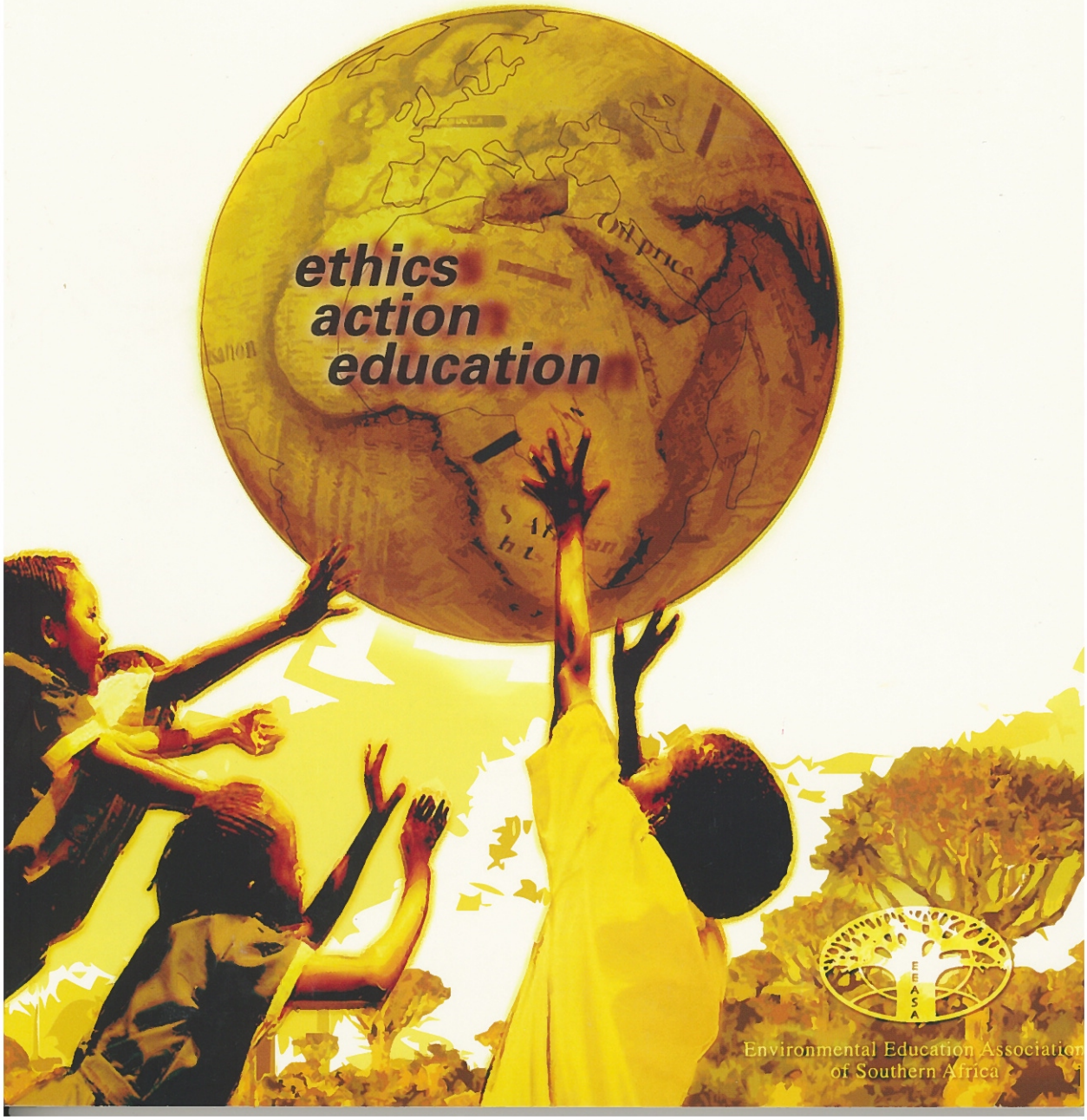
SOUTHERN AFRICAN JOURNAL of ENVIRONMENTAL EDUCATION

Vol. 28 (2011)



Southern African Journal of Environmental Education
Volume 28 (2011)

The Southern African Journal of Environmental Education (SAJEE) is an internationally refereed journal published once a year. The journal is published by the Environmental Education Association of Southern Africa (EEASA).

The SAJEE aims to publish and report on a wide range of aspects relating to Environmental Education, Ethics and Action in southern Africa and elsewhere. The journal seeks to further the study and practice of environmental education by providing a forum for researchers, scholars, practitioners and policy makers. The journal aims to carry papers reflecting the diversity of environmental education practice in southern Africa, and includes conference reviews and keynote papers, retrospective analyses of activities or trends in a particular field, commentaries on policy issues, comparative aspects of an environmental education, environmental ethics or environmental action issue, and critical reviews of environmental education, ethics and action in a particular country or context. The journal actively seeks out international dialogue in order to provide perspective on and for environmental education in southern Africa.

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The production of Volume 28 (2011) has been made possible through the generous support of the Southern African Development Community's Regional Environmental Education Programme, which is supported by Swedish International Development Assistance (Sida). Institutional support for the journal is provided by the Rhodes University Environmental Learning Research Centre (South Africa), in the Faculty of Education at Rhodes University.
Cover Design: Francis Lotz

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ISSN 1810–0333 ISBN 978-1-920489-47-2

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A Search for Conjunctions at a Time of Direction-setting Review and Synthesis

Rob O'Donoghue, Rhodes University, South Africa

This journal reflects a diversity of environment and sustainability education research and viewpoints alongside two synthesis papers. Read as a whole and within a widely held ideal that diversity reflects resilience, the environment and education for sustainable development landscape in Africa might be said to be healthy and proliferating. But read against the pressure to produce tangible evidence of change on an African landscape of persistent climate variation and poverty, along with a widening gap between rich and poor, the picture remains challenging. These contrasting readings are notable at a time when we are looking towards the Association for the Development of Education in Africa (ADEA) Triennial in February, 2012, the Rio+20 Earth Summit in June 2012 and our own EEASA +30 conference in September 2012.

The UN Decade of Education for Sustainable Development is characterised by a proliferation of education imperatives. These emerged as modern education in response to the issues of the day and now a modernity in deepening crisis. The scope of the change is notable in a UNESCO teacher education module that is today called Global Climate Change Learning for Sustainable Development (UNESCO, 2012). Here, education to address global risk is re-inscribed as learning to mitigate the impact of climate change alongside adaptive learning to change. In the lead-up to Rio+20 there is also an emphasis on learning as transition to a 'green economy' or for a 'green society'. The subtle differences in terms here are provoking as much intense debate as did the advent of education for sustainable development (ESD) over a decade ago.

The diversity in this journal challenges us to have a closer look at the ideals that shape and steer a globalising modernity. Here education, as emergent systems of reason, is orientated to shape citizens so as to mitigate risk that is being produced by the growth-orientated engine room of the modernist project, an issue that still remains relatively untouched by educative practice. To provide perspective on the scholarship in this journal, I loosely draw on aspects of works of Tom Popkewitz. His critical *History of the Present* exposes how the ideals of modernity bind us into education practices that, in response to emergent risk, are named and assume an inscribed rationale for mediating enquiry that raises awareness to steer the citizenry towards making the desired change. Responsive processes of reasoned practice emerge with an implicit 'philosophy of consciousness' that is prone to rhetorical marking and 'movement as an illusion of change' in the progressive trajectories of modernity. It is becoming evident that much of what has constituted the early twenty-first century enterprise of environment and sustainability education has unfolded as an engaging rhetoric for change through education for awareness. Learning to change has seldom engaged the underlying patterns of practice shaping risk.

The proliferation of new social movements and the advent of participatory practices in the 1990s has gone some way to enabling more critical purchase, reflexivity, border crossing and

transformative social learning, to seemingly produce cosmopolitanism landscapes of diverse knowledges and literacy practices to produce change. The research papers accepted through the review process, although not drawing on the analytical tools signified here as a touchstone for a critical reading of this journal, reflect a critical purchase on some of the surface and rhetorical practices in the modernist education project of ESD.

Shava critically examines tensions and contradictions in an appropriating institutional mediation of declining medicinal plant natural resources. Working with Foucault's concept of 'governmentality', the study probes power/knowledge relations around access to and the use of traditional medicinal plants. It tracks how power is distributed and primarily comes to be mediated by medical and conservation science institutions that exert control through the manner in which mediating knowledge is generated, recorded, accumulated and applied in the Western tradition to governing access to and the health-producing use of plant resources. An implicit standpoint design makes the marginalised plight of the traditional healer explicit with an attendant loss of governance, apparent against the commercial harvesting of common areas and the loss of access to heritage resources on land that is now under freehold and conservation agency governance.

In another take on modernity and knowledge, Dalelo probes the challenges of literacy on climate change amongst postgraduate students in Addis Ababa. He questions whether learners get an adequate grasp of climate change. Much of the work is focused on how informed the students are about the projected impacts of climate change in African contexts. It also probes student awareness on the measures proposed to address the problem that is read as climate change literacy. A question that remains open is a critical explanatory purchase on the processes that have produced and maintain a habitable planet.

In a similar search to deeply grasp the integration of environmental issues, Nsubungu probes the lessons of rural teachers. She sets out to develop a tool to review how teachers in rural schools are integrating natural resource management (NRM) issues in their lessons. Her project is orientated to work with educators on how they are able to bring NRM into their classrooms to make a success of the education enterprise in rural contexts where resources are often insufficient. Her note that there is little or no integration of NRM is telling, but her conclusions are positive and the call for further work reflects a confidence that comes with having a tool to probe a concern that was not clearly evident at the outset.

Finally, Muloongo also undertakes research on pedagogical practices, but from the context of museum education in Zambia. As a museum educator, he saw the prospect of expanding into community radio to add impetus to a school and community extension service that was difficult to sustain and was not drawing the community into the museum for necessary environmental information. The study reports a careful and in-depth review of community radio programming practices that attempt to engage social and ecological concerns. The researcher concludes his appraisal with a somewhat cautionary but informed position that will be invaluable to much of the widening environment and sustainability education enterprise.

All of these studies point to the importance of careful, situated work that raises questions or provides an in-depth view, suggesting to me that the southern African research field is rich in critical practice and insights. The challenge that diversity brings is that of knitting the insights derived in this and other research into a coherent perspective for the expanding field. The four

research papers reflect some of the diversifying practices in the region as an interesting backdrop to the two synthesis papers that follow.

Reddy takes up the age-old academic challenge of positioning his intellectual project through an inaugural lecture at his investiture as Professor of Environmental Education. It is interesting that he elected to tackle the vast and contested terrain of curriculum. In a time of continuing curriculum change he gives attention to the academic field and a rationale for some of the contested issues of the day that pose challenges to the academic as custodian of a vibrant and critical field into the future.

Lotz-Sisitka's synthesis paper, focusing on the re-orientation of teacher education towards sustainability in South Africa, brings together policy and practice in a national case study developed to inform deliberations on Education and Sustainable Development in Africa, which is the theme of the 2012 ADEA paper. The paper points to a need to re-think knowledge in teacher education, and highlights some of the more dominant knowledge practices in environment and sustainability education in pilot teacher education settings.

Both papers provide discursive maps for informing and steering a modern education system in transition. They gesture towards future trajectories that invite further research and deliberation in practice. Continuing to draw on Popkewitz for critical purchase here, I note after one of his earlier works, A *Political Sociology of Education Reform*, that education trajectories emerge within the ideological mix of the day, locating environment and sustainability education as both critical fields of research and reflexive modernist projects engaging the tensions and contradictions of the day.

Finally, the journal presents three viewpoints that were offered for review in a forthcoming year of ADEA and Rio+20 that may have all of us pausing to catch our breath and deliberate renewed focus at the EEASA+30 that follows in September. A reading of the research and position papers with a critical purchase on education in the modern state (after Popkewitz) suggests that proliferating categories and clustering of educational endeavour merit careful reflection as the variously named perspectives take the form of a rational enterprise for the common good and function to mediate the social dispositions of child and citizen in a complex of more globally integrated social figurations.

Each of the viewpoint papers reflects a dimension of positioning and critical review that seeks to map out a perspective for better practice to mediate social orientation to more sustainable and just modes of living together in a world of change.

Kulundu develops a view on the creative arts and the agency to change. As an experienced creative artist working in community theatre, she attempts to lift out an informed perspective on social learning in challenging contexts of creative engagement. She conducts a useful and elegant conversation with the literature and attempts to develop perspectives that can be drawn out of interdependent presence in the *mêlée* of collective action, with the critical eye of informed experience.

Zazu opens a conversation on heritage education. He takes a novel approach of clustering three points of contestation (evolving/dissonant; natural/cultural; tangible/intangible) for deliberative engagement with the literature and case examples in southern Africa. His viewpoint discourse claims to be a scoping of the contested conceptions that constitute heritage that might allow him to undertake research on heritage management and education.

