theoretical framework for environmental interpretation and education processes was explored. By drawing on a number of sociological and educational perspectives on reality and social change, efforts have been made to broaden the theoretical base of interpretation as an educational process. These efforts are aimed at re-orienting interpretive experiences towards socially critical environmental education processes. In this re-orientation, a shift has been made from viewing interpretation as a leisure-based educational activity, to that of enabling critical environmental literacy and action competence of learners within school contexts. The theoretical work on which this study is argued is distinctive within much of environmental education literature in drawing its conception of 'environmental interpretation and education processes' from the often-perceived 'separate' fields of environmental interpretation and environmental education (see also Janse van Rensburg 2002, O'Donoghue 2001 pers. comm.).

Knowledge that has been generated from this study may inform the development of interpretation resources and materials in other contexts. However, the study is just the beginning of a 'voyage' into the realm of 'environmental interpretation and education processes'. By fully gaining insights from the past, contemplating the present, and taking responsibility for the future I gain the force to drive forward so as to fully draw on these emerging African perspectives on environmental interpretation and education processes.

The conclusions that I have drawn from this study, may only function as proposals to be

subjected to self-reflection in the light of one's own environmental interpretation and education practice.

Human beings are not built in silence, but in word, in work, in action-reflection. But while to say the true word – which is work, which is praxis – is to transform the world, saying that word is not the privilege of some few persons, but the right of everyone. Consequently, no one can say a true word alone – nor can she say it *for* another, in a prescriptive act which robs others of their words (Freire 1996:69).

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## APPENDICES

### APPENDIX 1: An inventory of research data sources

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#### DATA SETS

##### Phase One: Review of Materials With Teachers and School Profiles

- DS 1:** Research design and research proposal submitted to the Faculty of Education, Rhodes University, 2001
- DS 2:** Broad planning for phase one: outline of research process, pilot interviews and correspondences.
- DS 3:** Profile of Kenya High School: Returned questionnaires and interview transcripts.
- DS 4:** Profile of Samaj School: Returned questionnaires and interview transcripts.
- DS 5:** Samples of materials reviewed during visits to the non-formal education sector.
- DS 6:** Samples of field notebooks and audiotapes.
- DS 7:** Conceptual summaries of phase one field notes and audiotapes.

##### Phase Two: Development of Interpretation Resources With Teachers

- DS 8:** Broad planning for phase two and sharing of phase one interim research findings.
- DS 9:** Plans for developing a school-based 'botanic garden': Interpretive Plan for Samaj.
- DS 10:** Plans for developing a school-based 'arboretum': Interpretive Plan for Kenya High.
- DS 11:** Participant notes and handouts on environmental interpretation and education processes.
- DS 12:** Materials development workshops: Correspondences and workshop readings.
- DS 13:** Materials development workshops: Returned evaluation questionnaires from teachers.
- DS 14:** June 22 2001 materials development workshop: Proceedings.
- DS 15:** September 14 2001 materials development workshop: Proceedings.
- DS 16:** April 3 2001 materials development workshop: Proceedings.
- DS 17:** Initial drafts of materials developed in the two schools.
- DS 18:** Final drafts of materials developed in the two schools.
- DS 19:** Launch of Samaj School Botanic Garden: Video and information leaflets.
- DS 20:** Conceptual summaries of Phase two field notes and audiotapes.

### **Phase One and Two: General Research Data**

- DS 21:** Research journal: Summary of field notes and reflections on research events.
- DS 22:** 2001 Research diary and schedules.
- DS 23:** 2002 Research diary and schedules.
- DS 24:** Photographs and negatives taken during the study.
- DS 25:** Research slides.
- DS 26:** Summaries of interviews and personal communications from South Africa.
- DS 27:** 2001 EAEN conference in Nairobi, Kenya: Paper presentation and conference notes.
- DS 28:** 2001 EEASA Conference in Maseru, Lesotho: Paper presentation and reflections.
- DS 29:** Museum 2000 conference in Stockholm, Sweden (10-13 June 2001): Reflections.
- DS 30:** BGCI Education Congress in Sydney, Australia: Paper presentation and notes.
- DS 31:** Overhead transparencies generated during workshops and conferences.
- DS 32:** Research financial records.

### **Phase Two: The UK Research Trip November 2001**

- DS 33:** Materials from Learning Through Landscapes Project.
- DS 34:** Materials from Birmingham Botanical Garden.
- DS 35:** Correspondences and conceptual summaries.

### **Phase One and Two: Emerging Partnerships From the Study**

- DS 36:** Notes on the review and re-development of WCK Trail booklet and worksheet.
- DS 37:** Facilitation of workshops at Giraffe Centre & WCK: Presentation and handouts.
- DS 38:** NMK/KWS Teachers' Workshop: Proceedings, correspondences & workshop report.
- DS 39:** NMK Nairobi Botanic Garden new education programmes.
- DS 40:** Conceptual summaries on emerging partnerships.

## **ANALYTIC MEMOS**

### **Memos From Phase One And Two Data Files**

- AM 1:** Initial consultations and planning with teacher participants.
- AM 2:** Negotiating access to the non-formal education sector.

- AM 3:** Analysis of pilot interviews during a teachers' workshop in Mombasa.
- AM 4:** Emergent profile of environmental education processes at Samaj School.
- AM 5:** Emergent profile of environmental education processes at Kenya High.
- AM 6:** A list of interpretive materials collected during review visits.
- AM 7:** Analysis of review sessions at National Museums of Kenya.
- AM 8:** Analysis of review sessions at Kenya Wildlife Service.
- AM 9:** Analysis of review visits to Wildlife Clubs of Kenya.
- AM 10:** Analysis of review visits to Giraffe Centre.
- AM 11:** Analysis of review visits to at Butterfly Centre.
- AM 12:** List of notes and readings issued to participants: A synthesis of DS 11 and DS 12.
- AM 13:** Reflections on materials development workshops: A synthesis of DS 14 – DS 16.
- AM 14:** A synthesis of workshop evaluation questionnaires: Analysis of DS 13.
- AM 15:** June materials development workshop report: Analysis of DS 14.
- AM 16:** A synthesis of critical reflections on materials collected during phase one.
- AM 17:** Trialling of interpretive materials: Comments from learners.
- AM 18:** Summary of materials development sessions at Samaj School.
- AM 19:** Summary of materials development sessions at Kenya High.
- AM 20:** A critical review of botanic garden development at Samaj School: Consultant report.

### **Memos From General Data Files**

- AM 21:** Analysis of DS 22 and DS 23.
- AM 22:** Reflections on the use of photography during the study.
- AM 23:** Reflections on EAEN, EEASA, Museum 2000 and BGCI Conferences.
- AM 24:** Reflections on emerging partnerships.

## APPENDIX 2: Papers presented at three international conferences

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### REVIEW OF MATERIALS FOR INTERPRETIVE ENVIRONMENTAL EDUCATION PROCESSES IN NON-FORMAL EDUCATION SECTOR

PAPER presented at the 11th Annual Conference Eastern Africa Environmental Network (EAEN) Nairobi, Kenya on 25-26 May 2001 (see also Atiti 2001d).

#### Abstract

Recently, the National Museums of Kenya (NMK) Nairobi Botanic Garden and a group of teachers from two schools in Nairobi reviewed how a sample of interpretive materials are developed and used in the non-formal education sector. This paper discusses how the review study was carried out and also shares some of the findings that emerged. Significantly, the findings will be later used to inform the actual development of interpretive materials through a participatory action research model with teachers for use in the schools. The paper provides an example of how non-formal education organisations can develop partnerships with schools to safeguard environmental values through interpretive environmental education processes.

#### Introduction

Interpretive environmental processes, commonly known as interpretation, are mainly practised in the non-formal education organisations like the National Museums of Kenya (NMK), where a majority of the visiting groups are school children. However, due to constraints of time and finances, many schools are not able to visit the organisations on a regular basis. There is thus a need to develop interpretive opportunities within schools grounds to address these constraints. These opportunities would require materials that critically engage learners and teachers in interpretive environmental education processes on school grounds. Examples of such materials are worksheets, interpretive signage, brochures, trail booklets, posters, and interactive displays. Teachers can draw on the contribution of the non-formal education sector in the development of these materials for use in their school grounds. But to realize this, educational theories, curriculum orientations, values and key shaping ideas that inform the development and use of the materials need to be explored. It is in this context that the NMK Nairobi Botanic Garden and a group of teachers recently undertook a review study that is discussed in this paper. Central to this review study is an attempt to develop formal/non-formal partnerships, in this case schools/botanic gardens, to safeguard environmental values for sustainability.

#### Overview of interpretive environmental education processes

Traditionally, interpretation and environmental education processes have been treated as separate fields with very little in common apart from their objectives (Aldridge 1989). Rather than present them as separate fields, this paper will attempt to explore interpretation as an environmental education process in the context of materials development in the non-formal education sector, where the interpreters are themselves environmental educators. In this respect, as Sharpe (1982) observed, ‘separating interpretation from environmental education processes is difficult’.

By perceiving the similarities between interpretation and environmental education processes rather than their differences, I have chosen to use the term “interpretive environmental education processes” to describe the *educational activities that take place when interpretive materials and real objects are used to reveal meanings and communicate knowledge designed to arouse interest in the learners towards*

*addressing environmental issues that face their local community.* The aim of interpretive materials that are used in the non-formal education sector by schools would be therefore to ‘engage the learners’ experience with the intention of challenging them to examine their attitudes and actions with respect to social, environmental and moral issues’ (Ballantyne and Uzzell 1991).

Through use of interpretive materials and real objects, learners should be engaged in recognizing values and clarifying concepts so as to develop necessary skills and attitudes needed to promote ecological sustainability and social justice. To safeguard environmental values for sustainability, interpretive environmental education processes should aim at developing in the learners ‘an informed concern for the environment, a sensitive environmental ethic, and the skills for participating in environmental protection and improvement’ (Fien, 1993).

### **Creating partnerships with schools**

Since 1997, the NMK Nairobi Botanic Garden has been providing interpretive environmental education processes to schools within Nairobi. Significantly, the Botanic Garden has become part of a growing worldwide movement in making interpretive environmental education processes accessible to a wider audience (Atiti 1998). Through interpretive environmental education processes, botanic gardens are communicating the critical need to use plant resources sustainably (BGCI 1998). Interpretive materials that are developed at the Nairobi Botanic Garden are used to address social, political, biophysical and economic issues related to plants in such a way as to encourage learners to think about a sustainable environmental future. The Botanic Garden has been ‘promoting an environmental ethic which has sustainable living at its core’ (IUCN/UNEP/WWF 1991) through its programmes to visiting school groups. Values for sustainability that include those for social responsibility, concern for all life forms, harmony with nature and commitment to work with and for others (Tilbury 1995) are now currently being taught at the Garden. Learners are exposed to a variety of environmental value positions and are also engaged in examining how values are shaped by different contexts.

At the moment, the Nairobi Botanic Garden is making a shift towards encouraging schools to utilize their school grounds for environmental education processes. This has been necessitated by the growing number of schools currently seeking the support of the Nairobi Botanic Garden to develop interpretive opportunities on their grounds. Some of the schools are even keen to transform part of their grounds into small ‘botanic gardens’. I have started working with two such schools to realize this output. There has been thus a need to create partnerships with the schools to strengthen our working relations. Though still in its formative stages, the initiative of forming partnerships with schools is a new and better way of combining formal environmental education efforts with those of non-formal environmental education. Generally, botanic gardens are in the best position to offer schools ideas and information about diverse types and uses of plants (Cox 1993). The Nairobi Botanic Garden is now ready to take up this challenge.

### **The review study**

One approach the Nairobi Botanic Garden recently undertook to formalize its partnerships with schools was through involving teachers in a study to review how interpretive materials are developed and used in the non-formal education sector. Findings from the review will be used to inform the development of materials for interpretive environmental education processes on the grounds of participating schools and also, will form part of a study for my postgraduate studies in environmental education. In collaboration with eleven teachers from two schools in Nairobi, we made eleven review visits over a period of three months to five non-formal education organizations in Nairobi, including the NMK.

The main aim of the review was to find out how a sample of interpretive materials are developed and used by visiting school groups for interpretive environmental education processes. Specifically, we sought to identify practices and key shaping ideas regarding the development and use

of interpretive materials by school groups at the five non-formal education organizations visited. During the review sessions we conducted focus group interviews and had informal discussions with educators on how the existing interpretive materials were developed and used. Slides and photographs of interpretive signage existing at the organizations were taken and field notebooks and research diaries for capturing our reflections kept. We collected samples of materials from the organizations and later critically reviewed them to determine educational theories, curriculum orientations, values and key shaping ideas that informed their development and use.