Finally Mathibe, a Methodist minister, develops a Christian and African narrative on the stewardship of creation. He works with biblical verse and examples of environmental (socio-

economic and biophysical) risk on God's creation where humans have a stewardship duty. His narrative plays across Christian (biblical) and African (story and practices) ideas regarding creation to take up a standpoint of a caring response to emergent and latent environmental risks. The study is both a personal journey and a mediating piece that invites reflexive conversation.

In putting together this journal as guest editor, I was struck by the richness of the contributions of the reviewers, who critically probed the research claims and depth and detail expounded by authors who had offered their work for publication. In responding to the comments of reviewers, the complexity of the conversation lifted and what had started as a disparate set of papers and perspectives began to fall into place as direction-seeking discourses that all point to continuing change in the field. As EEASA enters a thirtieth year of review and celebration, it is evident to me that we have a resilient community of practice that has been working with a developing and changing range of education practices for enabling the production of more just, equitable and sustainable societies. The discourses have changed and will continue to do so, challenging the journal to maintain its practice of rigorous academic review in a positive way that is inclusive of and in constant search for emerging discourses that might open the way to better education for sustainability in the many evolving epistemologies of a global community at risk. This journal will continue to look to change, as the challenges will only get tougher. This will hopefully be at least as rewarding as the challenge of editing this journal that sets out to reflect and foster engagement on the discourses for mediating change-orientated social learning on pressing matters of environment and sustainability in Africa and beyond.

Rob O'Donoghue
Guest Editor

Note on the Contributor

Rob O'Donoghue is an associate professor in the Environmental Learning Research Centre, Rhodes University, South Africa. Much of his work is on emerging patterns of change-orientated learning in environment and sustainability education, with special emphasis on heritage knowledge and a primacy of practice in processes of learning-to-change. Email: r.odonoghue@ru.ac.za

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Inaugral Address
Environmental Education and Teacher Development: Engaging a Dual Curriculum Challenge

Chris Reddy, Stellenbosch University, South Africa

Introduction

Few events in South Africa have been as dramatic and sudden as the demise of apartheid (the institutionalised separation of 'races' in all spheres of life) and the introduction of a majority, multi-party government by democratic process in 1994. The events immediately following the demise of apartheid prompted a series of changes in the political and economic systems of the country. While political reorientation and economic redress were of immediate concern, there was also an acknowledgement of the importance of educational change in the rebuilding of the country.

Lotz and Olivier (1998) indicate that the change in government in 1994 has enabled fundamental change in the education policy environment in South Africa, which is primarily aimed at transformation at systemic, social and methodological levels. Johnson (1997) notes that educational policy changes are potentially far-reaching in that the proposals for education transformation are situated within a broader strategy for national reconstruction and development. Hargreaves (1998:vii), in writing about educational change in the United States of America, mentions that,

> [e]ducation change is everywhere. Never have so many schools and their teachers had to deal with so much of it. Responding to wide-ranging educational reform is an inescapable reality of teachers' work in the United States and most other advanced industrial nations as well.

Although this quotation refers to the United States, it is applicable and relevant to the current South African context, where widespread changes have been proposed for education at all levels. These changes needed to occur in a very compressed time frame. Polyzoi and Cerna (2001:64) suggest that educational changes under such conditions are like a 'living laboratory' that is different from the situation in more developed countries, where change occurs in an 'essentially stable societal context'.

Blenkin, Edwards and Kelly (1992) write that many attempts have been made to create conceptual frameworks for analysing and understanding the process of educational change and that a number of different though related perspectives have been offered. The authors add that such attempts have revealed the conceptual complexities of educational change and that social change has far greater ramifications than might at first be recognised. Change processes

are complex and they influence – and are in turn influenced by – many factors and conditions.

In essence, policy changes and developments have been influenced by socio-political conditions in the country as well as external political and societal factors, including global shifts in thinking about education and economics. However, implementation of policies occurs at local level and this requires adoption by and the support of educational institutions and professionals. I contend that the responses of teachers are an important indicator of the degree of support and adoption of change initiatives and policies and have located my research around this issue.

It is in this process of curriculum change and ferment that environment and environmental education entered the education debates on South Africa. In this paper I review the process of inclusion of environment in the South African curriculum and focus on the roles of teachers and their capacity to implement the environment as a curriculum concern in South Africa. In this paper I cover broader issues in environment and environmental education and also engage critically with issues of teacher development efforts implemented to develop capacity in this regard. It is not possible to unlink the processes of curriculum and teacher development as these complex processes are closely intertwined and impact on each other, presenting a dual yet integrated curriculum challenge for environmental education.

Currently, global environmental issues dominate the mass media, spelling doom and gloom for humankind. Amidst this furore there is often a call for education to 'do something' to address the problem. Environmental education as a field has been in existence for almost four decades, constantly engaging with both local and global environmental issues, and has in a sense served as a response to environmental issues and problems. Environmental education has been variously defined as understandings of the concept of environment broadened and changed and I use the essential description presented by Sauvé (2002:1) as a frame of reference for environmental education in this paper:

> EE [environmental education] is therefore not a form of education among many others; it is not simply a tool for environmental problem-solving or management. It is an essential dimension of basic education that lies at the root of personal and social development: the sphere of relationships with our environment, with our common home of life.

The importance of including environmental education in formal curricula is indisputable, but its implementation has often been described as less than ideal and below potential. Many authors have described environmental education as having potentially transformative impacts, and it is particularly what Robottom (1987) refers to as the 'counter-hegemonic' potential of environmental education or the ability to create the antithesis of a technical paradigm that tends to favour transmissive teaching of discipline-based curricula in education. At a time when the global environment has been described as unsustainable and in a crisis of galactic proportions, education approaches need to address the issues and problems of the day in order to contribute to reducing current problems and preventing future problems in the environment.

The implementation of curricula focused on environment and teacher development processes that will enable implementation of such curricula represent a dual challenge for

education at school and other levels and needs to be addressed so as to maximise implementation in meaningful ways and in this way to contribute to more sustainable living practices in the twenty-first century.

In this paper I argue for environmental education as one of the social agencies through which the transformation to an ecologically sustainable society can be achieved. I also highlight the importance of environmental education as a curriculum innovation in areas of national/international significance, such as environmental studies and teachers as change agents. Further, I provide a history of the field internationally as well as in South Africa. I trace the South African curriculum process to include environmental education and review teacher development approaches for educational change in general and for environmental education in particular. It is my contention that to promote these ideals and take up the dual challenge outlined, we need to respect the complexity of the challenge and deal with curriculum and teacher development as complex processes. This, in turn, requires a departure from what Stevenson (2007a) calls the traditional organisation of schools, which constitutes a major barrier to change and transformation, as it encourages the reproduction of dominant social values and safeguards the status quo, a vital error in these times of environmental crisis.

The Concept 'Environment' and a Perceived Environmental Crisis

Since the early 1970s, often seen as the start of the environmental movement, there has been a growing social awareness of the negative consequences of most human–environment relationships. There is increasing evidence of ecosystem change and destruction and thus malfunction, making it impossible for the environment to support human needs and life. Environmental problems are diverse and include global warming, deforestation, biodiversity depletion and population resource imbalances. Edwards (2011:1) suggests that these relationships are 'unsustainable and indeed detrimental to human life and will undoubtedly lead to an irreversible plummet: a rapid decline in life caused by a cascade of global environmental changes unprecedented in human history'. Even more ominously, Suzuki (2003) argues that the rate of population growth and use of the earth's (natural) resources will lead to a decline in the capacity of the earth's systems to continue to support human needs.

Environmental problems have reached unprecedented levels to the extent that few would disagree that our planet is on the brink of ecological disaster. Many environmental problems, such as climate change, transcend national borders, but the effects thereof are felt by local communities (Le Grange *et al.*, 2011). Many of the problems mentioned above are visible, manifest in many locations and are linked to a variety of causes. The root causes are often found in human activities that are detrimental to the ecosystems of the earth.

Before we continue, however, we should note that the term 'environment' is a complex social construct. As Di Chiro (1987) points out, we imbue a concept with meaning by virtue of providing a name for it. She says:

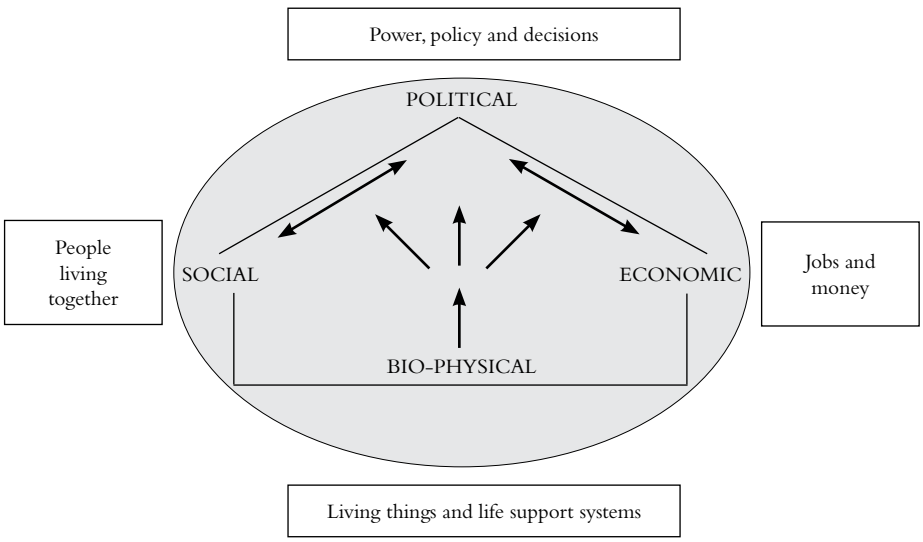
> We define (the environment) as such by use of our individual and culturally imposed interpretive categories and it exists as the environment the moment we name it and

> imbue it with meaning. Therefore the environment is not something that has reality outside or separate from ourselves or our social milieu. Rather it should be understood as the conceptual interactions between our physical surroundings and the social, political and economic forces that organise us in the context of these surroundings. It is in this sense that we say the concept environment is *socially constructed*.

Fein (1993) sees 'environment' as essentially a social construct that can be viewed as having interacting ecological and social activities in various dimensions. These are largely human activities (social) and natural processes (ecological) that reflect the concept of human–nature interactions or socio-ecological systems. In these terms, the environment is essentially a product of these interactions and can be viewed as different dimensions interacting with each other and providing a balanced life. However, these interactions have deteriorated to a state of, as described by Edwards (2011:1), 'humanity sitting on the edge of a precipice faced with making decisions that will influence life on earth'. She adds that the current state of affairs on earth has been presented as an environmental crisis of global proportions that is threatening the very existence of humanity.

The diagram below (see Figure 1) shows the interdependence of humans and nature, often referred to as the socio-ecological interactions described above. The main activities of humans as indicated are social, economic and political, and these all impact on the natural or biophysical environment in various ways. These activities include exploitation of natural resources for manufacturing various products used by people as well as developing what is often called the human environment.

Figure 1. Socio-ecological interactions



The diagram illustrates that environmental problems have multiple and interacting dimensions and that the biophysical dimension forms the base that supports all life and all human activity, manifesting in the interacting social, economic and political dimensions. The environmental problems described above are largely evidenced in the biophysical environment and are often described as a consequence of negative socio–ecological interactions. These have been linked to humankind and are often seen as contested problems with varying interests and are thus described as environmental issues. A simple illustration is one of development as opposed to conservation. A local developer in the area where I live wants to build a small shopping mall. However, the site earmarked is one of the last remaining pockets of natural fynbos veld so the development is being contested by local residents led by a conservation-oriented organisation. Promises of convenience, potential jobs and an improved local economy are countered by the need for green open space, the importance of conservation of rare biodiversity, aesthetic issues and the social problems often associated with such developments, including loitering and traffic congestion. This local problem is magnified on a global scale and includes deforestation to provide resources (like trees for wood pulp or wood), mining and manufacturing plants and the resultant negative impact of air, ground and even noise pollution and the loss of habitats and biodiversity. All these have an impact on the ecosystems of the earth and their ability to maintain balance on earth to allow for habitation and the preservation of biological life as we know it.

Authors such as Beck (1992), Capra (1983:3) and Le Grange (2004:3) argue that the roots of the current environmental crisis lie in modernism, which began with the European philosophic and scientific revolutions of the seventeenth and eighteenth centuries. According to Le Grange and Reddy (1997), this environmental crisis has manifested itself globally as large-scale biophysical destruction, global warming and other environmental issues. The authors also suggest that these issues have complex interacting social, economic and political dimensions and that human lifestyles characterised by consumerism, unbridled economic growth and materialism have exacerbated the problems. Furthermore, curricula in schools play a major role in reproducing the ecologically unsustainable values in modern society, thus contributing to the environmental crisis.

Early responses to environmental problems by scientists highlighted a variety of problems related to the use of pesticides, biodiversity loss as well as increases in human populations and resource use. Much of this evidence was collated in later investigations funded by and published as the *GEO-2000 Report* (GEO, 2000), which provided a shocking account of the state of the planet. *Time Magazine* presented a more popular version of the crisis in its articles 'Situation critical' (Linden, 2000) and 'The tipping point' (Kluger, 2006). These publications show the negative impact of the interactions between humans and nature and describe humanity as being on an unsustainable pathway if its destructive lifestyle and activities persist. According to Fein (1993:64), ecological sustainability concerns relationships between people and nature and includes the following elements: interdependence (people are part of nature and dependent on it), biodiversity (all life forms should be respected by people), living lightly on the earth (biophysical resources should be used carefully and degraded ecosystems should be restored) and interspecies equity (all life forms have value independent of their perceived importance to humans). Environmental education is one of the responses to the crisis we appear to be facing.

Environmental Education: A Response to Environmental Issues and Problems?

The field of environmental education is complex and has developed almost parallel to the social movements in environment and ecology. I will briefly trace the history and development of the field internationally and also highlight significant moments in environmental education in South Africa.

Environmental education is a complex concept open to many interpretations. Janse van Rensburg (1994: 4) argues, '[e]nvironmental education is widely regarded as a key response to the Environment crisis'. Much of the formal work in the development of environmental education was spearheaded by international agencies such as the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the United Nations Environment Programme (UNEP) internationally. This formal work included international conferences starting as far back as the United Nations Conference on the Human Environment (Stockholm Conference) in the early 1960s, the Belgrade Conference in 1968 and the early and important UNESCO Conference on Environmental Education held in Tbilisi, Georgia, USSR, in 1977. The main idea was that environmental education should be viewed as a process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems and that has the knowledge, attitudes, motivation, commitment and skills to work individually and collectively toward solutions of current problems and the prevention of new ones. A set of principles for environmental education was also developed. All these conferences developed some form of charter or position on environmental degradation and often provided guidelines and ideas for environmental education. The Tbilisi conference has by far been the most influential and the principles developed there for environmental education are as valued and highly regarded today as in 1977 when they were first formulated.

The 1992 United Nations Conference on Environment and Development held in Rio de Janeiro was another landmark event that had strong implications for the direction taken by the field. The idea of sustainable development was promulgated here and a set of principles for sustainable living was developed and disseminated. These principles aimed at promoting sustainable development and improving the capacity of people to address environment and development issues. At the Earth Summit held in Johannesburg in South Africa in 2002, a Decade of Environmental Education for Sustainable Development (2005–2014) was declared, and many countries, including South Africa, were signatories to this declaration.

Le Grange and Reddy (1997) indicate that early approaches to environmental eduation have been assessed as being rather narrow in terms of the conceptions of environment, the nature of the crisis and the kinds of action to be taken. Environment was mainly seen as synonymous with nature, with a focus on ecology and biophysical surroundings. Now, however, environmental educators accept that the concept of environment includes interactions among the social, economic, political and biophysical dimensions.

Lotz-Sisitka (2002) notes that environmental debates and discussions have expanded. There is now increasing emphasis on the need for education to respond to the wide-ranging complex environmental issues and risks and environmental education seems to be emerging as the best approach as a broader understanding of the environment is developed. Environmental education

has experienced many shifts and name changes (Tillbury, 1995), with the most recent shift linked to environmental education for sustainable development (ESD), which is linked to the declared Decade of Environmental Education of the United Nations (2005–2014). Robottom (2006) refers to these processes as an ongoing re-badging of environmental education with little change to the substance and processes of the field.

In the next section I briefly describe the formalisation of environmental education in South Africa.

Development of Environmental Education in South Africa

For a long time environmental education was not part of the formal curriculum and was largely encouraged by conservation organisations, non-governmental organisations and individual teachers. Many other organisations, such as the Environmental Education Association of Southern Africa (EEASA), also adopted and advanced the agenda of the formalisation of environmental education into formal education curricula. The first formal discussion concerned with environmental education included discussions related to a white paper on it in 1989. Not much came of this as bigger developments were occurring politically and socially with potential impact on education in the country. For this progression in South Africa, I draw largely on the work of Lotz-Sisitka (2002).

One of the first formal groupings, which in a sense emanated from EEASA membership, was the Environmental Education Policy Initiative (EEPI). This group introduced a participatory policy-making process to environmental education curriculum work in South Africa just prior to and after the first democratic election (Lotz-Sisitka, 2002). An important contribution was the inclusion of environment in the broader education debates and its eventual inclusion in the Education White Paper of 1995, which paved the way for environmental education in the formal curriculum. As the policy process evolved into a curriculum process, the EEPI shifted its emphasis to curriculum and was renamed the Environmental Education Curriculum Initiative, (EECI). The EECI was a state–civil society partnership project (1996–2000), enabling staff from the Department of Environmental Affairs and Tourism, provincial government education departments and environmental education practitioners to give inputs into the emerging new school curriculum known as Curriculum 2005 (Lotz-Sisitka, 2002). The above initiatives represent the major national curriculum intervention in environmental education curriculum development work between 1992 and 2002 and eventually led to the inclusion of environmental education in the formal curriculum, as is discussed later.

In South Africa environmental education was introduced into the formal school curriculum for the first time in 1997, when a new curriculum framework (Curriculum 2005) was instituted. Curriculum 2005 has since been revised, and in the year 2002 a Revised National Curriculum Statement (RNCS) for General Education and Training (GET) was introduced. General education refers to the first ten years of compulsory schooling and the first four levels of Adult Basic Education and Training (ABET) in South Africa. One of the five principles on which the RNCS is based is social justice, a healthy environment, human rights and inclusivity. In the elaboration of this theme, two important points are made: the South African curriculum

should play a role in creating awareness of the relationship between the different elements of this principle, and the principle should not be advanced in a single learning area only but instead should be integrated into the discursive terrains of all eight learning areas. In 2006 a new curriculum was phased in for Further Education and Training (FET), and as in the case of GET, environmental concerns have been infused into the learning outcomes and assessment standards of all subjects (Le Grange *et al*., 2011).

Including environmental concerns in national curriculum frameworks might be necessary and an important step. However, certain challenges are associated with this development in the South African context. It is not automatic that implementation will happen and barriers and impediments were encountered. One of the major 'obstacles' was the capacity of teachers to implement the environmental education content in the curriculum. The attitudes and skills of teachers are central in determining the mix of different types of knowledge, skills and affective objectives in environmental education programmes and the political and social interests that they serve (Fein, 1991). Stevenson (2007b) indicates that principles that frame the environmental education (sustainability) discourse need to be translated into curriculum and pedagogical practices. This will intellectually and emotionally engage students in developing deep, meaningful understandings and enduring dispositions, by no means an easy or simple task for teachers. Simply put, policy discourse must be (re)-contextualised and transformed by teachers into their own discourse of practice and, most importantly, into pedagogical actions.

However, most teachers have not been assisted in this task because environmental education policy and academic communities have maintained a focus on the development of environment-related goals and have neglected to probe deeply enough into pedagogy, particularly at the level of the teacher (Stevenson, 2007b).

If environmental education is to be one of the social agencies through which the transformation to an ecologically sustainable society is to be achieved, the role of teachers as change agents is vital. Environmental education is important to promote curriculum innovation in areas of national/international significance, such as environmental studies. I take a detour into the field of teacher education and professional development in this area in the next section.

Teacher Education and Teacher Development for Environmental Education: Engaging Curriculum Issues

Teacher education is generally viewed as the formal and systematic preparation of teachers for professional work (Garm & Karlsen, 2004). Tatto (1997:405) writes that 'teacher education refers to organised (formal) attempts to provide more knowledge and skills to prospective or experienced teachers and occurs in either education institutions or school contexts'. Garm and Karlsen (2004) describe teacher education (in Europe) as a field filled with a high degree of complexity and variation yet with common trends identifiable. Teacher education programmes, however, seem to be much the same throughout the world, and Tom (1995) indicates that programmes in the United States of America have not changed in almost a hundred years. He describes the general structure of teacher preparation courses as including several foundational courses followed by so-called 'methods' courses that are capped by a few months or weeks of

apprenticeship or student teaching practice (practicum). This model is widely applied in South Africa.

As part of the changes in education, the teacher education system was also overhauled in this process as part of both educational change and transformation of the higher education sector. As part of this transformation, teacher education shifted from being a provincially controlled activity to a national competence (Sayed, 2002). This in turn involved the shift from the dominance of teacher education colleges as providers of teachers to university faculties of education as providers of professional education for teachers (Gordon, 2009).

In addition to the political and social transformation in South Africa, teacher education has had to adjust to societal shifts towards what Green (2004) refers to as a technologically textured, knowledge-based form of social existence and organisation. Robinson and McMillan (2006:327) indicate that 'teacher educators, in addition to keeping up to date with developments in their discipline, also have to keep abreast of a range of new curricular and policy imperatives in the country'. Sayed (2002) indicates that the school curriculum, Curriculum 2005 (and subsequent revisions), committed the education system to an outcomes-based approach with learning areas instead of subjects, which had further implications for teacher education, training and provision. Robinson and McMillan (2006) further indicate that this has placed pressure on teacher educators who now have to prepare teachers for schools very different from the schools they experienced. This highlights an important curriculum debate for teacher education on whether what happens in schools should influence teacher education curricula. This is where environmental education featured as this presented a new challenge to teacher educators, most of whom were probably not introduced to environmental education in their own teacher education or studies beyond initial teacher education.

Fein (1991) indicates that there has been a historical inattention to environmental education in teacher education programmes. Not much has improved in this sector recently and although formally required to include environmental education, many institutions were left wanting in terms of its introduction into teacher education programmes. With environmental education in the school curriculum, this presented a problematic scenario and did not augur well for environmental education in the formal teacher education sector.

Teacher Development and Professional Development for Environmental Education

In-service teachers also need to overcome the disadvantage of not having had environmental education in their initial teacher education (Lotz & Robottom, 1998). Little and Houston (2003) indicate that viewing the shift in approach to teaching and learning as a change process necessitates providing new and deeper levels of knowledge and practice necessary for quality professional development while focusing on policies and practices, such as curriculum. The implication of this is that teachers have to be given the opportunity for further education and training so that they can fulfil their changed role. This has been part of the change process in South Africa, and I discuss programmes and processes currently running in South Africa.

What do programmes for in-service teacher education (INSET) presented for teachers look like generally, and what is considered as 'good' INSET processes? Professional development

(PD) has been given a number of meanings in academic literature, which makes it difficult in practice to define the answer. In a broad sense, PD covers all forms of learning undertaken by experienced teachers, from courses to private reading to job shadowing (Craft, 1996). PD has also been used to describe moving teachers forward in knowledge or skills (Bell, 1994). In addition, Craft (1996) refers to in-service learning, in-service education and in-service training as PD as they provide opportunities for teachers to learn.

PD has also been variously described in the literature and is used fairly loosely and interchangeably with INSET. Craft (1996) indicates that both terms tend to cover a wide range of activities designed to contribute to the learning of teachers who have completed their initial teacher education. Similarly, Veenman, Van Tulder and Voeten (1994:303) describe INSET as 'a coherent set of activities to deepen and broaden knowledge attitudes and skills that are directly connected with the profession of teaching to improve teachers' professional competence and the effectiveness of their school'. Little and Houston (2003:76), however, take a broader view: '[p]rofessional development is a goal-orientated and continuous process supported through mentoring, coaching and feedback and contextualised to address the perceived needs of students within individual classrooms and schools'. Evans (2002:134) indicates that teacher development can be seen as a developmental process including the stages of 'awareness of an imperfect job related situation, formulation of remedial action strategy and effecting remedial action'. The term is used here to mean all types of professional learning undertaken by teachers beyond the point of initial training, the concomitant skills learnt and developed in these learning processes, and changes in approaches to practice resulting from them.

In South Africa, INSET and PD programmes currently offered to teachers are related to school reform and educational transformation. If teachers in schools are to meet the needs of all students and implement the curriculum imperatives developed in policies (Curriculum 2005 and the RNCS), the instructional practices (teaching approaches) of teachers are one aspect of the education system that must be examined. In order to change instructional practices in meaningful ways (learn new instructional practices), teachers must not only need to learn new instructional practices and content but must also alter their current practices through a revised process of professional development that includes continued support.

The formal processes described by Reddy (2004) included mainly advocacy campaigns during which teachers were introduced to new terminology and ideas for teaching and learning. Very few opportunities were provided for putting new ideas into practice, as advocated by Bell and Gilbert (1994).