### Methodology

The review was guided primarily by a critical philosophical orientation that entails a commitment to socially transformative research for the common good of teachers as it sought to empower them during the process. The critical paradigm was relevant for this process as it aimed to integrate theory and practice by providing support for teachers who were being engaged in critical reflection and action (Carr and Kemmis 1986), in this case the review of materials for interpretive environmental education processes in the non-formal education sector. It further sought to identify aspects of the existing constraints that frustrate the teaching of critical environmental education goals in schools. This review employed a **participatory action research** method, which according to Tripp (1990) is the most effective form of critical research as “it offers the opportunity to combine critical intellectual discourse with practical action”. Carr and Kemmis (1986) defined participatory action research as:

...a form of self-reflective inquiry taken by participants in social settings in order to improve rationality and justice of their own social or educational practices, their understandings of these practices, and the situations in which these practices are carried out.

The purpose of choosing a participatory action research design in this review process was to enable a critical examination of the relationship between environmental education processes and interpretive materials development within the context and constraints of teaching in the two schools. Apart from being a process that can empower teachers to take social action for a better environment, Robottom (1987) argued that participatory action research could be a professional development medium for enabling teachers to undergo a critical analysis of theories, practices and values underlying materials development. The participatory action research design allowed teachers to contribute equally to the decision-making process during the review process, as they were co-researchers in this context. They were involved in the process of planning, acting, observing and reflecting to achieve improvement in the understanding of material development processes.

Using the participatory action research process of planning, acting, observing and reflecting, the four phases were implemented during the three-month period of the review process. In the planning phase, a total of thirteen consultations with teachers from the two schools and educators from the five non-formal education organizations were made. The plans were acted on through eleven review sessions in the five non-formal education organizations where observations were made and later reflected on to understand the materials development process.

### Analysis of the review

In total fourteen different interpretive materials from the five organizations were reviewed. These comprised of:

- Slide interpretive texts – found in one organization.
- Worksheets/activity sheets – found in two organizations.
- Interpretive signage – developed in three organizations.
- Trail booklets – found in three organizations with nature trails.
- Posters – found in two organizations.
- Interactive displays – found only in one organization.

- Videos – actual development process witnessed in one organization.
- Promotional brochure – found in one organization.

In all the organizations films shows was a common educational feature. Except for one, there existed a formal classroom where visiting school groups assembled for lectures and film shows. Two of the organizations had a modern studio that produced in-house videos for the public. In the organizations we found well-developed outdoor interpretive facilities that included nature trails, a safari walk, a green house and a botanic garden. Majority of the visitors that used these facilities were found to be school groups. In terms of human resources, all the organizations except one had qualified educators who were formerly practising teachers. The educators were actively involved in running programmes for school groups and played a major role in the development of materials that were reviewed. The organizations occurred almost within the same radius in Nairobi and some have even established collaborative links.

From the data collected through focus group interviews, photographs, observations, field notes and textual material review, the following themes were derived for the initial analysis:

- When and how the materials were developed.
- The context in which they were used.
- Role of evaluation during the development process.
- Values reflected in material development process.
- Links to the school curriculum.
- Ideas about the environment supported by the material.
- Funding implications in materials development process.
- Forms of interpretation supported by the materials.

The initial theme analysis shown in **Table 1** will be further reviewed with the participants through critical reflection and later validated by comparing the various methods of data collection used during the review process.

**Table 1 Initial theme analysis**

<b>Type of material</b>	<b>Context of use</b>	<b>Development process</b>	<b>Forms of interpretation</b>	<b>Ideas on environment</b>	<b>Role of evaluation</b>	<b>Curriculum links</b>
Slide interpretive text	to create awareness on conservation	through in-house consultations	mediated through show and tell	transmission of knowledge about the environment	limited to production only	themes on conservation ecology
<i>Worksheet</i>	for engaging in hands-on activities	through in-house consultations	self-mediated through experiential learning	uses environment as a medium for exploring issues	during planning and development process	objectives driven on all aspects of curriculum
<i>Interpretive signage</i>	to provide factual information	in-house consultations	self-mediated through induction	provides knowledge about environment	continuous and responsive	themes on school curriculum
<i>Trail booklet</i>	to stimulate interaction through encounter	involved team of naturalists/educators	reading and looking (show and tell)	uses the environment as a medium	continuous evaluation evident	themes on school curriculum
<i>Poster</i>	for awareness-making	consultative process with experts	self-mediated through induction	transmission of knowledge about the environment	during actual development	themes on school curriculum

<i>Interactive display</i>	to stimulate active participation through touching and reflection	by graphic designer	experiential learning	active engagement in construction of knowledge	during actual production	has aspects on social change
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### Emerging patterns

#### Teacher participation

Although schools are the main users of the materials developed in the non-formal education sector, there was limited participation of teachers in the actual process of development. In some cases experts were contracted to develop the materials with little regard to the needs of the end-users. Most of the materials were developed in-house with some assistance from research teams.

#### Links to the school curriculum

In all the organisations, the materials were related to the school curriculum for both primary and secondary schools. Some materials directly covered ecology for high school students while others had themes across the curriculum.

#### Evaluation

In most cases evaluation was overlooked after the development and during the implementation of the materials. Some of the materials have not been revised for a long time and are even outdated. However, for some materials there was evidence of regular evaluation and even complete redevelopment.

#### Materials development processes

To some extent, materials development processes in the non-formal education sector are of deterministic and technicist in nature where educators in collaboration with research teams are creators of the materials and teachers are viewed as implementers (Lotz 1996). Most of the materials were developed with the aim of making learners aware of the environmental problems. In essence, the material development processes were found to reflect the classic RDDA (research, development, dissemination and adoption) approach. There were a few isolated cases where practising teachers were incorporated in the material development processes, but they had limited say on how the final product was to be packaged.

#### Environmental education processes

The materials seemed to reinforce the use of the environment as a medium for exploring issues through active learning. Some emphasised the transmission of knowledge aimed at changing the behaviour of the users. Very few materials facilitated interactive meaning making among learners that can lead to social change.

#### Forms of interpretation

Three forms of interpretation were evident from the review process:

- self-mediated interpretation where the learner used the material to gain knowledge about the environment through reading and looking
- mediated interpretation where the expert or educator used the material to interpret activities in the environment for the learner
- critical and experiential interpretation where the material engages the learner in active generation of new knowledge.

### Donor dependency

A number of materials were produced through financial assistance from donors as a one-off affair. This compromised sustainability in the production of the materials and also redevelopment in the absence of a continued flow of funds.

### Conclusion

Through partnerships, educators from the non-formal education sector can work with schools to safeguard values for sustainability. One way of realising this is by empowering teachers to use their school grounds more effectively to respond to the existing constraints of implementing environmental education processes in the school curriculum. The approach that is being adopted by the NMK Nairobi Botanic Garden is a new and better way of non-formal educators to share interpretive experiences with teachers. Through this initiative, there is going to be a new outlook in the way materials are developed and used by teachers for interpretive education processes on their school grounds. A radical departure from the top-down approach of developing materials for interpretive environmental education processes towards a teacher-centred is now in the offing.

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## **REVIEW AND DEVELOPMENT OF INTERPRETIVE MATERIALS IN TWO KENYAN SCHOOLS**

PAPER presented during the 19<sup>th</sup> International Annual Conference of Environmental Education Association of Southern Africa on 1-5 October 2001 in Maseru, Lesotho (see also Atiti 2001e).

### **Abstract**

The National Museums of Kenya through its Nairobi Botanic Garden is addressing constraints arising from a lack of environmental education materials by supporting schools to develop interpretive opportunities on their grounds. Generally, botanic gardens are in a good position to help schools promote an environmental ethic that has sustainable living at its core. This can be achieved by working with schools to develop materials that can be used to address social, political, biophysical and economic issues in a way as to encourage learners to think about sustainable environmental future. However, this calls for a new outlook in the way materials are developed for use in schools by radically departing from the top-down approach towards a teacher-centred one.

Findings from an ongoing study in two Kenyan schools on the review and development of materials for interpretive environmental education processes are shared to further illuminate the approach being presented. The paper introduces 'interpretive environmental education processes' as a departure from viewing interpretation and environmental education as distinct fields. To this end, the understanding of interpretation as an environmental education process is explored through a critically reflective inquiry process.

### **Introduction**

After critically reflecting on the theme of this conference, I would like to share with you the extent to which botanic gardens are contributing to environmental education processes globally. As will be discussed in this conference, we are faced with a myriad of environmental issues and problems that have major implications to the realisation of sustainable development. Many of our people on the continent continue to experience a declining quality of life, live in abject poverty and are being wiped out by the HIV-AIDS pandemic. There is occurring a rapid loss of biodiversity and over reliance on foreign aid by our governments. The need to address these issues and problems through critical environmental education processes is therefore imperative. One way of doing this is to promote sustainable development through integration of conservation and development issues into our environmental education processes. This entails developing materials for our audiences that can be used address social, political, biophysical and economic issues in our work contexts. Many botanic gardens

have started developing such materials that use plants to address these issues.

Nevertheless, many of us who work in the non-formal education sector are faced with the challenge of ensuring the availability of materials that can engage our audiences in critical environmental education processes. More often than not, the tendency has been to produce glossy materials that only emphasise conservation of the biophysical environment through creating awareness that is aimed at changing people's behaviour towards environmental issues being presented. In most cases, the materials are developed without active involvement of the end users. This has reinforced a top-down approach in the way materials are developed. The National Museums of Kenya through its Nairobi Botanic Garden is making an attempt to depart from this trend by supporting teachers to develop materials for environmental education processes in their school grounds. This shift from the top-down approach towards a teacher-centred one will be highlighted in this paper.

### **Botanic gardens as centres for environmental education processes**

There are over 1800 botanic gardens and arboreta in 148 countries that receive more than 150 million visitors annually and maintain more than 4 million living plant collections (Wyse Jackson and Sutherland, 2000). Unfortunately, 60 % of these botanic gardens are situated in temperate regions of North America and Europe. It is estimated that Africa, one of the high biodiversity areas, has only 98 botanic gardens with most of them neglected and under-utilised. But, there is cause for optimism as many new botanic gardens are now being created and environmental education is becoming a priority in them. With rapid urbanisation in Africa, more of the population is now moving into urban environments and botanic gardens may represent for them an important opportunity to visit a natural or semi natural setting in their countries. Raising the profile of environmental education processes in these urban-situated botanic gardens would therefore be a worthwhile cause.

#### **Focusing on environmental sustainability**

Globally, botanic gardens have started re-orienting their education programmes by incorporating a vision for a more socially and environmentally sustainable future. The programmes are addressing development issues such as relationship between people and plants, the role of science in plant conservation, the value of biodiversity, sustainable living and invasive threats from alien plants. Environmental education processes in botanic gardens are now being "sharply focussed on the integrative view of education and sustainability by linking the natural and social worlds, emphasising environmental citizenship, promoting values and environmental ethics and incorporating a futures perspective in their programmes" (Fien 1998). Sustainability has been seen as a guiding principle for development but in the context of this paper it is used to refer to the social and ecological processes for "sustaining human interaction [with plants] in healthy, just, and equitable environments" (O'Donoghue 2001).

Significantly, botanic gardens are promoting environmental sustainability by working with communities to understand the vital links between human survival and sustainable development (Wyse Jackson and Sutherland 2000:9). Many botanic gardens educators are now "reconstructing and representing nature in more sustainable ways by using plants to raise development and environmental issues" (Huckle 2000:20) through a variety of approaches that include guided tours, outreach programmes, events, interpretive materials and workshops. Botanic gardens are actively involved in engaging their audience in debate and change through participatory and reflective processes; they are no longer places that practice "a culture of education that is uncritical and complacent to their social vision" (Sanders 1998:33). The majority of the world's botanic gardens are found in urban areas. They are therefore easily accessible in the provision of green environments for people to contribute to, and participate in reflective environmental education processes.

Willison (1993:33) has argued that through providing support, training, access to information and a

forum where ideas and solutions can be discussed, botanic gardens can empower and enlighten people to become involved in the process of making decisions towards environmental sustainability.

### The role of community gardens

According to Wyse Jackson and Sutherland (2000:3), community gardens are the fastest growing sector in the botanic garden world. These gardens are in most cases designed to serve specific needs in local communities and of more significance, the local communities are the managers of the gardens.

Examples of community gardens in Africa would include sacred groves and medicinal gardens (Muthi gardens). In Kenya most communities still preserve specific sacred groves for cultural reasons (Atiti 2001). A community garden established within such a cultural environment can immensely draw on the cultural experiences of these communities. As Stocker and Barnet (in Huckle 2000:23) has argued, community managed gardens including school gardens, can contribute to sustainability by producing food (ecological sustainability), creating community places for social and cultural interaction (social sustainability) and providing sites for learning (economic sustainability). Through community gardens values for sustainability that include those of “social responsibility, concern for all life forms, living in harmony with nature and commitment to work with and for others” can be enhanced (Tilbury 1995).

### Linking interests of schools and botanic gardens

Botanic gardens have dynamic learning-centred environments and foundations in inquiry and experiential learning (Reichel 1995:37). Their potential to enhance teacher education programmes that address environmental education processes, as an integral part of the school curriculum is immense. Many African botanic gardens have started providing teachers with professional development experiences that support, extend, reinforce and enliven the quality of environmental education processes. For instance, at the National Botanical Institute Pretoria Garden, workshops that address social, political, economic and biophysical issues to contribute towards critical environmental education processes in schools have been held with teachers (Symonds 2000:25). Botanic gardens are becoming ideal places for schools to learn the richness of the plant kingdom, how plants touch every aspect of our lives, threats facing plants and what can be done to save them.

Worldwide, the quest to improve school grounds is creating a growing demand for support of a kind that can easily be supported by botanic gardens. As Cox (1993:81) reiterated, botanic garden educators are in a good position to provide advocacy for educational ideas that can be integrated with other needs in the school grounds. It has been found that school grounds play an important role in forming positive attitudes in the children through first hand experiences of nature (Willison 1993:33) and the role botanic gardens can play in realising this is significant. The NMK Nairobi Botanic Garden has started working with teachers from schools to develop botanic gardens for environmental education processes in their grounds. However, to achieve this goal, *interpretation* of features in the school-based botanic gardens is mandatory. This involves developing interpretive materials that can engage learners in critical environmental education processes. *But what is the relationship between interpretation and environmental education processes?* While it is beyond the scope of this paper to discuss this question, an attempt to show the relationship between interpretation and environmental education processes that are perceived as two different fields by others will suffice.

### Towards interpretive environmental education processes

Traditionally, interpretation and environmental education processes have been treated separately and have been seen by some as “...having little in common apart from their objectives” (Aldridge 1989:65). As a result, the relationship of interpretation to environmental education processes is not always clear (Milne 1996:4). However, Ballantyne (1998) has suggested that interpreters and environmental educators should perceive and act on their commonalties rather than their differences. It is not the aim of this paper to dwell on the differences and similarities between interpretation and environmental

education processes; however, this paper treats these perceived distinct fields as the same. As Sharpe (1976:25) argued, “separating interpretation from environmental education processes is difficult”.

The term *interpretive environmental education processes* is used in this paper to reflect this commonality. Consequently, interpretive environmental education processes would be described as educational activities that reveal meanings and relationships through the use of real objects and illustrative materials rather than simply to communicate facts (Tilden 1957:8). The materials are used to arouse interest in the learners towards solving environment problems and issues that face their local community by developing in them “an informed concern for the environment, a sensitive environmental ethic, and the skills for participating in environmental protection and improvement” (Fien 1993). Through interpretive environmental education processes, knowledge that is designed to stimulate an interest and excitement in the learner towards an object being interpreted is communicated (Irwin and Milne 2000:21).

### Education ideas that inform interpretive environmental education processes

Education ideas associated with constructivist, social constructionist and critical theories can be used to explore interpretation as an environmental education process. The use of original objects, engages learners in meaning-making and social construction of knowledge through interaction with the environment (Berger and Luckmann, 1967; in Janse van Rensburg and Lotz, 2000). Within the context of school grounds, learners bring in their classroom knowledge that signifies the real objects being interpreted to gain new insights in the environment. In this regard, learning becomes an active process and not merely the absorption of factual information (Bishop and Carpenter, 1993; in Janse van Rensburg and Lotz, 2000). It is therefore crucial to develop materials that provoke learners’ capital of ideas that have been taught in abstract to promote interpretive environmental education processes in schools. In this way, school grounds can effectively be utilised to realise critical inquiry teaching through real encounter experiences. I will now share some findings from an ongoing study where teachers have been involved in the review and development of materials for interpretive environmental education processes.

### **A teacher-centred approach to review and development of interpretive materials**

#### The context of the study

There is a perennial lack of participation by teachers in the development of interpretive materials in the non-formal education sector in Kenya. It has traditionally been held that teachers are practitioners and are only required to put into practice what has already been developed by others elsewhere (Winberg and Kerfoot 1997). However, teachers have significant contributions to make to education theory, resource materials development and practice. Materials development processes in the non-formal education sector are of a deterministic and technicist nature where developers are creators of materials and teachers are viewed as technicians who implement the materials to schools (Lotz 1996). A change from this top-down and centre-out strategy towards a participatory approach to environmental education resource materials development has been recommended (O’Donoghue and Taylor 1988; Lotz 1996). It is in the context of this proposed shift that this study has been undertaken to review and develop materials for interpretive environmental education processes in two Kenyan schools.

#### Aims of the study and methodology

In this study, a sample of interpretive materials from the non-formal education sector has been reviewed to determine how the materials were developed and are used by visiting school groups. The information that has been derived is now being used to develop through a participatory approach, materials that engage learners and teachers in interpretive environmental education processes within their school grounds. Central to this study is an attempt to explore interpretation as an environmental education process through a critically reflective inquiry process with teachers.

A critical philosophical orientation that entails a commitment to socially transformative research for the common good of individuals in the society is guiding this study to achieve its aims. As Hillcoat and Fein (1996:29) argued, a critical orientation is grounded in a vision of social change and democratic values as it seeks to empower participants during the process of research. The critical paradigm has been found to be relevant for this study as it aims to integrate theory and practice by providing support for teachers who have been engaged in critical reflection and action (Carr and Kemmis 1986), in this case the development of materials for interpretive environmental education processes. Through the critical paradigm, aspects of the existing social order that frustrate the attainment of critical environmental education goals in the two schools have been identified and are shared in **Table 1** below.

Table 1: Constraints and responses to critical environmental education goals

Constraints	Possible responses
Training – teachers lack the creativity and training (formal and informal) to integrate EE processes into the school curriculum	Introduce in-service and pre-service training in EE and share experiences through workshops and seminars.
Time – due to the wide and overloaded curriculum there is very little time left for school-based EE processes	Time for EE processes should be allocated in school timetable or created after school.
EE materials – are inadequate to support school-based EE processes	Use locally available materials and initiate materials development processes in schools. Source materials from the non-formal education sector and curriculum developers. Develop resources such as botanic gardens and nature trails for school-based EE processes.
Value – there is very little value attached to EE processes in schools because it is not examinable	Create environmental awareness through clubs, excursions, debates, competitions and projects. Recognise learners' efforts in environmental conservation.
Funds – are limited to support school-based EE processes	Develop strategies to generate funds, e.g. environmental walks, raffles, proposals to donors.
Guidelines – no specific policies on how to implement school-based EE processes	Develop such guidelines/policies.
School support – sometimes there is a lack of support from the management	Involve the school managers in addressing EE issues in the school.

The study has employed a participatory action research method, which according to Tripp (1990) is the most effective form of critical research as “it offers the opportunity to combine critical intellectual discourse with practical action”. Teachers involved are now utilising their theory and practice to develop materials for interpretive education processes in their schools. In this regard, they are being empowered to take social action for a better environment through this method. Robottom (1987:108) argued that participatory action research could be a professional development medium for enabling teachers to undergo a critical analysis of theories, practices and settings. Although the emancipatory potential of action research is not guaranteed in this critical research teachers have been provided with a better understanding of interpretive environmental education processes, materials development processes and have gained skills and motivation needed to bring about changes in the way interpretive environmental education processes are constructed in their schools.

#### Interpretive environmental education processes as a response to teaching and curriculum tensions in schools

The focus on interpretive environmental education processes through this study is as an attempt to respond to curriculum and teaching tensions that arise around the implementation of environmental education processes in Kenyan schools. According to Robottom (1987:85), the strongly

interdisciplinary school curriculum, imposition of constraints to outdoor education by the school regulations, the emphasis of didactic forms of instruction and the tendency of the school to be more interested in liberal education are some of the tensions between schooling and provision of environmental education processes.

School-based botanic gardens are being developed to provide opportunities for interpretive environmental education processes as a response to these tensions. Teachers are being involved through a participatory approach to develop materials for use at these emerging botanic gardens. In one school, a forested area of 25 acres is being transformed into an arboretum that will consist of five thematic interpretive learning trails that will be used to support interpretive environmental education processes. In the other school, a small area is being developed into a botanic garden with themes on medicinal plants, succulent area, orchard, butterfly corner and a wetland area. The facilities that are being created in the schools will no doubt play a significant role in preparing learners to address environmental issues facing their local community in the context of what botanic gardens are doing as discussed earlier.

The following advantages of developing school-based botanic gardens as a response to teaching and curriculum tensions arising around the implementation of environmental education processes in schools were generated during a recent workshop for teachers:

- Learners will be sensitised on environmental issues and be prepared to address environmental problems affecting their local community through critical environmental education processes.
- The developed botanic gardens will be closer to the learners thereby saving on time and money spent in visiting environmental education centres.
- There is an element of the schools owning up the developed resources due their relevancy to the community and the way the teachers are being involved in a participatory manner.
- An opportunity for the teachers to carry out research in their own backyard will be provided.

### **Review phase of the study**

Interpretive environmental education processes in Kenya are mainly practised in the non-formal education organisations where the majority of the visiting groups are school children. This study has drawn a lot from these organisations on materials development processes through review visits with teachers from the two schools. During the visits, a sample of interpretive materials was reviewed to find out how they were developed and used by visiting school groups. Focus group interviews and informal discussions were held with non-formal educators and interpretive textual materials analysed to determine educational theories, curriculum orientations, values and key shaping ideas that inform development and use of materials in the non-formal education sector. A total of 14 materials comprising of slide interpretive texts, worksheets, interpretive signage, trail booklets, posters, interactive displays, videos and promotional brochures were reviewed. **Table 2** shows some findings from a critical review of three such materials.

Other materials that were collected and will be critically reviewed further include:

- A slide interpretive text that is used in one of the organisations to supplement activities in an ecology package for secondary school groups.
- A wetland poster that was produced and distributed to schools to create awareness on the conservation of wetlands.
- A teachers' pack containing activity sheets for use by primary school pupils at the NMK Nairobi Botanic Garden.
- A brochure that is issued to visitors as a promotional tool at one of the organisations visited.
- Interactive displays in a butterfly centre in which learners are encouraged to feel the contents of concealed boxes.
- Various interpretive signage in the three organisations that were visited.

- A variety of activity booklets developed for Wildlife Club patrons for use in schools.
- A promotional video on one of the Game Parks in Kenya that is being used as a marketing tool.

Table 2: A critical review of three interpretive materials

	Giraffe Centre Guide Booklet	NMK Ololua Nature Trail Booklet	Nairobi Botanic Garden Thematic Text
Education orientation of the author/s	Designed to help learners immerse in the environment without any guide	To engage learners in the environment through hands-on activities and reading information in the booklet	Designed to transmit knowledge on the importance of indigenous plants
Role of the learner (user)	The learner/user utilises the booklet for self-discovery	Uses the booklet for self-guided activities along the trail and for obtaining information	To passively read the conservation message in the text
EE methods being proposed	The booklet promotes learning about the biophysical environment of the Sanctuary	To some extent, an inquiry approach to learning through self-discovery is articulated. There is more show and tell with some incidences of taking actions for social change	Mainly show and tell through immersion in the environment for enjoyment.
Environment perspective being reflected in the resource	The environment is something out there to be immersed in for enjoyment	The booklet is oriented towards acquisition of knowledge on the biophysical and socio-economic dimensions of the environment	The text reflects acquisition of environmental knowledge through the environment
Values supported	The interdependence of biodiversity and its conservation	Supports ecological values of interdependence and biodiversity conservation, and social values of living lightly	Promotes a communal obligation of conserving the biophysical environment
Context of use	Can be used to teach biology and geography using the outdoors	Can be used as a reference when teaching geography and biology in schools	Used with reference to a live exhibit in this case an indigenous plant
Applicability in the school context	Can be easily adapted for use in the school with a nature trail	Adaptable to the school context	It is only applicable in a school with a similar plant

### Emerging patterns

#### Roles of non-formal educators in materials development

In many cases, the non-formal educators were the creators of the materials in most of the organisations that were visited. However, there were cases where consultants or experts were engaged to provide technical information and assistance.