The Environmental Education Programme University of Stellenbosch (EEPUS) was established to promote environmental education in the Faculty of Education at Stellenbosch University. In the years since its establishment, EEPUS staff members have introduced environmental education into all programmes in the Faculty of Education and have been instrumental in developing many resource materials for use in pre-service courses in the faculty and by in-service teachers during in-service teacher education aimed at continuous PD. The main operational thrust at EEPUS has been by way of a triadic relationship between materials development, professional development of teachers and curriculum development. The materials developed through consultative processes have served to assist curriculum innovation,

development and innovation, which in turn have had an influence on the professional development of teachers.

Further work was done as part of other national initiatives, such as HSRC meta research on environmental education (Le Grange & Reddy, 2000; Louw, 1999; Reddy, 2000). All were geared towards assisting teachers with the challenges of environmental education implementation in the formal school curriculum.

The Learning of Sustainability pilot project, a donor-funded pilot project (1997–2000), focused on the professional development of teachers to enable them to enhance their skills for learning programme development in a context of rapid curriculum change in two provinces (Janse van Rensburg & Lotz-Sisitka, 2000).

The National Environmental Education Project for General Education and Training (NEEP-GET) was a large-scale, donor-funded initiative (2000–2002) aimed at providing professional development to curriculum advisors and teachers to enable the integration of environmental learning in schools. This project operated in all nine provinces (NEEP-GET project document, 2005).

These processes have been running parallel to formal processes in some cases and concurrent with these processes in other cases. All have been focused on professional development in environmental education to provide opportunities for teachers to better implement the curriculum imperatives for environmental education documented in curriculum documents for schooling and other formal education processes. Has the dual challenge of curriculum implementation for environmental education and teacher development been taken up, and has some headway been made in these processes?

Environmental Education Curriculum and Professional Development as Complex Social Processes

The term 'curriculum' has been variously described in literature and texts in education. The construct is complex and is linked to and influenced by many social processes and interactions. According to Goodson (1997), the most popular interpretation remains the literal interpretation of curriculum, as based on the original meaning of the word as derived from the term *currere*, which means to run or to move and was literally a description of the track on which athletes competed or on which chariot races were held. It seems an appropriate metaphor in educational discourse to refer to the processes that educators plan and through which learners proceed to reach certain learning objectives or outcomes.

Curriculum can be described as the sum total of learning opportunities provided and can include aspects that affect learning processes directly and indirectly, aspects such as teaching methods and styles, our views of and interactions with learners and the ways in which assessment and evaluation is done. The resource materials used (or not used) are important functions of curriculum or curriculum choices. Apple (1983:111) describes curriculum as 'educative environments in which students are to dwell' and Grumet (1981:115) describes curriculum as the 'collective story we tell our children about our past, our present and our future'. Dillon (2009:347) indicates that teachers enacting curricula are faced with a number

of practice questions which influence choices. These include what should be taught, by what means, to whom, under what circumstances and with what in view. These elements he suggests all form part of the enterprise called curriculum and link to a fundamental question teachers are faced with during implementation: 'how to think and act' (Dillon, 2009:349).

Environmental education as a curriculum process fits into all the above descriptions and has had an impact on teachers' work and practices. In referring to the many groups that successfully shaped the curriculum in distinctive ways, Chisholm (2005:199) mentions the environmental education lobby as having agitated for 'recognition of environmental issues across the curriculum'. She credits this group with emphasising the 'integratedness' of knowledge. Through a ministerial advisor on environment, this lobby sought to raise knowledge, skills and awareness of sustainable development in all learning areas. Significantly, Chisholm (2005:199) concludes that 'a healthy environment became a key concept in curriculum'. Since the process was not entirely inclusive, environmental education may be construed, like many other changes, as a top-down imperative. It has certainly been construed in this way by many teachers. It has also been frustrating. As Wexler (2002:471) writes, school reform and curriculum have a big impact on the day-to-day working lives of teachers:

> The point is that incorporating school reform into the working day of teaching requires not only expertise and sagacity. It is an enormous amount of often frustrating additional work that is taken on by teachers, sometimes as an organic professional innovation and at other times as a no less professional adaptation to an external imposition which becomes part of a changing definition of good professional performance.

According to Collinson, Kozina, Yu-Hao, Ling, Matheson, Newcombe and Zolga (2009), nations typically try to institutionalise new ways of thinking and educational innovations by means of policies, and South Africa is no exception to this. Policy implementation is, however, left to practitioners, although they may have had little or no communication with policy makers. Thus even if policies represent desirable change, like environmental education in this case, significant difficulties and unintended consequences may surface during implementation in schools. The authors indicate that top-down policies may fail because practitioners have not been given the reasoning behind new policies or linkages to existing practices.

Collinson *et al.* (2009) indicate further that sometimes an educational policy is created in isolation or it may be inconsistent with existing financial or social policies, that sometimes short-term political thinking may weaken social goals or aspirations and that sometimes existing structures and norms in schools are inadequate to support innovative thinking and policies. This resonates with Stevenson's (2007b) view that existing school practices serve as barriers to environmental education implementation.

In 1997, Le Grange and Reddy argued that outcomes-based education and environmental education were incompatible. They also warned that the formalisation of environmental education in the school curriculum could lead to diluted forms that were narrowly linked to predetermined outcomes. They point out that the perceived mechanistic, reductionist and instrumentalist epistemology of outcomes-based education might be antithetical to

the holistic understanding of knowledge in environmental education, which is accepted in environmental education circles worldwide. The authors also point out that outcomes-based education tends to favour a narrow conceptualisation of environmental education that entails moulding learners through behaviour modification. Le Grange and Reddy further share the sentiments of Robottom (1996), that formalisation could rob environmental education of its important counter-hegemonic nature. It might be better for environmental education to remain peripheral than to be in the central education debate and risk losing its socially critical character, which is invaluable in dealing with environmental issues and problems. Curriculum debates and inclusions are not simple linear processes (Clarke & Collins, 2007), as will be illustrated later.

Stevenson (2007b) indicates that the gap between policy rhetoric and school practices in environmental education has not only persisted, but also appears to have increased over the past 20 years. Stevenson argues for reconceptualising the rhetoric–practice gap so that practices in schools are not simply assessed in relation to policy discourse, but so that policy discourse itself is re-examined in relation to teachers' practical theories and the context shaping their practices. Although the structures and norms of schooling continue to work against enquiry-based, action-oriented environmental education practices, several trends are identified that can offer promising spaces or opportunities. However, this requires fairly sophisticated and willing responses from teachers to engage the processes, and often capacity is lacking, as is the case in South Africa. Do PD programmes for teachers hold some hope for environmental education implementation?

Professional Development Processes as Complex Activities

Some of the programmes presented to teachers, as described in Reddy (2004), particularly the formal programmes, were the exact opposite of what is conceptualised as 'good' or 'effective' processes for professional development in environmental education. There are probably both logistical and academic reasons for this, but it has not served the cause of environmental education well. Other programmes, such as the NEEP, Learning for Sustainibility (LFS) and various EEPUS programmes, have strived to incorporate what is considered to be good practice for environmental education. The six important characteristics for environmental education professional development, namely contextual, responsive, emergent, participatory, critical and praxiological, shaped the conceptualisation of the programmes (Robottom, 1987; 2000) presented in these instances.

Effective professional development, according to Little and Houston (2003), is a complex and comprehensive process of change, including multiple constituents within a system. Fullan (1993:257) suggests that to achieve a desired change, 'professional development must be reconceptualised as continuous learning, highly integrated with the moral task of making a difference in the lives of diverse students under conditions of somewhat chaotic complexity'. Garet, Porter, Desimone, Birman and Yoon (2001:925) indicate that teachers need to be involved closely in the PD and INSET processes. They refer to active learning, which they describe as providing opportunities for teachers to become 'actively engaged in meaningful discussion, planning and practice, particularly how new curriculum materials and teaching

methods will be used in the classroom'. According to these authors, this active learning would include opportunities to link ideas introduced during professional development experiences to the teaching contexts in which teachers work.

Fraser, Kennedy, Reid and McKinney (2007) provide lenses for examining PD processes. They use the ideas of Kennedy's (2005) to illustrate that PD processes can provide learning opportunities that can be located along a continuum where the underpinning purposes of the modules can be categorised as transmissive, transitional and transformative. Transmissive professional learning is generally viewed as the top-down, uni-directional, technical, expert-driven processes whereby experts teach others who are passive, and it thus does not support professional autonomy. Transitional professional learning has the ability to support transmissive and transformative processes. It includes coaching and mentoring whereby some external support is provided but some space exists for adaptation and development of communities of practice using initial ideas. Transformative professional learning suggests strong links between theory and practice and promotes internalisation of concepts and construction of new knowledge by participants and its application in situations of the professional and political context. This approach supports considerable professional autonomy at both individual and profession-wide levels.

Fraser *et al.* (2007) further use Reid's quadrants of professional learning for analysis of learning from programmes. This model comprises a two-dimensional quadrant with formal–informal learning as one axis and planned–incidental learning as the other axis. Formal opportunities are organised by outside agencies and informal opportunities by teachers themselves through networking. Formal learning therefore represents planned opportunities that are pre-arranged, and informal learning has more of an incidental nature, often spontaneous and unpredictable.

A combination of the work of Kennedy (2005) and Reid (Fraser *et al.*, 2007) seems to suggest that a mix of transmission and transformative opportunities for learning, and combinations of formal as well as incidental and informal opportunities, would have a strong influence on teacher learning. This points to less rigid and more open processes for teacher learning.

Collinson *et al.* (2009:4) indicate that the twentieth century has marked a rare conceptual revolution that has affected countries and individuals by reframing understandings of change. They write:

> Gone are formerly accepted modernist concepts such as closed system models, stability and certainty, natural laws and order and linear thinking. These have been replaced by postmodern concepts such as organic systems, unpredictability, interdependence and constructed perspectives.

Collinson *et al.* (2009) indicate further that this kind of thinking envisions systems that are self-regulating and capable of transformation in an environment of turbulence. In this setting, the teacher's role is no longer causal but is seen as transformative. The authors indicate that this implies that teachers require advanced continuous learning as well as opportunities to engage in dialogue and enquiry to create new knowledge. Clarke and Collins (2007) suggest that teachers need opportunities to work collaboratively, disseminate their learning and contribute to their own and their colleagues' and the organisation's continuous learning.

Environmental Education Curriculum, Teacher Development and Complexity Theory: Will the Curriculum Caterpillar Fly?

Both curriculum processes discussed above clearly show the features of what Clarke and Collins (2007) describe as complex systems. Clarke and Collins (2007) use Weaver (1948) to distinguish among systems. Weaver worked at a time when 'scientists' divided phenomena into two main categories for investigation: simple and complicated, later called complex. Simple phenomena have few variables in their interactions, and it is possible to predict possible outcomes fairly accurately. Complicated or complex phenomena have many variables and it is difficult to predict or specify exact outcomes. Over a long period of time, outcomes can be predicted within acceptable limits and even with some confidence.

Complex phenomena have many variables but the outcomes are rarely predictable. Weaver observed that when outcomes emerge, they are not random but display a unique pattern. Complex phenomena seem to have an inherent unpredictability about them, but at a critical point, referred to as 'emergence' by Johnson (1997), they display a clearly discernable pattern. In short, Clarke and Collins (2007:161) indicate that 'complex phenomena represent interactions of events and practices that coalesce in ways that are unpredictable but nonetheless highly patterned'.

Important characteristics of complex systems are the following:

- Networks - Complex systems exhibit networked rather than hierarchical structures. This means that there are multiple horizontal lines of control, as opposed to vertical lines of control (Senge, 1990). Complex systems are thus difficult to control or constrain. Multi-branched or non-linear complex systems mean that development occurs but the exact direction is unknown prior to its emergence.
- Feedback loops - Networks allow loops that provide opportunity for learning at local level. This means that new knowledge returns to and is taken up at the point of origin. This provides quick communication due to multiple branching as there is no single point for order, direction control or organisation.
- Self-organisation - Stacey, Griffin and Staw (2000) write that self-organisation refers to patterned behaviour arising from agents interacting locally according to their own principles or 'intention', in the absence of an overall blueprint for the systems. Complex systems can have the capacity to change and alter based on information sent and received at the local level, independent of an authorising and directing agent. Local effects can thus have system-wide implications. It is, therefore, not possible to fully control or know a complex system, which means that we must accept that there is an element of indeterminacy.
- Disequilibrium - This runs contrary to the notion that successful systems need to have a state of equilibrium as an essential characteristic. Stability is important for closed systems, but because of the generative potential of open or complex systems, it is important to have a degree of disequilibrium as this creates opportunity for change and development and allows for spontaneity and the capacity to change.

- Nested nature of complex systems - Davis and Sumara (2005) note that complex systems are systems within systems. Complex systems are a collection of similarly complex systems and are part of larger complex systems, for example school districts and provincial and national political processes.