#### Use of the materials in fulfilling the school curriculum

The materials developed were found to be responsive to the school curriculum. The learners usually used them as reference materials to cover aspects of the subject content in the school curriculum. Activities in the materials supported active learning in the environment through self-discovery by learners.

#### Relevancy of the review study

Through the visits, ideas on how to develop materials have been gained. The visits further provided avenues for sharing ideas, approaches and tensions on the implementation of environmental education processes in schools.

#### Levels of teacher participation in materials development processes

In most cases, teachers were not involved in the development of materials in the non-formal education

sector. However, there were cases where teachers were involved through feedback comments and evaluation workshops. An interesting case of background involvement by the teachers was found in which ideas and views generated by students through the assistance of their teachers have been used to develop a material.

### Curriculum orientations to materials development

The development of materials in most cases was found to reflect the top-down approach in which the non-formal educators were the creators of the materials. Information in some materials was found to be very technical and it was thought that involvement of teachers would alleviate this problem.

### Forms of interpretation

The materials supported three forms of interpretation – self-mediated, mediated and critical interpretation. In self-mediated, the learners used materials to gain knowledge about the environment through reading and looking. During mediated interpretation the non-formal educators used materials to interpret activities in the environment for the learner. In critical interpretation, learners were engaged in active generation of new knowledge through the use of the materials, e.g. the case of interactive displays in one of the organisations visited.

### Materials development phase of the study

By drawing on key findings from the review phase, materials that engage learners in interpretive environmental education processes within their school grounds are now being developed through a participatory process with teachers. Joint plans that are being acted on to develop these materials in the schools were formulated with participating teachers during a materials development workshop. During this workshop, teachers were asked to state some of the useful insights that they have gained from the review phase and are likely to inform materials development processes in the schools. In general, the insights reflected the following:

- Materials (worksheets and trail booklets) that support an interdisciplinary approach to realising the school curriculum through outdoor environmental education processes can be developed.
- Basics on how to develop thematic interpretive trails for environmental education processes were learned.
- It is important to involve other people in materials development processes.
- *It is feasible to produce materials in-house on a small budget and without relying on experts for technical information.*
- Themes can be used to generate captivating interpretive signage titles.
- Diverse approaches and methods in realising environmental education processes through a variety of materials exist.

The materials being developed jointly with the teachers comprise of two trail booklets, three worksheets, nine interpretive labels, six interpretive signage and two brochures. The aim of these interpretive materials is to “engage learners’ experiences with the intention of challenging them to examine their attitudes and actions in respect of social, environmental and moral issues” (Ballantyne and Uzzell 1991:3). They will be further used to address social, political, biophysical and economic issues related to plants in such a way as to encourage learners to think about a sustainable environmental future. Significantly, the development of these materials has started drawing on some of the principles that inform materials development processes in botanic gardens as outlined below:

- Materials should foster understanding of the principles of sustainable development
- Information and data provided should be accurate, current and verifiable
- Materials should accurately reflect the broad range of informed opinion on the subject
- Materials should help people to explore values and develop responsible attitudes
- Materials should help develop the knowledge, skills and competencies to enable learners to

- participate effectively in their resolution of environmental and development issues
- Materials should be easy to use and appropriate for the intended audience
  - Developers should be able to demonstrate an identified need for the proposed resource
  - Developers should ensure that the development of the resource is inclusive, participative and has drawn on appropriate educational ideas
  - Developers should demonstrate that the production process has followed sustainable practice
  - Developers should consider the implications of promotion and distribution from the outset (BGCI 2000).

The first drafts of the materials will be tried out in the schools and observations made on how they are used by the teachers and learners. Critical reflections will be undertaken jointly to understand the process of developing interpretive materials and the strengths and weaknesses of the implemented plans and then the group will reformulate revised plans and the cycle started again.

### Conclusion

To address environmental issues and problems that frustrate efforts towards sustainable development in our countries, we need to enhance critical environmental education processes in our work contexts. This should be supported with materials whose development is inclusive, participative and has drawn on appropriate educational ideas. Such materials if well used can play a role in developing knowledge; skills and competencies in our learners to enable them participate effectively in the resolution of environmental issues and problems. Partnerships should be created between non-formal and formal educators to enable meaningful sharing of experiences in environmental education processes.

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## LINKING WITH SCHOOLS FOR JOINT INTERPRETIVE PROCESSES

PAPER presented during the BGCI 5<sup>th</sup> International Congress on Education in Botanic Gardens on 29 Sept – 4 Oct 2002 at Royal Botanic Gardens Sydney, Australia (see also Atiti 2002 in press).

### Introduction

This paper draws on a recent collaborative research that I involved a group of teachers from two Kenyan schools in a review and development of interpretation resources and materials. Other than being used to meet the requirements for a postgraduate course at Rhodes University in South Africa, the research has laid a strong foundation for a new outreach programme at the National Museums of Kenya (NMK) Nairobi Botanic Garden. Through the programme, NMK is forming partnerships with schools to support them transform their grounds into sites for environmental learning. This is being undertaken within a critical perspective in which teachers are developing skills and motivation that are needed to bring about changes in the way environmental education processes are taught in schools.

The theme running through this paper is the formation of non-formal/formal education partnerships as a better way of combining environmental interpretation and environmental education efforts to realise environmental literacy and action competency in schools. The concept of ‘environmental interpretation and education processes’ is introduced here as a departure from viewing interpretation and environmental education as separate fields. To this end, some education ideas that can be drawn on by teachers and non-formal educators to understand interpretation as a meaning-making process and critical reflection are suggested.

To enable teachers to become transformative intellectuals (Huckle 1996), a critical form of educational inquiry that allows them to investigate their own practice is required (Robottom 1987). Such an approach would entail developing interpretation resources and materials *with* teachers and not *for* them. The important thing would be to help teachers ‘help themselves’ by sharing with them ways of developing the ‘tools and skills’ of interpretation (Uzzell 1989) so that these may be drawn on in educational processes. I briefly share how I engaged teachers in a process of *mobilising* the ‘interpretive capital’ within the non-formal education organisations through a participatory action research approach. The mobilised interpretive capital was made available for development of interpretation resources and materials in two schools. A case study on development of a school-based ‘botanic garden’ and interpretive materials to foster environmental learning in one of the schools is presented. This ‘case’ highlights the potential role of teachers as transformative intellectuals in schools.

### Sharing ‘Tools and Skills’ of Interpretation with Teachers

Non-formal education organisations in Kenya play a crucial role in enhancing interpretation and environmental education processes with schools. These organisations include non-governmental environmental education centres and government conservation organisations like the National Museums

of Kenya where I work. A variety of interpretation resources and materials have been developed in these organisations for interpretation and environmental education programmes. The development and use of these resources requires skills and knowledge of interpretation. These 'tools and skills' of interpretation is what I have referred to as *interpretive capital* here. At the moment, this interpretive capital is mainly confined within the non-formal education sector. My argument is that time has come for us non-formal educators and interpreters to start sharing this interpretive capital with teachers in ways that enable them to design their own interpretive experiences in schools to facilitate environmental education processes. However, this should not imply imposing our agenda and mission to schools. Rather, it requires formation of genuine partnerships between schools and non-formal education organisations. This would ensure the creation of professional competencies that can support sustained materials development in schools. It is on this premise that I engaged a group of teachers from two schools in a process of *mobilising the interpretive capital* within five non-formal education organisations. In this process, non-formal educators from NMK, Kenya Wildlife Services, Wildlife Clubs of Kenya, Giraffe Centre and Butterfly Centre shared their 'interpretive capital' with teachers. By drawing on features of participatory action research I created forums for teachers and non-formal educators to meet and collectively understand how interpretation resources and materials are developed and used in the non-formal education sector for purposes of fostering environmental learning. These forums provided opportunities for developing partnerships between the two schools and the 'other' organisations that were involved.

Through a series of workshops, focus groups, guided tours and critical reviews of textual interpretive materials non-formal educators engaged teachers in examining their understandings, skills and values on interpretation resources and materials. The practical methods and educational perspectives underlying the interpretive practice in the non-formal organisations visited were explored. In this way interpretive capital was *mobilised* and then made available for actual development of resources and materials in the two schools as discussed later in this paper. The review visits revealed the existence of a number of interpretation resources that have the potential to foster environmental learning amongst school groups. These were nature trails, live exhibits on animals, a national park, a botanic garden and a museum. A variety of interpretive materials of interpretive signage, worksheets, trail booklets, interactive displays, teachers' packs, exhibitions and interpretive brochures were used to support environmental learning at these resources. A review on how these materials were developed and used provided useful insights on the role of interpretation in enhancing and enabling environmental education processes. The relationship between interpretation and environmental education processes became evident. Other than developing partnerships between schools and non-formal organisations, an active partnership between environmental education and interpretation (Ballantyne 1998) is needed to address the often-perceived differences between the two fields.

### **Environmental Interpretation and Education Partnerships**

Traditionally, environmental interpretation and environmental education processes have been viewed as separate fields with a number of general differences between them (Ballantyne and Uzzell 1994, Ballantyne 1998). For example, environmental interpretation is often associated with informal learning experiences for a wide range of visitors within a recreational setting. Such visitors are usually referred to as non-captive audience and are out for an informative and entertaining experience at interpretive sites. On the other hand, environmental educational processes have been mainly directed towards school groups in diverse areas such as classrooms, outdoors and interpretive sites. The school groups are expected to acquire environmental literacy, action competency and at the same time realise the needs of the school curriculum. Unfortunately, dialectical arguments that focus on the differences in design, content, audience, purpose and educational setting have continued to separate environmental interpretation from environmental education processes. They have further tended to undermine the potential role of interpretation in *mobilising* learners' cultural capital through encounter with real objects in the outdoors for socially critical environmental education processes.

Notably, both interpreters and environmental educators apply education ideas associated with how people socially construct meanings during informal interpretive experiences and formal environmental education processes. There is therefore a need to act on this commonality rather than on the perceived differences. However, this requires creating active partnerships between environmental interpretation and environmental education processes. Through such partnerships, an understanding of interpretation as an environmental education process would be explored to help bridge the theoretical gap that exists between environmental interpretation and environmental education processes. Broadening the theoretical base of interpretation, as an education process would enable interpreters and teachers design interpretive experiences that can lead to socially critical environmental education processes for school groups.

The collaborative research I undertook with teachers focussed on the relationship between interpretation and its potential to foster critical and action-oriented environmental education processes. I have used the concept *environmental interpretation and education* processes to reflect on this relationship. In this regard, environmental interpretation and education processes become acts of mobilising learners' cultural capital in interpretive local settings in order to engage them in investigation, social critique, information finding, action-taking and reporting to participate in social change. To further shed light on this relationship, requires consideration of theoretical perspectives on interpretation (Uzzell 1998) and environmental education processes. Very few interpreters have attempted to inform their practice with educational theories. I have drawn on educational theory and social theory to provide a theoretical basis for clarifying the relationship between interpretation and socially constructed environmental learning experiences. I did this by engaging teachers in a critically reflective inquiry process to explore our understanding of interpretation as an environmental education process. To this end, a number of education ideas that can be drawn on to provide further insights on interpretation and environmental education processes through meaning making and critical reflexive educational processes have been explored.

Education ideas associated with how learners socially construct meaning can be applied within theoretical frames drawn from symbolic interactionism (Charon 2001), social constructionism (Schutz 1967) Vygotskian social constructivism (Vygotsky 1981) and critical pedagogy (Fien 1993). Teachers and non-formal educators can draw on these theoretical frameworks to design interpretive materials and experiences that engage learners in meaning making and critical reflexive processes of learning. Structuring and enabling such interpretive learning experiences required partnerships between schools and non-formal education organisations. We drew on these education ideas and applied the 'tools and skills' of interpretation acquired from the non-formal education organisations to develop interpretation resources and materials to foster environmental learning in two schools. The development process followed a teacher-centred approach that challenged conventional top-down approaches that creates a hierarchy of 'developers' and 'technicians' (Robottom 1987, O'Donoghue and Taylor 1988). This approach further strengthened the developed partnerships between NMK and the two schools.

### **Developing Resources through a Teacher-Centred Approach**

Those who work in the non-formal education sector are faced with the challenge of ensuring the availability of environmental learning support materials that can engage learners in critical reflection and action to respond to environmental problems. More often than not, the tendency has been for us to produce glossy materials that only emphasise conservation of the biophysical environment. The materials are usually intended to create awareness and change learners' behaviour. In many cases, these materials are developed without the active involvement of teachers who form the majority of the end users. This reflects a top-down approach in which teachers are merely viewed as technicians expected to implement the materials for environmental learning in their schools. The NMK Nairobi Botanic Garden outreach programme is shifting from this trend by supporting teachers to develop interpretation

resources and materials on their school grounds. This shift from the top-down approach towards a teacher-centred one recently took place in two schools that NMK Nairobi Botanic Garden supported to develop interpretation resources on their grounds. Central to this shift was the formation of partnerships between NMK and three other non-formal education organisations. These partnerships created an enabling environment in which teachers were empowered to change and improve on their own practice of interpretation resource and materials development in order to overcome constraints to the teaching of environmental education processes in their schools. I will now focus on the actual development of a 'botanic garden' and materials in one of the schools.

### **Case Study: Developing a School-Based 'Botanic Garden' and Interpretive Materials**

Many botanic gardens professionals would frown at the idea of developing a 'botanic garden' modelled along theirs in a school as it happened recently in Kenya. In November 2000, two teachers and a group of Science Club students from a private school in Nairobi visited the NMK Nairobi Botanic Garden for a guided tour with a focus on medicinal plants. What was a normal school visit however, became different when after the guided tour the teachers sought our assistance in developing a 'botanic garden' in their grounds as a club project. Previous similar requests had only focussed on support for creating teaching trails in school grounds. At the time of this request, I was still designing my research for a postgraduate course that focussed on resource development. After careful consideration, I decided to involve the school in my research project but within a framework of an outreach programme for NMK Nairobi Botanic Garden. The idea was then re-conceptualised within a collaborative participatory research framework to fulfil three 'agendas' of my research, NMK outreach programme and Samaj School project.

### **Status of Environmental Education Processes at Samaj School**

Samaj School is a private school managed by a charitable trust. It is situated in the western suburbs of the City of Nairobi and has a population of 800 students, from nursery to form six, and fifty members of staff. An inquiry into the status of environmental education at the school revealed an emphasis on both teacher-centred and discipline-centred approaches to teaching and learning processes. No guidelines for implementing environmental education processes across the curriculum were found. To a great extent environmental education processes were dependent on initiatives from the non-formal education sector as reflected in the existence of environmental clubs whose support originated elsewhere. None of the five teachers on the project team had received any form of in-service training on environmental education. Besides this, the teachers claimed that the pre-service training they had received in environmental education was inadequate for their teaching contexts. The development of a school-based 'botanic garden' at the school was thus aimed at raising the profile of environmental education processes at Samaj. The process followed a participatory action research model that involved a spiral of self-reflective cycles of planning, acting and reflecting.

### **Formulating Resource Development Plans**

A team of five teachers was selected to work with NMK Nairobi Botanic Garden to realise the development of a 'botanic garden' and materials to foster environmental learning at the school. This was after the school management had adopted the idea that had initially been conceived at a club level. A process of realising the goals was then initiated through a whole school approach. In collaboration with NMK, the teachers first formulated broad plans outlining project goals, themes envisaged, methods and financial implications of the project. Eight themes that reflected those at NMK Nairobi Botanic Garden were proposed. These were on medicinal plants, succulents, wetlands, rare plants area, memorial area, recreation corner, butterfly corner and orchard. Plans on specific materials that would support environmental learning at the 'botanic garden' were also collaboratively formulated. A

publicity brochure, a trail leaflet, two worksheets, interpretive signage and interpretive labels were planned for. Throughout this phase, teachers contributed to the generation of plans. The plans were approved by the School Board and later implemented in collaboration with NMK and a number of other organisations.

### **Implementing the Formulated Plans through Critical Reflection**

Drawing on teachers' theory and practice, and also the interpretive capital mobilised as discussed earlier in this paper, the formulated plans were implemented through a series of focus group meetings in the school. The teachers were engaged in a self-reflective process of examining the relationship between the 'mobilised' interpretive capital and the development of interpretation resources and materials that foster environmental learning, thus 'mobilising' further interpretive capital in the context of the school grounds project. The actual development of the school 'botanic garden' entailed transforming an under-utilised area within the school grounds into a site for environmental learning. To do this, one of the teachers designed the area on paper to indicate the proposed themes and pathways. The area was then dug up and filled with forest soil by applying landscaping skills. The availability of a qualified gardener and a member of the Board of Trustees who had some landscaping skills at the school made this exercise easier. In addition, NMK botanic garden staff provided useful inputs in these initial landscaping processes. Later a professional horticulturalist was invited to further evaluate and polish up the landscaping of the site. NMK Nairobi Botanic Garden, commercial nurseries and other non-formal education organisations provided plants as a result of partnerships that had been created.

### **Conclusion**

Through partnerships with schools and other non-formal education organisations, the NMK Nairobi Botanic Garden has started working with teachers to transform school grounds into sites for critical environmental interpretation and education processes. What began as a one-off project with two schools has turned into a reflexive process of learning by doing and learning with teachers by changing the ways school grounds are used for environmental learning and also the way materials are developed. By involving schools in a collaborative research to investigate their own practice, the potential role of botanic gardens in enabling teachers to become transformative intellectuals has been highlighted. The participatory action research model that was applied during the NMK Nairobi Botanic Garden pilot outreach programme has proven to be a powerful form of professional development medium as it grew out of the teachers' own specific contexts. Professional development was not done on the teachers. Rather, teachers were allowed to be in control of the process of developing interpretation resources and materials by their collective planning, action and reflection. The role teachers can play as researchers, reflective practitioners, interpreters and materials developers through genuine partnerships became evident. Fundamentally, botanic gardens need to start viewing teachers as reflective practitioners with significant contributions to make to environmental interpretation and education processes instead of merely regarding them as 'target groups'.

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### APPENDIX 3: Workshop readings, programme and correspondences

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#### WORKSHOP READINGS

1. Ideology critique and environmental education, John Fien (From: Kim le Roux, *Environmental Education Processes: Active learning in schools*, pp 231-234. Pietermaritzburg: University of Natal Press).
2. Environmental education processes and changes in educational theories (From: *Theme 3* of Rhodes University/SADC International Certificate in Environmental Education, pp 3-4).
3. Table on Summary of educational perspectives. (From: Kim le Roux, *Environmental Education Processes: Active learning in schools*, p. 70. Pietermaritzburg: University of Natal Press)
4. Stories from practice: Learning through landscapes (From: Lucas, *Australian Journal of EE*, vol. 13, 1997 pp 85-88).
5. Towards participant-centred resource development for Environmental Education (From: O'Donoghue & Taylor, *Southern Africa Journal of EE*, No. 7, 1988 pp 3-4).
6. Core democratic values (From Fien 1993, *Critical curriculum theorizing*).
7. Some useful orienting features of programme processes
8. Curriculum development orientations
9. Changing orientations to curriculum and resource development (From: *Theme 4* of Rhodes University/SADC International Certificate in Environmental Education, pp 7-11).
10. Figure on Action research as a cyclical process (From: *Ebbut* 1985, p 163).
11. Planning a resource: Some tips
12. Curriculum in context (From: Cornbleth 1990)

## WORKSHOP PROGRAMME

**Materials Development Workshop for Teachers - Friday 22 June 2001**

<i>9.00a.m. to 9.15 a.m.</i>	Opening Remarks by Nairobi Botanic Garden Manager, <i>William Wambugu</i>
<i>9.15a.m.to 9.20a.m.</i>	Ice breaking and introductions
<i>9.20a.m.to 10.05a.m.</i>	Overview of EE processes, materials development processes and participatory action research by <i>Barasa Atiti</i>  Introduction to Interpretation by <i>Agnes Lusweti</i>
<i>10.05 a.m. to 11.00 a.m.</i>	Group discussion on constraints of teaching environmental education processes in schools
<i>11.00a.m. to 11.30 a.m.</i>	Tea-Break
<i>11.30 a.m. to 1.00 p.m.</i>	<b>Case studies on Materials Development</b> Development of WCK activity booklets by <i>Programmes Officer, WCK</i> Development of Giraffe Centre Guide Booklet by <i>Peter Gitonga</i> Design and development of Interpretive Signage at NMK by <i>Patrick Adoyo</i> Development of Interpretive Graphics at KWS by <i>Edward Indakwa</i>
<i>1.00p.m to 2.00p.m</i>	Lunch-Break
<i>2.00p.m. to 3.00p.m</i>	Review of textual interpretive materials from NMK, KWS, WCK, and Giraffe Centre
<i>3.00p.m. to 4.00p.m.</i>	Planning for a Resource Material
<i>4.00p.m. to 4.15 p.m.</i>	Evaluation and Closing Remarks
<i>4.15p.m. to 4.30 p.m.</i>	Tea Break

## CORRESPONDENCES (Samples)




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**NATIONAL MUSEUMS OF KENYA**


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PO Box 40658, NAIROBI, KENYA

Telephones: 742131/4, 742161/4

Telegrams: Museums

Telex: 22892

Fax: 741424

E-mail: nmk@museums.or.co.ke

4 September 2001  
 Zipporah Musyoki  
 Giraffe Centre  
 PO Box 15124  
 Nairobi

Dear Colleague,

**Re: One-day Materials Development Session at NMK – Friday 14 September 2001**

The National Museums of Kenya (NMK) through the Nairobi Botanic Garden Education Programme will run the above-mentioned session for eleven teachers from two schools currently developing materials for use at their emerging 'botanic gardens'. As earlier discussed, I am now writing to invite you to participate in this session, which will be held at the NMK Seminar Room as a resource person. Specifically, we would like you to share your rich experiences with the teachers in a **thirty-minute** session on *Centre-based environmental education processes and the school curriculum*. In addition, we are very keen to have you further share with us your recent Rhodes University/SADC course experience with reference to curriculum and resource material development (Theme 4).

We are very grateful to your continued support and collaboration in assisting schools develop interpretive opportunities for environment education processes on their grounds.

Enclosed please find a copy of the programme for the planned September 14 session.

Warm regards.

Yours Sincerely,

**Abel Barasa Atiti**  
**Education Officer**  
**NMK Nairobi Botanic Garden**



## NATIONAL MUSEUMS OF KENYA

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PO Box 40658, NAIROBI, KENYA  
 Telephones: 742131/4, 742161/4  
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 Fax: 741424  
 E-mail: nmk@museums.or.coke

10 September 2001  
*The Principal*  
*Kenya High School*  
 PO Box 30035  
 Nairobi

Dear Madam,

**Re: One-day Materials Development Session at NMK – Friday 14 September 2001**

The National Museums of Kenya (NMK) through the Nairobi Botanic Garden Education Programme has organised the above-mentioned workshop for teachers from two schools currently involved in developing interpretive opportunities on their grounds.

Six teachers from your School are working with the Nairobi Botanic Garden to develop a school-based arboretum for environmental education processes. I therefore invite them to attend this workshop that will be held at the NMK Seminar Room. The invited teachers are as follows:

*Mrs. Hellen Holi*  
*Mrs. Nancy Wachira*  
*Mr. Peter Khayombe*  
*Mrs. Jennipher Ivuso*  
*Mrs. Eunice Mabachi*  
*Mrs. Nereah Otieno*

It would be appreciated if the school provides transport to and from NMK for the teachers and permission is granted for them to attend the workshop.

Attached please find a tentative programme for the day.

Warm regards.

Yours Sincerely,

*Abel Barasa Atiti*  
 Education Officer  
 NMK Nairobi Botanic Garden

## APPENDIX 4: Summaries on the interpretive materials reviewed

**Table 4A** Context of use, development processes, curriculum links and role of evaluation

	<i>Context of use</i>	<i>When and how material was developed</i>	<i>Curriculum links</i>	<i>Role of evaluation</i>	<i>Other comments</i>
<b>1. WCK trail booklet</b>	Used for both self and guided tours with visiting school groups.	In 1984 by three external experts (naturalists).	Used to supplement secondary school biology (ecology) curriculum.	Was not stated, but since its development it had not been reviewed.	The booklet needs some revision (later reviewed and revised during the study; see section 6.6.1).
<b>2. NMK trail booklet</b>	Used for ecological field studies at Ololua Forest Reserve with school groups.	Developed in 2001 by NMK Education Department, through in-house consultations.	Used to supplement secondary school biology (ecology) curriculum.	Teachers were involved in evaluating the booklet during its piloting. Ongoing evaluation reported.	Teachers from Kenya High found this material applicable to their context.
<b>3. Giraffe Centre trail booklet</b>	Used for both self and guided tours for visiting school groups.	In 1983 by the Giraffe Centre educator in consultation with two external naturalists.	Links to all aspects of the curriculum (both primary and secondary).	Evaluation was recently carried after several years of its development.	Teachers found it to be more appropriate for the tertiary groups. A revised one was being developed.
<b>4. WCK ecology pack</b>	Used during ecological field studies at WCK nature trail and Nairobi National Park.	In 1991 by a team of five people (including three teachers).	Supplements secondary school biology (ecology) curriculum.	During its development, evaluation was limited to in-house editing and proof reading.	The pack has not been revised for a long time
<b>5. NMK teachers' pack</b>	Used for garden-based EE programmes at the Nairobi Botanic Garden.	In 1997 by NMK Nairobi Botanic Garden educator in consultations with other botanic educators.	Has links to primary school curriculum (Science, mathematics, English).	Evaluation was in form of feedback comments from colleagues and teachers during the pilot phase.	The material is still in the draft form.
<b>6. NMK wetlands poster</b>	Distributed to schools throughout the country for creating awareness on wetlands conservation.	In 1999 by a team involving NMK staff and other stakeholders (a teacher was part of the team).	Has broad links to the school curriculum	Limited to reviews during the development period.	Views of teachers were incorporated as a practising teacher formed part of the development team.