A complex phenomenon is therefore irreducible. It transcends its parts so it cannot be studied strictly in terms of a compilation of those parts and must be studied at the level of emergence. The characteristics of complex systems, namely networks, feedback loops, self-regulation, disequilibrium and nested nature, represent dynamic interactions that cannot be accounted for by simple or complicated views and applications/renderings.

Haggis (2005), in Clarke and Collins (2007), notes that if a sufficient number of these interactions take place over a sufficiently long period of time, forms of order or organisation will periodically emerge from within the system. It should be noted, according to Clarke and Collins (2007), that it is possible for all these characteristics to exist. However, there is no guarantee that complexity will emerge.

It is clear that environmental education as a curriculum process and professional development for environmental education are complex systems. I believe that we should take Clarke and Collins's (2007) warning seriously that control kills and stifles and is a sure way to ensure that innovation is stillborn. These systems can and will become moribund in regimes of high control that stifle the qualities inherent to complex systems. Davis and Edwards (2001) use the analogy that caterpillars need to develop into butterflies by a complex process and will not fly if *we* add wings to them. Similarly, complex processes such as curriculum for environmental education and PD for teachers need to unfold in time to develop the outcomes they show the potential for in education.

Concluding Remarks

Education is a dynamic social process that is influenced by different and varying social and political conditions and it needs to adapt and adjust often. It is, however, well known that education is a notoriously conservative 'enterprise' that requires much effort to effect change.

Morrow (2001:1) captures the essence of this change process in education in South Africa when he writes:

> Although the social and political world never remains stable for very long there are key symbolic moments of change, and 1994 provided such a euphoric moment in our shared experience. However, social transformation itself is not a single dramatic event, it takes decades (sometimes centuries) to unfold and requires the combined efforts of many people … Social transformation always raises fundamental questions about education, schooling and teaching. Embedded convictions that carried our thinking and practices fairly comfortably in the past are challenged by the new situation, and issues we once thought settled press forward for articulation and reconsideration.

While no one doubts its importance, the implementation of environmental education leaves much to be desired. Since the continued existence of humankind is at stake, it is vital that this be set right. However, for this to happen, we need to acknowledge the complexity of the field of environmental education and the many influences on it. Hoban (2002) suggests that education and change in education are a dynamic and complex system, where varying aspects of the field impact and are in turn impacted on by other aspects and activities in the field by way of complex interactions that are self-limiting and yet open. It is my contention that education would best be viewed, treated and practised in this manner.

In the practical world of schools, shifts are neither simple nor easy, especially in environmental education as there are major differences in aspirations of it, as laid out in policy discourses internationally, and dominant purposes and structures of schooling in Western industrialised societies (Stevenson, 2007a). Thinking about schooling in the short-term frequently subverts collaboration, which is more time-consuming and messy, but real change requires long-term visions of schooling and society and new understandings of learning and the assumptions underpinning curriculum and teacher development.

Stevenson (2007b) states that teachers are both subjects and agents of change. They have their own practical theories of education and their own understanding of the practical and conceptual constraints of their work. Although practical theories are often tacit, any new policies, frameworks or ideas are filtered through the lens of theories and dominant ideologies. According to Collinson *et al.* (2009), education policies that are not coherent with or supported by social and financial policies have a long history of failure and unintended consequences. Teachers and other knowledge workers in a world of change need continuous PD, some from the bottom up and some through collaboration. Recent emerging trends for broadening and enhancing teacher learning through continuous PD suggest that a collaborative model for change can contribute to better understanding, stronger policies and improved implementation in schools. Discourses of professional learning that reflexively build, sustain and develop spaces for meaningfully enacting environmental education in schools and recognise the importance of teacher agency and professional communities, have the potential to move the focus from educators' implementation (as expressed in policy discourse) to building their normative and technical capacity, both individually and collectively, to shape their practice.

We probably need to adopt the suggestion made by Cvetek (2008) and ground or theorise such complex education activities in order to do full justice to education's complexity, non-linearity and sensitivity to initial conditions. I fully support Cvetek's view that if education professionals accepted complexity and unpredictability as part of education processes (education and research), environmental education as a field could be more responsive to the real needs of education and the environment. It would also be able to make relevant contributions not only to professional education but also to the improvement of social, economic, political and biophysical conditions. In my view, these are the core functions of the field of education.

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National Case Study
Teacher Professional Development with an Education for Sustainable Development Focus in South Africa: Development of a Network, Curriculum Framework and Resources for Teacher Education[1]

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Abstract

This national case study reports on the development of a national network, curriculum framework and resources for teacher education, with specific focus on the inclusion of environment and sustainability, also known as education for sustainable development (ESD) in the South African teacher education system. It reviews and reports on the history of environment and sustainability education in teacher education, and from this, the national case study begins to conceptualise a new approach to environment and sustainability teacher education within a new curriculum policy environment, and a new teacher education and development policy environment.

Action research case study methodology is used to document the first phase of the emergence of this network, and this report covers Phase 1 of the initiative, which covers formation of the network, review of previous practices, three conceptual development pilot studies undertaken in both in-service and pre-service teacher education environments and a piloting of a 'Train the Trainers' or 'Educate the Teacher Educators' programme, which complements and extends the actual teacher education and development (TED) programme under development.

The study highlights critical insights of relevance to the shift to a content referenced curriculum in South Africa, and shows how the 'knowledge mix' which forms the foundation of the new Teacher Education Qualifications Framework can be engaged. It also highlights some features of the changing knowledge environment, and what dominant knowledge practices are in environment and sustainability-related teaching and teacher education practices, opening these up for further scrutiny. It raises concerns that dominant knowledge work, while integrating a range of forms of knowledge (as is expected of the teacher education system under the new policy), tends to be limited by content on problems and issues for raising awareness, and fails to develop deeper conceptual depth and understanding of environment and sustainability, as issues-based knowledge dominates. Similarly, it fails to support social innovation as a response to environment and sustainability concerns, as awareness raising dominates in dominant knowledge work. The study provides a revised conceptual framework for the Teacher Development Network (TEDN) programme, with guidance on key elements necessary to take the programme forward in Phase 2.

Executive Summary

This national case study reports on the development of a national network, curriculum framework and resources for teacher education, with specific focus on the inclusion of environment and sustainability – also known as education for sustainable development – in the South African teacher education system. It reviews and reports on the history of environment and sustainability education in teacher education, and notes that the previously numerous efforts to strengthen environment and sustainability in teacher education have failed to make systemic impact, and have suffered from a range of quality-related problems which have paradoxically been reproduced through ongoing reliance on similar concepts and approaches. From this, the national case study begins to conceptualise a new approach to Environment and Sustainability Teacher Education within a new curriculum policy environment, and a new teacher education and development policy environment. It seeks to disrupt taken for granted 'old' practice as practised within the former emphasis on Outcomes-Based Education. The new curriculum policy environment introduces a more strongly content-referenced curriculum which has commitments to active and critical approaches to learning, and to environment and sustainability content, which is integrated into a range of subjects at all levels and phases of the schooling system. It also has clearly defined, structural guidance for assessment. Analysis of the Curriculum and Policy Assessment Statement (CAPS) shows that in some subjects, up to 50% of content is 'environment' or is related to 'sustainability'; and that environment and sustainability content permeates a wide range of subjects, in line with a curriculum principle that seeks to ensure an environmentally literate citizenry. The new policy environment foregrounds approaches to dealing with a critical issue associated with educational quality in South Africa, teachers' knowledge and knowledge practices, which form the foundation of an interesting differentiated 'knowledge mix' in the new Teacher Qualifications Framework. This knowledge mix has different emphases within different types of teacher education qualifications and programmes, with differentiation being linked to purpose. The initiative is also conceptualised and linked to the UN Decade on Education for Sustainable Development's (UNDESD) objective to improve the quality and relevance of education, and to priorities teacher education in the second half of the UNDESD.

Action research case study methodology is used to document the first phase of the emergence of this network and programme. This report covers Phase 1 of the initiative, which deals with formation of the network, review of previous practices, three conceptual development pilot studies undertaken in both in-service and pre-service teacher education environments, and a piloting of a 'Train the Trainers' or 'Educate the Teacher Educators' programme, which complements and extends the actual teacher education and development (TED) programme under development. Conceptual piloting took place within a B.Ed Honours 20 credit programme; and within two Post Graduate Certificate of Education contexts, one where environment and sustainability topics were dealt with from a range of different subjects, and another where the focus was on science knowledge specifically. At the heart of the piloting were questions about teachers' knowledge, how teachers and teachers-in-training work with knowledge in teaching practices, and what issues they encounter when dealing

with environment and sustainability knowledge specifically. The pilots, however, recognise that teaching is a complex practice in which a variety of different forms of knowledge intersect, and the pilots therefore also investigated pedagogical content knowledge, and the relationship between knowledge, and teaching practice; i.e. knowledge-practices of teachers in training (in-service and pre-services). It also investigated the scope of material and orientation relevant to such a programme, and an associated Training of Trainers Programme (for teacher educators), which was also piloted.

The study highlights critical insights of relevance to the shift to a content referenced curriculum in South Africa, and shows how the 'knowledge mix' which forms the foundation of the new Teacher Education Qualifications Framework can be engaged in an integrated manner. It also highlights some features of the changing knowledge environment, and what dominant knowledge practices are in environment and sustainability-related teaching and teacher education practices, opening these up for further scrutiny. It raises concerns that dominant knowledge work, while integrating a range of forms of knowledge (as is expected of the teacher education system under the new policy), tends to be limited by content that teachers are familiar with, and content on problems and issues for raising awareness, and fails to develop deeper conceptual depth and understanding of environment and sustainability, as issues-based knowledge dominates. For example, knowledge of climate change as an issue will be shared, but teachers fail to work with underlying concepts to *understand* climate change, and how it comes to be present, and also fail to consider what can be done about it (i.e. their conceptual frameworks tend to be limited by dominant knowledge practices around environment and sustainability that exist in society). Similarly, these dominant knowledge practices fail to support social innovation as a response to environment and sustainability concerns, as awareness-raising dominates in dominant knowledge work. This has implications for how knowledge and pedagogical content knowledge are conceptualised and worked with at teacher education level. A teacher education curriculum that simply aligns with the CAPS appears to be inadequate, as a more critical, expansive orientation to knowledge and pedagogical content knowledge is required, if quality education is to emerge. The study provides a revised conceptual framework for the Teacher Development Network (TEDN) programme, with guidance on key elements necessary to take the programme forward in Phase 2. These include developing deeper understandings of the CAPS and its assumptions (and flaws); and the 'knowledge mix' expectations of teacher education policy, as well as dealing with a range of practical/structural factors such as materials development; accreditation and quality management; ongoing partnership formation and differentiation of roles, research, integration with national teacher education and development priorities and structures; and business planning to ensure a sustainable intervention that will have long-term quality impacts. All of these are considered as ongoing for Phase 2 development, which will commence in 2012 with materials development piloting, and expansion of the programme, which will include giving attention to the concept of professional learning communities, which provide a mechanism for ongoing learning and change.

Introduction and History

Rationale for the contribution

Key principles of education for sustainable development (ESD) (environment, society and economy) have been incorporated into the National Curriculum Statements (NCS) for General Education and Training (GET) and the Further Education and Training (FET) National Curriculum Statement for Schools (Grades R–12) since 1996 in post-apartheid curriculum transformation in South Africa. This is best captured in the principle of the NCS which required all schools and teachers to ensure that the relationship between a healthy environment, social justice, inclusivity and human rights was incorporated into curriculum and teaching and learning activities (DoE, 2002). One of the former Ministers of Education established a National Environmental Education Programme (NEEP) in 2000, building on an earlier pilot 'Learning for Sustainability' programme implemented in two provinces. The National Environmental Education Programme was oriented towards building system capacity for implementing this principle of the NCS. The NEEP supported the emergence of the Education for Sustainable Development Strategy in South Africa, but tended to concentrate more on piloting models for the professional development of subject advisors at district level than on formal teacher education programmes, although some teacher education clusters were established in which models and approaches to Environment and Sustainability/ESD[3] teacher education were piloted.

Through a parallel programme, also supported in part by the NEEP, the South African Eco-Schools Programme, implemented by the Wildlife and Environment Society of South Africa (WESSA), and linked to the International Foundation for Environmental Education and a network of international 'Sustainable Schools' initiatives, developed the Eco-Schools initiative in South Africa, which today involves more than a thousand schools in the development of 'sustainable schools' through whole school development and curriculum change approaches (Rosenberg, 2008). This programme in particular has captured the interest of teachers and local-level partners as it has useful tools for reviewing current practices in schools, and it provides a practical and useful set of resources and tools for teachers to integrate environment and sustainability concerns (such as biodiversity, resource management, health and nutrition, etc.) into curriculum and teaching practices.

However, both of these programmes – the NEEP and the Eco-Schools programme – have not been able to provide for a sustainable system of teacher professional development (or teacher education and development [TED]) for environment and sustainability education (ESD) in South Africa. While many examples of good practice exist in schools (via the Eco-Schools Programme's annual portfolios and ongoing school-based practices), and good policy frameworks exist (via the NEEP, which influenced curriculum policy), very little has been achieved in ensuring that environment and sustainability issues are consistently and coherently integrated into teacher education.

The context

South Africa is emerging from 300 years of racial oppression which created a divided education and training system. This system was implemented through social engineering orientations that produced second rate, poor quality education outcomes for the majority of the black African population, and high quality education outcomes for the minority white population. While the ANC-led government has made significant inroads into equalising the system through, for example, equalising budget expenditure (spending the same on all children regardless of race), there are still a number of legacies that continue to impact on the basic education and training system, most notably the achievement of quality learning. Many of the schools are under-developed in the sense that the facilities remain inadequate, and large numbers of children are still affected by poverty-related factors which affect their participation in schooling. Environmental health issues such as sanitation and waste management affect achievement of a healthy environment in schools, and school and community violence affects human rights in schools and their communities. Social justice has not yet been achieved in the sense of providing an equal, high quality education for all learners. Teachers have mostly been exposed to poor quality teacher training, and it has been confirmed through a number of national studies that the issue of teacher's knowledge is a central concern in achieving educational quality. Literacy and numeracy skills are also poorly developed in the national education system, and South Africa has recently scored lowest on both PIRLS (Progress in International Reading Literacy Study) and TIMMS (Trends in International Mathematics and Science Study) tests, indicating that achievement of educational quality is a key issue in the majority of schools (Rosenberg, 2008).

South Africa, like most countries in Africa, is also faced with a number of sustainable development challenges, most significantly water scarcity, climate change mitigation and adaptation and loss of biodiversity. Building capacity at community level for adaptation and sustainable livelihoods and lifestyles is also a critical challenge, particularly for those in rural areas who are most vulnerable to the impacts of social, economic and environmental risks (DEA, 2010; DST, 2010). A poor understanding of sustainable development currently exists in schools and amongst teachers, and teachers have little capacity for integrating these issues into teaching and learning.

Three large scale national studies on the skills development issues associated with South Africa's sustainable development pathway undertaken by the Department of Environmental Affairs (DEA, 2010), the biodiversity sector (HSRC, 2010) and the Department of Science and Technology's Global Change Grand Challenge National Research Plan (DST, 2010) all point to the need to improve South African teachers' knowledge and pedagogical content knowledge (capacity to teach) of environmental and sustainable development content, values and skills. These national skills studies for the environmental sector have all shown that teachers have inadequate environmental and sustainability knowledge to lay the foundation for further environmental learning and career-path development for youth in South Africa, or for associated forms of citizenship development.

The revised Curriculum and Assessment Policy (CAPS) (DBE, 2010) that will be implemented from 2012 requires teachers from a wide range of subject areas to teach new

environmental content knowledge, values and skills. Because the Department of Basic Education (DBE) is concentrating on improving basic capacity in areas of literacy and numeracy, inadequate attention is being given to this new knowledge area (environmental and sustainable development knowledge) that is essential for improving the quality and relevance of teaching in South Africa. Research is showing that engagement with environmental education and place-based knowledge improves learner achievement (Smith, in press) through providing contextually situated forms of epistemological access (access to more complex forms of knowledge offered in schools) (Lotz-Sisitka, 2009). While there are some good examples of excellent practice in a number of universities, teacher education for environment and sustainable development education, has, on the whole, been neglected in teacher education innovations in the past 15 years, as institutions have struggled to adjust to mergers and changed institutional forms. Consequently, most provisioning in this area has been through small-scale NGO- and/or interested partner-based interventions which have not had the desired systemic impact.

The issue of the need to invest in teachers' knowledge for enabling a sustainable development pathway is not only a South African issue. In 2002 at the World Summit on Sustainable Development, agreement was reached to establish a UN Decade on Education for Sustainable Development (2005–2014). This was because progress in halting environmental degradation and establishing a more sustainable, just world order was too slow, and the power and potential of education was not fully engaged (UNESCO, 2005). In 2009 the Decade was reviewed, and it was found that not enough attention was being given to teacher education. Consequently, UNESCO and governments around the world agreed to strengthen teacher education initiatives focusing on environment and sustainability education as a priority for the second half of the UN Decade of Education for Sustainable Development (UNESCO, 2009). UNESCO, in their 2004 Education for All Monitoring Report, noted that teachers were one of the most significant determining factors in ensuring educational quality.

As indicated above, teacher education has been identified as a key priority for the second half of the UN Decade on Education for Sustainable Development (UNESCO, 2009). This has been taken up at continental level through the establishment of the Southern African Development Community/UNESCO (SADC/UNESCO) ESD Teacher Education network; the AFRITEIS network (African Teacher Education Network for ESD); and at a global level through the UNESCO ESD Chair of Teacher Education, which is supporting the establishment of both international and affiliated national teacher education networks and programmes such as the one reported on here. This case study therefore feeds into these regional and international programmes and network initiatives.

All of this feeds into a changing teacher education context in South Africa. Currently, South Africa employs approximately 350 000 teachers, but projections for the supply of teachers indicates that South Africa will be facing a shortage of teachers in the near future, particularly in areas such as Foundation Phase, African Languages, Science and Mathematics. Subjects such as Geography Education have also been put on the scarce skills list. The Department of Higher Education and Training (DHET) is therefore engaged in structural initiatives in partnership with South Africa's 21 higher education institutions that offer teacher education to address these supply and demand issues.

For the purposes of this Environment and Sustainability/ESD Teacher Education initiative, however, issues of supply and demand are not the core focus; rather the focus is on what is taught during teacher professional development programmes and how and why. Environment and sustainability concerns are cross-cutting societal issues influencing all teacher education programmes and specialisms; thus the initiative reported on here is as relevant to a Foundation Phase teacher in training as it is to a high school Science teacher, or an Intermediate Phase Life Orientation or Language teacher. Although the emphasis and specific focus of ESD within these different teacher education streams may differ slightly, there are a core set of issues and principles that cut across all teacher education programmes and different subjects approach environment and sustainability concerns in different ways. It is this emphasis, namely how to improve the quality and relevance of teacher education across all subjects and specialisms through Environment and Sustainability Education or ESD, that is the main driver of this initiative.

Policy Relevance

Broad-based policy relevance

The Constitution of South Africa (RSA, 1996) enshrines the right of every South African citizen to an environment that is not harmful to their health or well-being, and it also secures the right to protection of natural resources for present and future generations. Section 24 of the Constitution, in the Bill of Rights, states that:

> Everyone has the right:
> a. To an environment that is not harmful to their health or well-being; and
> b. To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
> i. Prevent pollution and ecological degradation;
> ii. Promote conservation; and
> iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

The South African National Environmental Management Act (NEMA) of 1998 (RSA, 1998) developed from this constitutional mandate, which provides framework legislation for a host of related environment and sustainable development policy that governs biodiversity management, waste management, coastal zone management, natural resources management, water resources management, alien invasive species management and many other issues relevant to the sustainable development of the country. It also introduced a people-centred orientation to environmental management and placed sustainable development at the centre of the country's approach to environmental management, which integrates society, economy and societal issues. Hence environmental education, which is a principle statement of NEMA has, in South Africa, tended to reflect principles and practices that are congruent with most international thinking on ESD.[4]

Environmental management and education in South Africa also supports a human rights and social justice approach to environmental concerns, in response to former policies of disenfranchisement from land, the environment and natural resources during the apartheid era. The National Environmental Management Act (RSA, 1998), which introduced a legal framework for governing sustainable development in South Africa, provides orientation to all government departments to include sustainable development and integrated environmental management approaches in their operations. NEMA includes a clause that emphasises the need to integrate ESD principles into education and training. Under NEMA, South Africa also developed a National Sustainable Development Framework for South Africa, which requires giving attention to capacity building of youth for sustainable development in South Africa.

The government's Medium Term Strategic Framework (MTSF) 2009–2013 includes a strong focus on quality education, skills development, rural development, sustainable human settlements and the sustainable use of natural resources. The sustainable use of natural resources is defined as a specific goal. These issues are also included in Vision 2030, in new green economy plans and the strategy for climate change mitigation. These issues are also powerfully linked to poverty reduction; a social justice approach to sustainable development of South African society and economy; and the national system of innovation. These sustainable development objectives have their roots in the South African Constitution, which includes a focus on poverty alleviation, equitable access to natural resources, sustainable utilisation of natural resources for present and future generations and the right to an environment that is not harmful to health or well-being. However, to address poverty while addressing related new development challenges such as climate change, water scarcity, new energy futures, sustainable human settlements, loss of biodiversity and natural resources and vulnerability to risk, urgent attention needs to be given to strengthening the skills and human capacity needed for achieving these development objectives. New development challenges such as climate change and water scarcity threaten to reverse development progress, thus driving the need for new skills and human capacity to address this risk.

Education sector policy relevance

Within the wider policy context that supports sustainable development, this initiative to develop a sustainable teacher education network – with a curriculum framework that can be operationalised at different levels of the teacher education system, and resources to support school-based praxis and reflective practice of teachers – is also informed by the following education sector policies:

- The 1995 White Paper on Education and Training (RSA, 1995) requires the integration of environmental education for sustainable development[5] into all levels and phases of the education and training system. It explicitly states that integration of environmental education should adopt an active, integrated approach to teaching and learning.
- The National Curriculum Statement (NCS) (DoE, 2002) and its most recent Curriculum and Assessment Policy Statements (CAPS) (DBE, 2011) require teachers to integrate aspects of environment and sustainable development into almost all subjects (see samples of more detailed analysis in Appendix A). This policy framework requires

that teachers attain the requisite knowledge and pedagogical content knowledge skills for integration of environment and sustainability concerns into the South African National Curriculum. It also has specific associated assessment requirements which include aspects of education for sustainable development.

- The recently approved Higher Education Qualifications Framework for Teacher Education (DHET, 2011) requires teacher education institutions and programmes to foreground knowledge in their accredited programmes. This replaces previous norms and standards for teacher education which were based on reflexive and applied competences. The Department of Higher Education and Training foreground different *types* of knowledge and learning, which include subject-based knowledge, disciplinary knowledge, practice-based knowledge, pedagogical knowledge and situational knowledge. This 'knowledge mix' is fundamentally transforming the structuring and content of teacher education qualifications in South Africa at present, and is particularly significant to this initiative, as all qualifications need to be re-oriented within this framework by 2014. The new policy seeks to ensure that teacher education is of the highest quality, which includes issues of relevance and responsiveness to current and future knowledge demands in South Africa.
- The new *Integrated Strategic Planning Framework for Teacher Education and Development in South Africa* (2011–2025) prepared by the Department of Higher Education and Training and the Department of Basic Education (DHET & DBE, 2011) seeks to support continuous professional development of teachers to adopt new orientations and approaches, and to improve their subject content knowledge, pedagogical content knowledge, practice and situational knowledge through a recognised, accredited system of continuous professional development, and through systems that support the establishment of professional learning communities. Significant to this initiative is the commitment in this strategic planning framework to content-rich, pedagogically sound, continuous professional development courses for teachers. To provide these, the DHET and DBE will draw on available specialist knowledge of the specific focus areas, including expertise provided by NGOs and other specialist groups. District Teacher Development Centres will be established, with associated professional learning communities to provide ongoing professional development support for teachers.
- The UN Decade of Education for Sustainable Development (2005–2014) International Implementation Scheme (UNESCO, 2005), and the UNDESD strategy for the second half of the decade emphasise teacher education and the quality of education. According to UNESCO, ESD seeks to improve the relevance and quality of teacher education, and ultimately through this the relevance and quality of the education offered to learners in schools. South Africa is a UNESCO member state, and is also a signatory to the ESD Strategy for Sub-Saharan Africa, which commits government to integrating ESD principles and practices into the education and training system, including teacher education.

Objectives and Methodology Guiding the Case Study Development

Objectives

Objectives were defined for a two phase programme. It was decided that Phase 1 of the programme (2011–2012) must be aligned with the preparations and implementation of the Curriculum and Assessment Policy Statement, which meant that development would concentrate first on the training of trainers, Foundation Phase and Grade 10 (FET) interventions, as these are to be implemented in 2012. As the initiative is ongoing, the main focus of the first phase was to put a clearly structured, high quality initiative in place, which required different kinds of review, scoping, piloting and development work, mainly at conceptual framework and content development levels; as well as structural location and alignment. Four objectives were defined for Phase 1 of the initiative and four for Phase 2. Phase 2 objectives seek to consolidate the developmental phase objectives (Phase 1).