<b>7. Giraffe Centre poster</b>	Issued to visiting school groups, also mailed to schools.	Developed in-house in 1999, printed elsewhere (commercial printer).	Focuses on science and geography with reference to the giraffe.	Not stated.	Information technology skills were used in the design and development of the poster.
<b>8. NMK interpretive signage</b>	Interpretive texts read by visiting school groups at both at the Nairobi Museum and Nairobi Botanic Garden.	Developed in-house through joint efforts between educators, graphic designers and research scientists.	Has broad links to the school curriculum.	Evaluation was continuous in the development of signage at the Nairobi Botanic Garden. Most interpretive signage at the Nairobi Museum has never been evaluated.	The development process at the Nairobi Botanic Garden is ongoing.
<b>9. KWS interpretive signage</b>	Interpretive texts read by visiting school groups at the Nairobi Orphanage.	Developed in-house by naturalists and graphic designers.	Direct links to primary and secondary school curriculum (science).	A review of interpretive signage at the Animal Orphanage has been done.	Most signs have been affected by weather. There are plans to use aluminium panels at the newly developed Nairobi Safari Walk.
<b>10. Butterfly Centre interpretive signage</b>	Information displayed on interpretive boards for learners to read.	Developed in 1999 by a consultant.	Has broad links to both primary and secondary school curriculum.	Not stated.	Impressive in terms of design and layout. However, a lot of technical information has been used.
<b>11. Butterfly Centre interactive display</b>	Learners touch and feel concealed boxes.	Developed in 1999 by a consultant.	Links to the primary science curriculum (use of senses).	Not stated.	The touch and 'feelie' boxes seem to generate a lot of curiosity.
<b>12. Giraffe Centre brochure</b>	Issued to visitors to market and fundraise for education programmes.	Developed in 1998 through in-house consultations.	Has no direct links with the school curriculum.	Effectiveness of the brochure evaluated in terms of visitor responses to financial assistance appeals.	Although printed on cheap paper, it appeared dull and not well designed.
<b>13. KWS Promotional video</b>	Shown to tourists and school groups to promote Shimba Hills National Park.	Developed in 2000 by the audio-visual staff.	Relates to geography and ecology in the school curriculum.	Mainly during the editing phase of the production.	Video production requires appropriate technology and trained staff.

**Table 4B** Learning and teaching processes, views on education, views on the environment and values.

	<i>Learning &amp; teaching processes</i>	<i>Views on education reflected in the text</i>	<i>Views on the environment reflected in the text</i>	<i>Values supported by the text</i>
<b>1. WCK trail booklet</b>	Learners interact with real objects at the nature trail with assistance of a more knowledgeable WCK educator. Both self-mediated and mediated interpretation used during the learning processes.	Through social interactions, learners' cultural capital is mobilised for meaning-making processes in context.	The environmental is viewed as a medium for education in which learners' cultural capital is mobilised for meaning-making processes that may lead environmental learning.	Values that promote ecological sustainability supported by the texts. Conservation of biodiversity and respect for nature is emphasised.
<b>2. NMK trail booklet</b>	Guided questioning focusing on stops at the Oloolua Forest Reserve and personal interpretation by NMK educator.	NMK educator took on the role of organising learning opportunities to enable learners to socially construct meanings in context.	The environment as a medium for education, this reflects the perspective on education <i>through</i> the environment.	Both sets of values on social justice and ecological sustainability supported by the texts.
<b>3. Giraffe Centre trail booklet</b>	With assistance from the Giraffe Centre educator, learners use the booklet to actively find out information on the features along the nature trail.	Information transmission and meaning-making processes are reflected in the texts of the trail booklet.	The environment viewed as a medium for education.	Emphasises values on ecological sustainability.
<b>4. WCK ecology pack</b>	Through guided questioning, illustrated talks and hands-on activities, the WCK educator supports learners, to use their cultural capital to make sense of what they see and experience.	Learners socially construct meanings through interactions with objects at the trail, peers and adults (social constructivism).	The view that the environment is composed of complex interactions between life systems and physical components is reflected in some of the texts in the pack.	Promotes values of conservation of biodiversity and species equity.
<b>5. NMK teachers' pack</b>	Learners are engaged in collaborative inquiry processes at the Nairobi Botanic Garden (for example, discovering different habitats).	Learning involves interacting processes of reflection, encounter and dialogue within a context of action (socially critical).	The environment viewed as an interacting system of biophysical, social, economic and political dimensions. This reflected a perspective on education <i>for</i> the environment.	Values on social justice supported.
<b>6. NMK wetlands poster</b>	Learners read information aimed at raising their awareness on the need to conserve Kenyan wetlands.	Transmission of knowledge based on one-way form of interaction.	The environment is viewed in a technocratic manner, emphasis is on providing knowledge that may be used to manage and conserve the wetlands.	The poster supported values on the need to conserve biodiversity.

<b>7. Giraffe Centre poster</b>	Learners read information on the need to conserve giraffes on the poster.	Transmission of scientific facts aimed at changing the behaviour of learners.	Conservation of the endangered giraffe species (Rothschild) can occur if learners are provided with facts and generalisations about giraffes. This reflects a perspective on education <i>about</i> the environment.	Its emphasis on the conservation of the Rothschild giraffe. This reflects on values of interspecies equity.
<b>8. NMK interpretive signage</b>	Interpretive texts on the signs are read and related to features displayed both at the Nairobi Botanic Garden and Nairobi Museum.	Scientific knowledge transmission based on the transmitter-receiver model. Learners may not be engaged in critical reflection and action.	A perspective on the teaching of facts about the environment reflected.	Supports values of ecological sustainability.
<b>9. KWS interpretive signage</b>	Information on the signs is read and used by learners to construct meanings on the animals exhibited at the Animal Orphanage.	Transmission of scientific facts on the animals at the Orphanage.	Projects technocratic environmental perspectives.	Supports values on ecological sustainability, places emphasis on the conservation of biodiversity.
<b>10. Butterfly Centre interpretive signage</b>	Learners read the displayed information on butterflies with the assistance of a guide.	Transmission of scientific information on butterflies aimed at raising awareness of learners on the conservation of Kenyan butterflies.	A technocratic view of the environment promoted, the assumption is that more information on the butterflies may lead to the conservation and management of their habitats.	Supports values on ecological sustainability by promoting respect and care of butterflies and their habitats
<b>11. Butterfly Centre interactive display</b>	Learners touch concealed boxes, reflect on the encounters and then share their experiences with peers.	Active engagement of learners in processes of meaning-making and reflection	Environmental as a medium for learning reflected in the use of interactive displays.	Promotes values on equality in knowledge generation as learners share freely share their experiences.
<b>12. Giraffe Centre brochure</b>	Information about the conservational initiatives at the Giraffe Centre is read, and actions to support these initiatives considered.	Communication of information aimed at creating publicity (form of social marketing).	The environmental is viewed as a medium for education in which learners' cultural capital is mobilised for meaning-making processes.	Values on social justice promoted as through publicity resources (financial) are shared.
<b>13. KWS Promotional video</b>	The video is shown to the learners in a lecture hall (video was mainly developed to promote tourism).	Transmission of information with, learners taking a passive role.	Environment viewed as a commodity to be promoted and sold.	Advances respect for ecosystems and the diversity of life.

**APPENDIX 5: Interpretive plans developed in the two schools**

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**DEVELOPMENT OF A SCHOOL-BASED BOTANIC GARDEN  
FOR ENVIRONMENTAL EDUCATION PROCESSES****Project summary**

A themed school-based botanic garden called “SCLP Samaj Botanic Garden” will be developed on an area that is currently under-utilised at Samaj. The Samaj Botanic Garden will focus on providing environmental education processes across the curriculum.

The proposed Botanic Garden will have eight themes that will be accessible to a wide audience of teachers, students, local community, parents and members of the Board of Governors. The Garden will be developed in collaboration with the National Museums of Kenya Botanic Garden. An information centre and a small recreation area will be set up at the Garden.

Financial and human resources will be provided by both the National Museums and Samaj School. Before the actual development of the Garden at the proposed site, five teachers that will implement the project will visit non-formal education organisations to review how materials are developed and used for environmental education processes. Teachers’ development workshops will be organised to equip the teachers with skills necessary to implement the project. Both formative and summative evaluation will be undertaken to ensure the success of the project.

**Background information**

SCLP Samaj School was started in 1994 under the management of a board of governors and sponsorship of SCLP Samaj. At inception the school was meant to be a complex running from primary school to high school. The school started in May 1994 with standard 1-4. At this time it had 51 pupils and 6 members of staff. In January 1995, the secondary school section had its first enrolment and started offering both GCE and KCSE curricula.

From 1997 the management of the school was taken over by the SCLP CHARITABLE TRUST and the school has since experienced rapid growth marked with excellent performance in both KCSE and GCE examinations. In the year 2000 KCSE examination, the school received several awards as being the most improved, and also for attaining the first positions in biological sciences in Nairobi province.

The school has now resorted to GCE Curriculum, which is to run from form one up to A-level with an approximate population of 800 students and 50 members of staff.

The school is located in Nairobi west just behind the shopping centre. The school grounds are well maintained and also have a variety of plant species. To the south, a polluted river borders the school. The school is multicultural, multi religious and has all levels of age groups all of whom use the same environment.

For a long time, learning has been confined to the classroom situation. This has made learning both boring and monotonous. In a bid to make it more interesting, enjoyable and practical, there is a need to adopt environmental education as an integral part of the curriculum to enrich learning, club activities and environmental conservation as well as recreation. At the moment environmental education is still marginally taught and is only emphasised through club activities.

Due to lack of a central developed area/facility/tool to enhance outdoor learning, and to fulfil environmental objectives, there is a need to develop such a facility in the school hence this proposed project. Apart from raising environmental awareness, the pollution of the river bordering the school will be addressed through the project by planting papyrus in it.

## Goals and objectives

The overall goal of this project is to provide a resource for teaching environmental education processes at Samaj School. Specific objectives within this goal are as follows:

- To provide a tool for teachers to effectively utilise the school grounds for the teaching of environmental education processes across the school curriculum.
- To address some of the environmental problems around the Samaj School Community.
- To develop interpretive materials that can engage learners and teachers in environmental education processes through fun-filled and hands-on activities.
- To develop a thematic botanic garden that can be used to share ideas and experiences with other schools on outdoor interpretation.
- To provide an additional recreational facility at Samaj School.
- To contribute towards meaningful club activities through environmental action learning projects within the school grounds.

## Audience

The proposed school-based botanic garden will serve the entire Samaj Community that comprises of students from nursery to form six, teachers and members of the non-teaching staff. In addition, visitors to the school, parents, members of the Board of Governors, other schools and neighbouring communities will use the resource.

## Methods

The development of the school-based botanic project will take place in three phases:

### *Educational visits*

This phase will comprise of review visits to non-formal education organisations to find out how resource materials are developed and used by school groups for environmental education processes. This first phase is expected to take about three months. Visits will be made to the National Museums of Kenya Nairobi Botanic Garden, Giraffe Centre, Butterfly Centre and Wildlife Clubs of Kenya. Through the visits, members of the implementing team will learn from educators from these organisations how to develop resource materials for use at Samaj School. Samples of resource materials from the organisations will be reviewed and later adapted for use in the school. This phase will be co-ordinated by the National Museums of Kenya Nairobi Botanic Garden. Towards the end of this phase, a workshop involving resource persons from the National Museums of Kenya (NMK), Wildlife Clubs of Kenya, Giraffe Centre, Wildlife Clubs of Kenya and members of the implementing team will be held at NMK to further discuss the use of school grounds for environmental education processes.

### *Actual development at the site*

During this phase, the actual development of the garden will start. In collaboration with the NMK Nairobi Botanic Garden, various themes at the site of the proposed Samaj School Botanic Garden will be developed. At the same time, interpretive materials for environmental education processes across the curriculum will be developed. The development of the garden will be an ongoing process in which new plants will be sourced and planted at the Garden.

### *Creation of an information centre*

This will involve the development of an information centre/garden office in which various resource materials developed or acquired will be kept for reference. Information panels and a notice board will be erected near the centre.

## Proposed themes

Eight themes have been identified for the Samaj School Botanic Garden as follows:

- Medicinal plant area – plants of medicinal value consisting of both exotic and indigenous will be planted. Educational opportunities at this area will include the teaching of Chemistry and cultural values related to plants.
- Wetland plant community – papyrus and other wetland plants will be planted in the river to purify the polluted water. Educational opportunities here will include sewage treatment using plants and also plant adaptations.
- Butterfly corner – food and nectar plants for butterflies will be planted here and models of butterflies erected. This area will be useful during the teaching of pollination and economic importance of butterflies. A small plot of silkworm farming will be part of this area.
- Orchard area – various fruit plants will be planted to be used to teach agriculture and economic importance of plants.
- Succulent area – plants that require less water will be planted for the teaching of plant adaptations and conservation of Kenyan succulents.
- Rare plants area – some of the rarest and endangered plants in Kenya will form part of this area of the Garden for the teaching of plant conservation. A mixture of both potted and terrestrial plants will be displayed.
- Memorial area – will be devoted to the founder of the school and both exotic and indigenous plants used to commemorate events will be planted.
- Recreation corner – a seating area with benches will be part of the Garden where students and visitors can relax and meditate on particular issues.

### **Project activities**

The following main activities will be carried out to realise the development of School Botanic Garden:

- educational review visits to environmental education centres,
- professional development workshops,
- designing and mapping of pathways,
- developing a path network within the garden,
- landscaping of the proposed site,
- fencing the site along the river,
- sourcing of plants,
- developing interpretive materials and labels,
- installation of water points,
- developing an information centre,
- installation of seats and development of picnic area, and
- training of project implementing team.

### **Resources**

#### ***Available resources***

The NMK Nairobi Botanic Garden will provide human and financial resources to implement the review visits to environmental centres. NMK will also provide a few plants for some of the themes, and will also meet the costs of all the professional development workshops.

A strong team of five teachers is available to implement the project.

Other resource persons from Giraffe Centre, Wildlife Clubs of Kenya and Kenya Wildlife Services are ready to offer information.

#### ***Required resources***

More financial resources will be required to implement the development of the botanic garden. Planting materials, construction material and forest soil will be needed.

## Implementation plan

<i>Activity</i>	<i>Timeline (Months)</i>	<i>Duration</i>
Initial consultations with NMK	December 2000	2 days
Educational review visits	January to March 2001	3 months
Formulation of development plans	April to May 2001	2 months
Materials development workshop	June 2001	1 day
Presentation of plans to School Board	July 2001	1 day
Materials development	July to December 2001	4 months
Development of site and sourcing of plants	August 2001 to March 2002	7 months
Training of project team	March to April	2 weeks
Professional development workshop	March	1 day
Summative evaluation	March	2 weeks

## Project evaluation

Project evaluation will be the responsibility of the implementing team and someone from the NMK Nairobi Botanic Garden. Two evaluative strategies – formative and summative will be carried out.

## Provisional budget

<i>Item</i>	<i>Particulars</i>	<i>Cost (KES)</i>	<i>Total (KES)</i>
<i>Educational review visits</i>	Visits to NMK,	Lunches and snacks @ 400X3X5	6 000
	Giraffe Centre and	Transport @ 800X3	2 400
	Butterfly Centre	Stationery @ 200X5	1 000
		Entrance fees @ 120X5	600
			10 000
<i>Professional development workshops</i>	2 Workshops at	Lunches and snacks @ 400X2X5	4 000
	NMK	Transport @ 800X2	1 600
		Stationery and photocopies @300X2x5	3 000
			8 600
<i>Fence</i>	Using concrete post + Chain link	@ 500/Linear MetreX150	75 000
<i>Paths</i>	Concrete paving tiles	600/ Linear MetreX150m	90 000
<i>Landscaping of site</i>	Local labour 10 days	@ 150X4X10	6 000
<i>Production of interpretive materials</i>	8 Large panels	@ 1000 X 8	8 000
	100 Small labels	@ 200 X 100	2 000
	20 Interpretive labels	@ 800 X 20	1 600
			31 600
<i>Construction of information centre</i>	10X10ft structure	Rough estimate	83 500
<i>Planting Material</i>	Sourcing Plants	@ 200X300 plants	6 000
<i>Installation of water points</i>	Labour	@ 150/dayX2	300
	Pipes for 4 points	@ 300/m X 80m	24 000
			24 300
<i>Installation of seats</i>	8 Wooden benches	@600 X 8 plus labour	5 000
<b>Total</b>			<b>KES 340 000</b>

**NB:** The National Museums of Kenya Nairobi Botanic Garden will finance the educational review visits and professional development workshops (KES 18 600); and also provide some plants and free consultancy services.

## **A SCHOOL-BASED ARBORETUM FOR ENVIRONMENTAL EDUCATION PROCESSES AT KENYA HIGH**

### **Project summary**

A school-based arboretum called “Kenya High Arboretum” (KHA) will be developed on five acres that comprises of mature woody plants currently under-utilised at the school. KHA will focus on providing environmental education processes across the curriculum. This will raise the profile of environmental education processes at the school. Apart from contributing the realisation of eco-school principles, KHA will promote the teaching of science in the school and also become a resource for sharing ideas with other schools on outdoor interpretation.

KHA will have five themed interpretive trails that will be accessible to a wide audience of students, teachers, local community, parents and members of the Board of Governors. Interpretive materials that engage learners and teachers in environmental education processes across the curriculum will be developed in collaboration with the National museums of Kenya Nairobi Botanic Garden.

### **Background information**

Kenya High school is a national school that was started in 1910 and is situated within the city of Nairobi on Kileleshwa Hill. It was formerly known as “The Nairobi European School until 1937 when it changed to its current name. The motto of the school is *Sevire est Regnare* that translates to “To serve is to reign”. Therefore the mission of the school is to achieve supremacy in all its undertakings by helping and serving others in all ways. Currently, the school has a population of 800 girls and a teaching staff of sixty.

The school occupies about 100 acres of land of which five acres comprises of mature woody plants of both exotic and indigenous species. Most of this area is currently under-utilised hence the proposed development of a school arboretum. There exists a stream, an orchard and a disused open-air theatre on the area proposed for an arboretum. More than 100 species of both exotic and indigenous plants do exist on the area.

Currently, environmental education processes are dependent on a few teachers who are patrons of various relevant clubs. Some of these include – Environmental Club, Wildlife Club, Young Farmers Club and African Global Link Project. More significantly, the school has joined the Eco-School Project being co-ordinated by the Kenya Organisation of Environmental Education (KOE). Through this project, there have been attempts to develop an environmental policy that can be used to guide the school’s activities towards environmental management. A school arboretum would be a very useful tool in realising the objectives of an eco-school.

In spite of these efforts, environmental education processes in the school are still marginal and largely depend on initiatives from the non-formal education sector and a few enthusiastic club patrons. Environmental education has not been officially adopted, as an integral part of the school curriculum and lack of adequate materials to support these processes in school is a major constraint. In addition, many teachers in the school appear not to understand the nature and scope of environmental education processes, which many view as an additional burden in the already overloaded curriculum and as only relevant in the science curriculum. Teachers lack adequate training in environmental education. Whilst environmental education processes entail outdoor education, the school rules and regulations impose constraints on out-of-classroom activities. Like in any other public schools in Kenya, the structures and relationships in Kenya High tend to reproduce more didactic forms of instruction as opposed to inquiry teaching. Due to financial constraints, it is difficult to implement environmental education processes through visits to non-formal environmental education organizations.

The development of a school arboretum will be an attempt to respond to some of the above constraints. Through the arboretum, teachers would be able to prepare learners to address environmental issues

facing their local community. This will entail developing appropriate interpretive materials for outdoor learning to support environmental education as an integral part of the school curriculum. The arboretum would be also a unique facility for networking with other schools and environmental education centres. The arboretum will provide a site for an open-air theatre and a camping area. Therefore a surrounding that offers relaxation of the mind away from the daily stresses of a classroom setting will be created for the girls, teachers and other visitors of Kenya High. Furthermore, a school-based arboretum would represent a special opportunity for Kenya High students and teachers to gain an understanding of the importance and value of plant resources in particular and the environment in general. However, to develop this unique facility, funds are required hence this proposal.

### Goals and objectives

The overall goal of this project is *to raise the profile of environmental education processes across the curriculum* at Kenya High School. Specific objectives within this goal are as follows:

- To contribute to the realisation of the principles of an eco-school through various environmental action learning projects within the school grounds.
- To provide a resource for teachers to effectively utilize school grounds for critical inquiry teaching of environmental education processes across the school curriculum.
- To develop interpretive materials that engage learners and teachers in environmental education processes through fun-filled and hands-on activities.
- To provide a facility for sharing ideas and experiences with other schools on outdoor interpretation.
- To promote the teaching of science through first-hand investigations and real encounter experiences.

### Methods

The primary methods for realising the goals and objectives of the Project will be:

The creation of a school-based arboretum with themed interpretive trails will become a unique resource for providing environmental education processes to a wide audience of students, teachers, parents, members of Board of Governors, local community, the youth, other schools and tourists.

The development of interpretive materials that engage learners and teachers in environmental education processes across the curriculum, within the school grounds. There will be collaboration with the National Museums of Kenya Nairobi Botanic Garden and Kenya Organisation of Environmental Education to obtain information on creation of an arboretum and an eco-school for environmental education processes.

In addition, an Implementation Plan will be developed by the Project Committee to guarantee the systematic execution of the Project and provide the basis for periodic evaluation.

### Implementation plan

<i>Activity</i>	<i>Timeline (Months)</i>	<i>Duration</i>
Initial consultations with NMK	December 2000	2 days
Educational review visits	January to March 2001	3 months
Formulation of development plans	April to May 2001	2 months
Materials development workshop	June 2001	1 day
Presentation of plans to School Board	July 2001	1 day
Initial materials development	July to December 2001	4 months
Initial development of interpretive trails	August to December 2002	5 months
Fundraising	September 2001 to January 2002	5 months
Sourcing of plants and tree surgery	October 2001 to March 2002	6 months
Development of site (paths, camping area, etc)	March 2002 to September 2002	7 months
Professional development workshop	March	1 day
Summative evaluation	October 2002	4 weeks

## **Project activities**

The following main activities will be carried out to realize the development of a school-based arboretum at Kenya High:

- Erecting a 1500m perimeter fence around the arboretum site
- Designing of five interpretive trails and pathways
- Contract out pedestrian pathway work
- Clearing of site of all grass, weeds and bushes
- Cutting down and chopping some of the trees on the proposed site
- Prepare interpretive materials and labels
- Contract out work for fish pond construction
- Contract out work for Butterfly theme development
- Develop a silk-worm farming theme
- Sourcing plant materials
- Renovation of the open-air theatre
- Construction of a picnic and camping area
- Construction of recycling area
- Construction of an orientation office
- Project evaluation

## **Project administration**

The School Principal will oversee the project development and operation, establishing and maintaining links with relevant local non-formal education organisations and funding agencies.

An Eco-school Committee comprising six teachers from various subject areas will be responsible for establishing the KHA and conducting periodic evaluation of the Project. The Committee will also be responsible for developing interpretive materials in consultation with the rest of the teachers.

The Project will employ an arboretum assistant who will be responsible for maintaining the appearance of the Arboretum, guiding visitors along the interpretive trails and other forms of communication with potential users from outside the school.

The School Board of Governors will be responsible for sanctioning the operation of the Arboretum and assisting the School Principal on fundraising for the Project.

## **Evaluation plan**

Project evaluation will be the responsibility of the Eco-School Committee and two different evaluative strategies – formative and summative will be carried out.

## **Resources**

### ***Required resources***

The NMK Nairobi Botanic Garden will provide human and financial resources to implement the review visits to environmental centres. NMK will also provide a few plants to be planted at the arboretum, and will also meet the costs of all the professional development workshops.

A strong team of six teachers is available to implement the project.

Other resource persons from Giraffe Centre, Wildlife Clubs of Kenya and Kenya Wildlife Services are ready to offer information and consultancy services. The school has water, electricity and an area earmarked for the development of the project.

### ***Required resources***

More financial resources will be required to implement the development of the KHS Arboretum. Planting materials, construction material and external consultancy services will also be required.