Phase 1: Development phase (2011–2012)

- *Objective 1:* Establish a national consortium and network of environmental education/ESD teacher education providers, with capacity to provide high quality, nationally recognised and accredited continuous professional development short course/s for teachers.
- *Objective 2:* Develop, through careful critical review of past experience of ESD/environmental education teacher professional development and new policy requirements, a conceptual framework and materials for an environmental education/ESD short course/professional development programme for teachers that is aligned with the new Curriculum and Assessment Policy Statement (CAPS) and teacher development policy environment.
- *Objective 3:* Pilot test the conceptual framework, materials and monitoring and evaluation framework in both pre-service and in-service teacher education contexts with a view to improving the quality, relevance and efficacy of the programme (reach at least 50 teachers in Phase 1 piloting).
- *Objective 4:* Establish a sustainability strategy and implementation plan for the initiative within a nodal framework structure (including further fundraising, institutionalisation into the Continuous Teacher Professional Development (CTPD) system, etc.

Phase 2: Consolidation and limited extension phase (2012–2013)

- *Objective 5:* Expand the development of the programme/s and materials to incorporate a wider range of subjects. Expand the piloting sites and numbers of training providers through a 'Training of Trainers' Programme through integration into existing teacher education provisioning systems and structures.
- *Objective 6:* Develop and pilot test the concept, functioning and structural sustainability of professional learning communities associated with the CTPD system and the association of these with the TED programme.

- *Objective 7:* Publish the materials in an open learning system format and integrate the use of the materials and core concepts of the programme into pre-service teacher education programmes and qualifications by 2014.
- *Objective 8:* Establish a substantive research programme and research consortium involving a number of participating teacher education institutions that contributes ongoing knowledge to the development of the initiative over time.

It is envisaged that the programme will develop into a Phase 3, which will be wider adoption and expansion, to eventually reach up to 100 000 teachers in South Africa and be used by all 21 higher education institutions offering teacher education programmes, as well as an expanding network of providers of the CPTD accredited programme. This will require more substantive funding than is currently available, but the intention is to locate the initiative strongly within existing budget and institutional frameworks that exist for providing ongoing teacher professional development.

This initiative is therefore focused on seeding a national initiative that will be of high quality, well-resourced, fully accredited and widely implemented.

Case study design and implementation

As indicated in the title of this contribution, this initiative is a national case study of the establishment and initial implementation of a high quality teacher education programme for ESD that is curriculum and policy aligned and sustainable. It therefore uses case study methodology and research approaches that are consistent with case study research design. As Flyvberg (2011) states, choosing to do a case study is not so much a methodological choice, but rather a choice about what to study (the bounded unit represented by the case). As case studies may be studied in varied ways using a range of different methods or even methodology (e.g. qualitatively, quantitatively, hermeneutically or by mixed methods), the researcher or research team have to make decisions as to what types of data are most useful for informing and/or studying a case. As this is a developmental initiative, action research methodology, involving cycles of review, action and reflection will be used to structure the development of this case study.

Methods used for Phase 1 of the action research process are primarily qualitative, as Phase 1 involves mainly conceptual review and development work. For the purposes of constructing this research report, the following data sources and methods have been used: document analysis of policy documents, previous training materials and course reports and evaluations, minutes of meetings and piloting data gathered during the pilots which included student assignments and course frameworks and materials and teacher evaluations of pilot programmes. Five deliberative workshops involving members of the consortium and participating teacher education institutions were also held, and these provided a valuable source of data for the case study. Three small-scale pilots were also developed to inform the initial work of Phase 1. It is envisaged that some quantitative methods will be used in Phase 2 and in the monitoring and evaluation phases of the initiative.

To ensure quality in the development of the case study, the following methodological points relevant to case study research were observed. Firstly, it is important to define the boundaries

or focus of the case clearly. In this case the establishment of a high quality environment and sustainable teacher education programme and network. Secondly, case studies are 'intensive' and require detail, richness, completeness and variance, or depth; they involve what Sayer (1992) calls 'intensive research'. Thirdly, case studies, according to authors such as Flyvberg (2011) and Stake (2008) should also stress developmental factors, and case studies typically evolve over time, often as Flyvberg (2011:301) states as a 'string of concrete and interrelated events that occur "at such a time, in such a place"'. These constitute the case, when seen as a whole. Finally, case studies focus on 'relation to environment' or context. This requires the researcher to draw boundaries around the case in such a way that he or she is able to differentiate between what is case, and what is context. For example, in this case, supply and demand issues in teacher education in South Africa are dealt with as context, while the ESD quality and relevance contribution to teacher education programming is dealt with as case.

Phase 1 Results

Reporting focus

This section reports on the main outcomes of the Phase 1 action research process, which was to undertake careful review and analytical work to learn from past initiatives. It is to conceptualise a high quality programme that will address the issue of poor quality teacher knowledge of environment and sustainability concerns, develop pedagogical content knowledge, practical knowledge and situational knowledge relevant to the CAPS and established in a manner that will situate and locate it within the Integrated Strategic Planning Framework for Teacher Education and Development in South Africa (DHET & DBE, 2011) and the Qualifications Framework for Teacher Education (DHET, 2011), as the programme and materials can also be used and integrated into formal teaching qualifications.

This has involved the following stages of analysis and development work which forms the first cycle of the Action Research Process:

- *Review and plan:* Review and analysis of previous environment and sustainability teacher education programmes, partnership formation and structural analysis.
- *Action:* Development of a pilot conceptual framework and pilot testing the conceptual framework in pre-service, in-service and 'Training of Trainer' teacher education contexts.
- *Reflection and planning:* Refinement of the conceptual framework, programme materials and programmatic structure for further piloting (Phase 1) and implementation in Phase 2.

The main results reported on here therefore reflect the outcomes of this first Action Research Cycle. This also documents the agreed upon framework for the design of courses to integrate Environment and Sustainability Education into teacher education in both pre-service and in-service contexts (for piloting purposes), as well as at the level of 'Training of Trainers' (teacher educators). It comments critically on some of the outcomes of the initial piloting work. This will be used to further strengthen development of the initiative and expanded piloting work in 2012.

Lessons learned from similar earlier programmes

As mentioned above, a range of in-service professional teacher development initiatives focusing on Environment and Sustainability Education in South Africa have been implemented by a variety of organisations, including the National and Provincial Departments of Education under the banner of the donor-funded National Environmental Education Programme. Various universities have also offered in-service teacher professional development for environment and sustainability, and a number of NGOs and parastatal organisations have also offered various teacher professional development programmes in this area. These initiatives were, however, all formed under the banner of the outcomes-based approach of Curriculum 2005 and the Revised National Curriculum Statement (DoE, 2002), which have undergone significant changes as the new Curriculum and Assessment Policy Statement (DBE, 2011). The CAPS has retained core elements of the NCS, but has also introduced a stronger content referenced curriculum, more structured delivery frameworks and greater specification at the level of assessment. A review of these earlier programmes therefore needed to take place to identify 'best available knowledge' and to re-contextualise this within the new policy framework contexts.

Findings from the review of earlier initiatives identified the following key issues to consider and take forward in the planning of Environment and Sustainability Education in South Africa.

- Inclusion of environment and sustainability issues is generally neglected in formal teacher education institutions, and is often 'left to the side' as an extra or separate programme. It is not integral to diverse methods courses, and does not have a strong presence or focus at a broader level either.
- Previous initiatives led by universities, NGOs, parastatals and environmental organisations lacked a sustainable approach for embedding Environment and Sustainability Education programmes into formal teacher education systems and structures.
- Materials tended to be more generic and general, and focused more on active learning approaches and environmental issues, and not on environmental or sustainability content knowledge. There was some engagement with different environmental foci in different learning areas but this requires more differentiation according to phases and grades.
- Assessment and issues of educational quality (e.g. literacy and numeracy) tend to be neglected in Environment and Sustainability Education, where the emphasis tends to lean towards action taking in school and community contexts.
- Workplace-based assignments, linked to programmes such as Eco-Schools help to contextualise and support applied professional development and improvements in practice.
- Courses tend to be high cost and lack sustainable funding infrastructures, and therefore tend to end when funding comes to an end, thus lacking sustainable institutionalisation.

Critical conceptual and orientation problems were also identified in the environment and sustainability education programmes more generally. These were paradoxically being reproduced in teacher education initiatives and include:

- An over-emphasis on activities, projects and experiential learning and an under-emphasis on quality environmental content and concepts, and a failure to make links between issues and concepts.

- An over-emphasis on issues-based approaches to environmental education, which tend to neglect core knowledge, and practice-centred approaches that focus on alternative practices.
- Lack of attention to scope, suitable depth and progression from grade to grade.
- An 'outside-in' approach which starts with issues or species and lobbies for their inclusion in the school curriculum, and difficulties in working from the purpose and existing environmental focus of the learning areas 'inside' the curriculum.
- Activities that are of too short a duration; longer-term initiatives are needed to develop adequate depth, and once-off workshops are often met by the request for 'much more' training.

All of the above point to inadequate engagement with the teacher education system and how it functions, curriculum requirements and in-school educational issues. This review informed the first proposed framework for the Environment and Sustainability Teacher Education Programme, which was subsequently piloted (Figure 1) and refined through ongoing piloting work over a year (Figures 2 and 3). Key features of the first conceptual framework were:

- Emphasis on quality education in a South African setting (e.g. literacy and numeracy issues, learning in a second language, working with large classes and learners' contexts etc.);
- Emphasis on subject knowledge (and by implication,teachers' knowledge of their subjects);
- Emphasis on pedagogical content knowledge and assessment practice (emphasis on teaching practice);
- From a 'Training of Trainers' (ToT)[6] perspective, additional dimensions were added:
  - learning from best practice in other parts of the world;
  - wider knowledge and understanding of Environment and Sustainability Education and ESD more specifically (as reflected in international discourse);
  - whole school development, as it relates to the quality of the environment, resources management and longer-term sustainability practices.

Conceptual Pilot 1: Environment and Sustainability (ESD) in the B.Ed Honours curriculum

The main focus of this pilot was to try out the conceptual framework agreed upon after the review of the earlier programmes (Figure 1), and to see if the conceptual framework could be used to design a 20-credit (200 notional hours) B.Ed Honours module. This teacher education programme serves mainly in-service teachers (already practising teachers), and is meant to support the development of research-based competence, since it is an Honours degree. It also aims to support teachers to understand and work with the environmental and sustainability content knowledge which is integrated into all subjects at all levels of the CAPS curriculum. This influenced the way in which the module was developed (i.e. the purpose of the qualification influenced the course design), and the assignments. The 12 teachers involved in the pilot were qualified in a range of different subjects including Science, Geography, Life

Orientation, Languages, Tourism, Mathematics and Technology. They were mostly trained under 'Bantu Education', and were working in rural, poor schools. They could be said to be relatively 'representative' of the majority of teachers in South Africa. Five inter-related, sub-sections were designed using the conceptual framework presented in Figure 1. School-based assignments were set to contextualise the course content and to strengthen both teacher's subject knowledge (with emphasis on the environment and sustainability content aspects of their subjects) and their pedagogical content knowledge, as outlined briefly below:

- *Section 1 – Know your context:* Focus on knowledge of broader (foundational, global and local) environment and sustainability concepts and issues. Assignment involved local research to identify contextually situated environment and sustainability issues and applications of concepts and broader content to local contexts.
- *Section 2 – Know your subject:* Focus on the environment and sustainability content that is specific to different subjects (e.g. biodiversity appears in the Science curriculum, while environmental health appears in the Life Orientation curriculum). Assignment involved finding research-based information on the particular focus topic from the subject, and developing a 'subject dialogue' or information resource to use in teaching. It required using the information resource with learners in the subject concerned, and reflecting critically on use of knowledge in teaching, using theory.
- *Section 3 – Improve your practice:* Focus on teaching methods relevant to teaching the content knowledge researched in section 2 of the module and planning a lesson using the method concerned. Teaching the lesson and reflecting critically on how the method worked in relation to the learning of the content, using theory.
- *Section 4 – Improve your assessment practice:* Focus on assessment theory and assessment of action competence and action learning pedagogies, which are proposed for environment and sustainability education more broadly. Designing an assessment task using the CAPS assessment guidelines for setting different types of assessment questions in tests and exams and assessment tasks, implementing the assessment and reflecting critically on it, using theory.
- *Section 5 – Whole school development:* Focus on strategies to broaden subject-based teaching on environment and sustainability into whole school development programmes and activities. Assignment required development of a whole school plan for environment and sustainability.