**Provisional budget**

<i>Item</i>	<i>Particulars</i>	<i>Cost (KES)</i>	<i>Total (KES)</i>
Educational review visits	Visits to NMK,	Lunches and snacks @	7 200
	Giraffe Centre, KWS,	400X3X6	4 000
	WCK and Butterfly	Transport @ 800X5	1 200
	Centre	Stationery @ 200X6	720
		Entrance fees @ 120X6	13 120
Professional development workshops	2 Workshops at NMK	Lunches and snacks @	4 800
		400X2X6	1 600
		Transport @ 800X2	3 600
		Stationery & photocopies @300X2x6	<b>10 000</b>
Fence	Using concrete post + Chain link	@ 1000/Linear m X 1 500 m (1 km)	1 500 000
Personnel	gardener	@ 5000 X 3	15 000
Baseline plant survey	Consultancy	1000/day X 2	2 000
Aboriculture	Tree surgery	@ 400 X 50 trees	20 000
	Consultancy	@ 2000/day X 2	4 000
			<b>24 000</b>
Paths	Murram and ballast	@ 8000 X 10	80 000
Landscaping of site	Labour 30 days	@ 150 X 4 X 30	18 000
	Consultancy	@ 1000/day X 4	4 000
			<b>22 000</b>
Clearing site	Labour	@150/day X 6X 30 days	27 000
Fish pond	Liner	@ 220/sq m X 40	8 800
	Guppies (fish)	@ 500X 20	10 000
	Pond bank	@ 800/linear metre X 40	32 000
	Design	@ 20000	20 000
			<b>70 800</b>
Production of interpretive materials	8 Large panels	@ 6000 X 8	48 000
	100 Small labels	@ 200 X 100	20 000
	15 Interpretive labels	@ 2000 X 20	40 000
	Computer	@ 120 000	120 000
	Consultancy	@ 4 000	5 000
			<b>233 000</b>
Air theatre renovation	Grassing and lights	Rough estimate	100 000
Planting Material	Sourcing Plants	@ 400X300 plants	120 000
Silk worm theme	Labour and consultancy	@ 1 600	1 600
Recycling area	Permanent enclosure	Rough estimate	700 000
Picnic and camping area	Labour	@ 150/day X 4 X 14	8 400
	Toilets block	Rough estimate	250 000
	13”X 10” Tents	@ 75 000 X 10	750 000
	Beds and mattresses	@ 5500 X 42	231 000
	Cooking area	Rough estimate	70 000
			<b>1 309 400</b>
Orientation office	3 roomed structure	Rough estimate	2 500 000
Project evaluation	Consultancy	@ 1000 X 14 days	14 000
Contingencies 11 %			758 080
		<b>Total</b>	<b>7 500 000</b>

## APPENDIX 6: A Sample of interpretive materials developed in the schools

### AN INTERPRETIVE LEAFLET DEVELOPED AT SAMAJ SCHOOL

A lot of importance and value is accorded to the Neem tree. It is regarded as a 'complete pharmacy'. It's said to cure more than 40 diseases. Bark extracts from the Red Stinkwood are used to treat prostrate cancer.

*Start your own medicinal garden to help conserve some of our threatened medicinal plants.*

**Stop 6**  
**The Source of Life is Here**

Did you know that almost 75% of our planet is covered with water? The small pond before you contains part of this water. A number of living things are in it. Closely observe signs of life in the pond. Can you name some of the animals and plants found that you have seen? Think of life without water.

There are fish and plants depending on this pond for survival. A plant like *Papyrus* growing here provides oxygen to the fish and other animals. *Papyrus* has many other uses. There are attempts to use it to purify the Ngong River that you will see at the next stop. Think of other uses of the *Papyrus*.

**Stop 7**  
**A River in Tears!**

The River that you are seeing is Ngong. It joins Nairobi River downstream.

Look at its water. Would you like to have a cool drink from it? Like most rivers in this City, Ngong is heavily polluted. Its water is no longer safe for human consumption. Just a few metres from where you are standing there is a slaughterhouse. The owner empties wastes from it directly into this river. What are some of the other sources of water pollution? What can you do to save this River?

**Stop 8**  
**Now Relax and Enjoy!**

Sit down and relax at this lovely Garden. Look around you and appreciate the beauty of nature. Apart from learning, we are also using this area to relax. Our country has many beautiful sceneries like the waterfall you are seeing right here. Tourists visit these places to relax and enjoy. Become such a tourist today.

Stop and look back at what you've gone through. What else can nature offer? Isn't it an appealing and interesting site to relax at?

**This is a product of conservation. Join us in conserving our environment for a healthy Kenya and world.**

**For further Information**  
 Contact  
 Management Committee of  
 SCLP Samaj School Botanic Garden  
 PO Box 17953  
 Nairobi.

*"Under SCLP Charitable Trust"*  
**SHREE CUTCHI LEVA PATELSAMAJ SCHOOL**  
 (SHREE L.R. PINDOLIA ACADEMY)

**SCLP Samaj School Botanic Garden**  
**A resource for active learning in the environment**



*Mr. Ojéke, the 'A' Level Biology Teacher conducting an Ecology Class in the Garden*

**A Trail Leaflet Guide for Students and Visitors**

## Welcome!

A themed school botanic garden has been developed here to enhance active learning in the environment. A walk through it leads you to different types of plants and features. Interpretive signage reveals their benefits to us and other animals.

We need to conserve our environment to continue enjoying these benefits.

The story of SCLP Samaj School

Botanic Garden starts just ahead of you. **Enjoy your walk!**

### Stop 1

#### Plants Ration Water Too!

Growing at this rocky area juicy and fleshy plants that ration water. We call them **succulents**. Like the camel, they have the ability to store water. Closely examine their leaves and stems. How are they adapted to living in areas with less water?

#### Succulents have many uses

Apart from making this area very beautiful, succulents have many other uses. The famous *Aloe vera* and other Aloes have medicinal properties. Sisal and Baobab are good sources of fibres. Some Euphorbias are used as hedges. Find out more uses of succulents.

*Did you know that the baobab is the world's largest succulent?*

For more information on succulents, visit the Succulent Garden at the National Museums of Kenya.

### Stop 2

#### Plant Vitamins are Made Here!

Here we have a collection of fruit plants. It's referred to as the orchard. Can you be able to identify some of the fruit plants? Before you is a mango tree. It's the source of your favourite mango juice. Fruits in our diet provide us with Vitamins that we cannot do without. They also provide instant energy because of their high sugar content. What happens to our bodies in the absence of Vitamins?

Create your own fruit garden at home for a steady supply of fruits. Eat these fruits and obtain Vitamins. Other fruit trees found here include passion, strawberry, banana, orange and tomato tree.

### Stop 3

#### Plants that Attract Butterflies

Most of the plants at this point are brightly coloured. If you stand here for some time, you will observe butterflies visiting them for nectar. In the process, they carry out the service of pollination. Without pollination, crop yields in the world would decrease. We must appreciate the value played by butterflies and other insects in providing this free service. *Bring butterflies into your garden and save our beautiful pollinators!*

### Stop 4

#### Down the Memory Lane

Have you ever used a plant to recall an event? Plants with sweet smells have been used in many ways. Growing at this point are herbs that have memorial uses. Herbs have been used for religious ceremonies, perfumes and even medicine. Look out for the '*Tulsi*' or Basil herb at this area. Both Hindus and Christians regard this aromatic herb as sacred. No offering to the Gods by Hindus is complete without the leaves of it. On St. Basil's day, Christian ladies plant it in their orchards to remember the resurrection of Jesus.

Growing here also are Roses. Many people exchange them during Valentine's Day on February 14. What other plants are used to recall events?

### Stop 5

#### An Encounter with Living

##### Pharmacies

Plants have given our modern Western pharmacies some 7000 different medical compounds. Many of the modern medicines are obtained from plants. All around the world, people have relied on plants to stay healthy. Identify the Neem tree and Red stinkwood at this place. What are they used for?

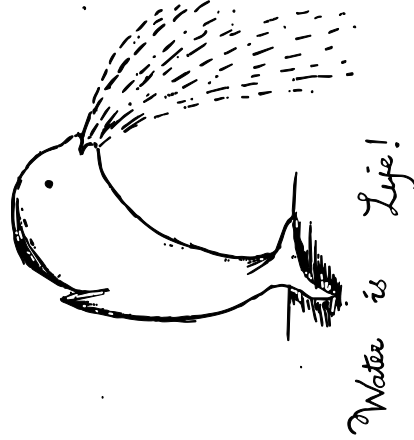
## AN INTERPRETIVE SIGNAGE DEVELOPED AT SAMAJ SCHOOL

"Under SCLP Charitable Trust"  
SHREE CUTCHI LEVA PATELSAMAJ SCHOOL

### **The Source of Life is Here!**

Did you know that almost 75% of our planet is covered with water? The small pond before you contains part of this water. A number of living things are in it. Closely observe signs of life in the pond. Can you name some of the animals and plants that you have seen? Think of life without water.

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## SOME OF THE ACTIVITIES GENERATED FOR THE KENYA HIGH WORKSHEET

### 1. Marvellous maths at the Trail

Locate a tall tree growing at the Silkworm Trail.  
Can you think of ways of measuring the height of this tree?

*Here are some ideas*

A clinometer can be useful when measuring heights. Make a simple clinometer from a piece of paper. You will require a piece of square paper and a tape measure.

- Fold the paper to make a right angle.
- Sight the top of the tree along the longest of the right triangle (This is called the hypotenuse). Keep the bottom of your triangle parallel to the ground.
- Measure the distance from where you are now standing to the base of the tree.

Your answer is ...

How tall are you? ...

Your own height plus the distance to the base of the tree will be the height of the tree.

The height of the tree is ...

Measure the radius and circumference of the Indian Ash tree.

Radius ...

Circumference ...

*Vital statistics*

You will need a leaf, a piece of a squared paper, some string and a ruler.

Your task is to calculate the area and the perimeter around the outside of the leaf.

On the squared paper trace the leaf and shade in.

Now count all the squares to work out the area of the leaf.

**Rules:**

All squares completely shaded count as 1 cm.

All squares half shaded or more than half shaded count as 1 cm.

The area of the leaf is ...

Decide upon a way to measure the perimeter.

The perimeter of your leaf is ...

Choose another leaf and calculate the area and perimeter.

### 2. Soil activities

Make a vertical cut into the soil using a soil auger.

Observe the soil profile. What does it tell you about the thickness of the soil at this Trail?

Look at the distinct soil layers, that is, the topsoil, subsoil, weathered rock and parent rock.

Discuss in groups the suitability of the soil profile in crop production. What would you expect to see here in ten years if clear cutting of the trees above the soil was done?

Carry a sample of the soil at a depth of 15 cm to your school laboratory and perform the following experiments:

- Determine the soil constituents using the sieve method.
- Determine the amount of water in the soil.
- Determine the amount of soil air in the soil.
- Find out whether the soil structure contains microorganisms.
- Observe the soil structure to determine whether it is blocky, columnar, platy, etc.

- Fell the soil to determine the soil texture. Discuss the importance of the soil structure in crop production.
- Determine the soil pH. Why is the knowledge of pH important?

### 3. Sensory Awareness

Sit quietly in at the recreation area. Close your eyes and listen carefully. Write about the different sounds that you can hear.

- What animals can you see on the trees? Identify the phylum to which they belong. Can you see any signs of the larger animals at the Trail?
- Identify more animals as you walk along the Trail.
- How can you see God's hand in your present surrounding?
- State some of the spiritual uses of this arboretum.
- Write a poem in both English and Kiswahili on God's creation about life at the Arboretum.

### 4. Pollution indicators

Lichens are the greyish green patches attached on this tree (Broad leaved Croton). They appear in many forms. Draw a sketch of lichen in your notebook.

Lichens are extremely sensitive to pollution from combustion of fossil fuels (especially due to sulphur dioxide from fuels). They are the first species to disappear in areas polluted with these fuels. They are known as pollution indicators.

Lichens are made up of two plants in one, an alga and a fungus. What role does each one of these play in the association?

Fungus...

Alga....

What is symbiosis?

### 5. Photosynthesis and the Carbon sink

It is now widely agreed that the earth is getting warmer due to the rapid increase of greenhouse gases (carbon dioxide, methane, nitrous oxides, chlorofluorocarbons) released into the atmosphere through human activities in the past few decades. If these gases are minimised in the atmosphere, then the rate of global warming would be slower and this is good.

Forests such as the one found at this Arboretum may help in reducing one of these gases. Which one? In this way, the forest serves as a sink for the carbon dioxide.

Explain the process by which the gas is used by the forest/plants? What is this process called?

The process that you have identified enables plants to make their own food. This form of nutrition is called *autotrophic* nutrition.