Findings related to this pilot showed the following insights in relation to the following key issues that the programme sought to pilot:

- *Knowledge of environment and sustainability content:* All teachers showed a fair understanding of local environmental questions and issues. Their summaries of newspaper articles displayed a reasonable understanding of causes and effects of environmental concerns as well as the associated risks. However, the majority of the teachers (eight out of 12) struggled with critical reflection on local environmental issues. They were unable to synthesise wider views of these concepts and concerns in relation to locally familiar concepts and concerns. This was related to surface or limited in-depth

reading of texts containing information on wider concepts and concerns related to environment and sustainability. The consequences are that the majority of teachers, in their practice, are likely to miss out on the depth and complexity of environmental issues and how they are intertwined with development issues as well as with human rights and social justice issues in both local and global contexts.

- *Complex and new knowledge relevant to subjects:* Teachers showed capacity to analyse their subjects and to identify relevant environment and sustainability content. They were able to produce 'subject dialogues' or information resources on available, straightforward information, and showed an appreciable ability on how they could engage learners with available knowledge, working with well-known concepts and content. Despite some pedagogical technicalities here and there, in the 'subject dialogues' all teachers displayed that they will manage the bigger chunks of environmental content in their learning areas. However, all had great difficulty in dealing with environmental knowledge that is contested, not certain or not available. They seem to have very little aptitude, not only to mobilise other forms of knowledge, but also to use cross-disciplinary links to engage knowledge from other contexts or learning areas in relation to their own subject knowledge. For example, a Geography teacher would get stuck with an idea that is well-managed in Life Sciences, or that can be explained reasonably through indigenous ways of knowing.
- *Methods and learning theory:* Teachers displayed a great deal of competence in working with some educational theories especially social constructivism, but almost all were cautious with other theories, for example socially critical theory. Most of their suggested activities were designed for learners to work together to arrive at the known knowledge or established concepts. There was hardly any evidence of planning to drive the learners to challenge the established norms or to engage with the contested knowledge. Follow up discussions revealed that the teachers themselves are not adequately equipped with necessary pedagogical skills to assist their learners to engage with contested knowledge. They also blamed the school system for not giving them enough space to be socially critical of society. They all agreed that the school curriculum is designed in such a way that if learners do not 'conform' with the known and established norms and values then they may not be successful in examinations.
- *Assessment of environment and sustainability knowledge and approaches:* More than half of the teachers could not design assessment activities in ways that could develop values and skills towards action competence. Some were not clear of any pedagogical activities that could allow action competence. Similarly, about two thirds of the group could comfortably design assessment tasks on knowledge about causes and knowledge about effects, but only a third were able to satisfactorily assess other forms of knowledge (e.g. about visions and knowledge about strategies for change). This reflects similar findings to the above, namely that teachers are inclined to deal with the known knowledge and are hesitant to go into the contested or the unknown.

- *Critical reflexive capacity, as foundational research competence:* The majority of teachers were quite capable of using a reading, model or theory to reflect and critique their own practice (an attribute that the course emphasised throughout), but there remained (throughout) a small group (about 25%) that struggled to make sense of such models or theories. Surprisingly, such individuals seem to know about what the theory says or what the model is all about (judging from their descriptions), but they seem not to have acquired the skills to apply them in their practice. On whole school improvement (Section 5), it was encouraging that the majority could see the curriculum vantage point of environmental knowledge in improving conditions of learning and teaching in addition to maintaining a healthy school environment; showing wider societal reflexivity of their teaching and learning programmes.

The depth, contextualisation and expansion of teachers' subject knowledge and pedagogical content knowledge appeared to be critical issues emerging from this pilot, as did skills to work with new and more complex forms of knowledge as introduced by environmental and sustainability topics into existing (more familiar) subjects and subject knowledge/s. Following this pilot, it was decided to integrate Section 1 and 2 of the conceptual framework and to embed Section 5 into the whole programme, giving it a sharper subject knowledge (within which environment and sustainability knowledge is embedded) and pedagogical content knowledge focus (Figure 2).

Figure 1. First conceptual framework

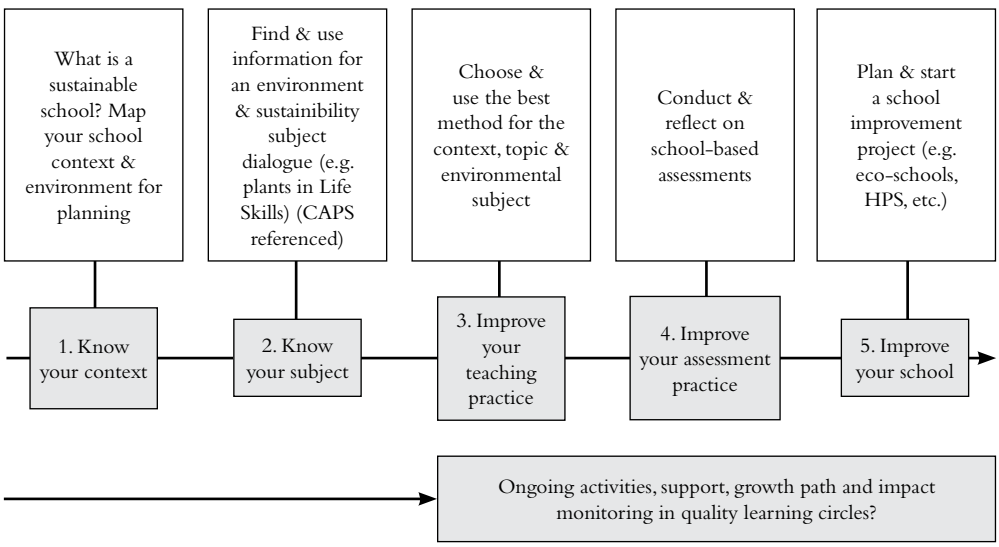
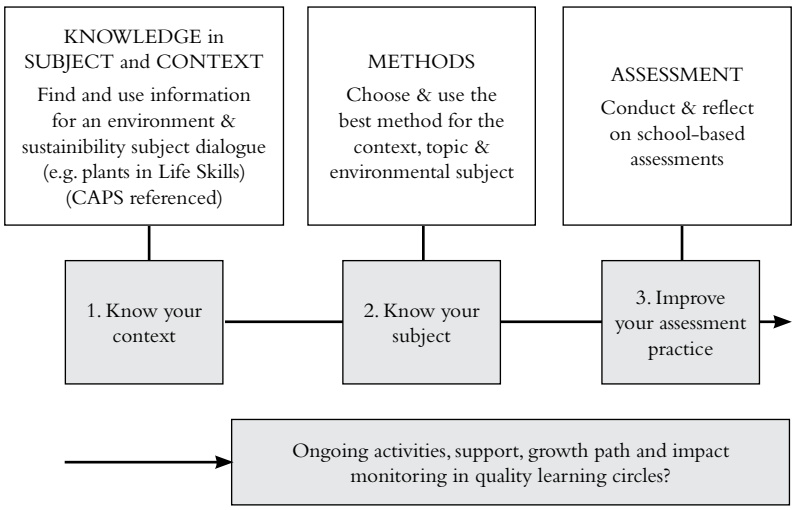


Figure 2. Revised conceptual framework



Conceptual Pilot 2: Environment and Sustainability (ESD) knowledge in a cross-curricular module in the PGCE

The issues associated with environment and sustainability content, its nature and emergence within different subjects and associated pedagogical content knowledge became the core focus of the next two conceptual pilots. Conceptual Pilot 2 was focused on environment and sustainability knowledge of student teachers (teachers-in-training) who were involved in a cross-curricular module on environment and sustainability education in a Post-Graduate Certificate in Education Programme (PGCE) programme. The PGCE is a pre-service, post-graduate, one-year teacher training programme in which graduates specialise to become teachers. From the DHET (2011) 'knowledge mix' perspective, the emphasis is on subject knowledge (to know what is meant to be taught in the Science curriculum in schools), pedagogical content knowledge (how to integrate knowledge and pedagogy in and through teaching practice and assessment), practice-centred knowledge (how to practice Science teaching) and situational knowledge (how science is situated in society). The 40 students in the groups had a variety of different disciplinary backgrounds, and were training to teach a variety of different subjects, including Arts and Culture, Mathematics, Physical Science, Languages, Life Science, Life Orientation, Natural Science and Geography. The key research questions informing this pilot were:

- What are the current subject discipline *perspectives* on environment and sustainability education?
- What range of *methods* are seen as appropriate for environment and sustainability education in the subjects concerned?
- How is *content* reflected in ESD teaching practices (of student teachers)?

The analysis focused on the pedagogical content knowledge narratives on subject perspectives and method selections for environment and sustainability in the Science education curriculum,

as represented in PGCE student assignments and practice teaching activities. Key findings emerging from this pilot showed the following patterns associated with the core interests of this pilot, namely environment and sustainability perspectives, methods and how content was being worked with.

- *Perspectives on environment and sustainability and education:* Most students viewed environment as natural systems and/or problems or issues. ESD was seen to be about awareness creation, values and ethics and/or behaviour change. Dominant topics selected by the students (across the different subjects) were recycling, biodiversity, climate change, population and resource use.
- *Methods:* Most students made use of methods that were core to their disciplines, but also worked with methods such as fieldwork, case studies, practical work, awareness campaigns, real life debates and audits.
- *Broad trends:* Students tended to use perspectives centred on the natural environment and issues to create awareness amongst learners, using disciplinary core methods with 'borrowing' of fieldwork, case study materials and problem-solving tasks and deliberation methods. Recycling and field trips were generally 'first up' (or most popular).

From this it was possible to establish that dominant knowledge work appears to be primarily conceptual and descriptive with an issues focus (empirical) towards awareness production to steer problem solving change (narrative) and is borne of an informed understanding of issues (theoretical/dialectical). This reflects student's engagement with differentiated knowledge forms in and through their knowledge practices as described by Hedegaard (2007:251-2).[7] This evidence of students (teachers-in-training) working in integrated ways with a differentiated knowledge framework in and through environment and sustainability issues or topics in and through their practice in the CAPS curriculum environment is significant to the new Teacher Education Qualifications Framework, which prescribes different types of knowledge and learning as a foundation for teacher education. The DHET differentiates these types of knowledge (as described above), and it indicates that these types of knowledge should not be used to design teacher education curricula in 'types of knowledge/learning' formats, but rather that the teacher education curriculum should seek to develop this 'knowledge mix' in and through teaching practices that show sophisticated engagement with such a knowledge mix.[8] Thus, it would seem that the teacher education curriculum framework being pilot tested allows for an *integrated engagement* with this 'knowledge mix', refraining from treating the DHET 'knowledge mix' in a technicist, reductionist manner; yet giving adequate attention to this knowledge/learning framework in teacher education.

An additional finding associated with this dominant knowledge work, however, is that within it is a paradox or contradiction which requires further engagement. Through the dominant knowledge work patterns (as evidenced in the teachers-in-training lessons and lesson planning) it seems apparent that people seem to get the message and become aware of issues, but understanding and change to more reasonable practices is not easy. This draws critical attention to the dominant orientations associated with environment and sustainability knowledge and pedagogical content knowledge work and its ultimate purpose and/or outcome. The question

that arises is what absences are there that need to be removed, or what ought to or could be done differently to transform this knowledge work problem?

Conceptual Pilot 3: Environment and Sustainability (ESD) knowledge in PGCE Science education

The main focus of this pilot was to research the teaching of environment and sustainability content (climate change is one of the topics) in the CAPS Natural Science Curriculum (Intermediate Phase). Key guiding questions for this pilot included:

- How does environment and sustainability education articulate with a content-referenced curriculum?
- What environmental education processes enable better learning of what is now known?
- What does a CAPS emphasis on content mean to environmental learning in the Natural Sciences?

An heuristic (Figure 3) was developed to support teachers-in-training to systematically engage with the interface between knowledge and practice.

Figure 3. Lesson planning template (heuristic)

Topic planning template: 'T-Sheet' **TOPIC:**	
KNOWLEDGE What I know and can find out ⟷ (interface)	PRACTICES How are things being done and why?
Key words to unlock what is known	Planned learning sequence from assessing what learners already know
Summary of what is known: Key concepts and issues in context	Provision for key words, reading and writing to learn through activities, experiements and skills tasks for knowledge acquisition to understand what is now known and extend knowledge into creative innovation
Key points for knowledge-assessment Enquiry and action-awareness ideas Possible innovative change practices	Assessment of: • What is now known and remembered • Understanding and application of knowledge • Analysis, evaluation and innovation of what is known and how things might be done in better ways

This heuristic was developed to support the design of practice teaching lessons. It was also designed to address educational quality issues, particularly a context where many learners are learning in second, third or even fourth languages. Language and vocabulary development, or the language needed for learning in such cases, needs to be integrated into the teaching and learning of scientific, environment and sustainability concepts and practices. Socio-cultural language theory is showing that one of the key success factors in enabling learning in

second language learning contexts is adequate vocabulary as well as meaning-making support structures. These issues were considered in the piloting (as mentioned above), and as shown in the heuristic above.

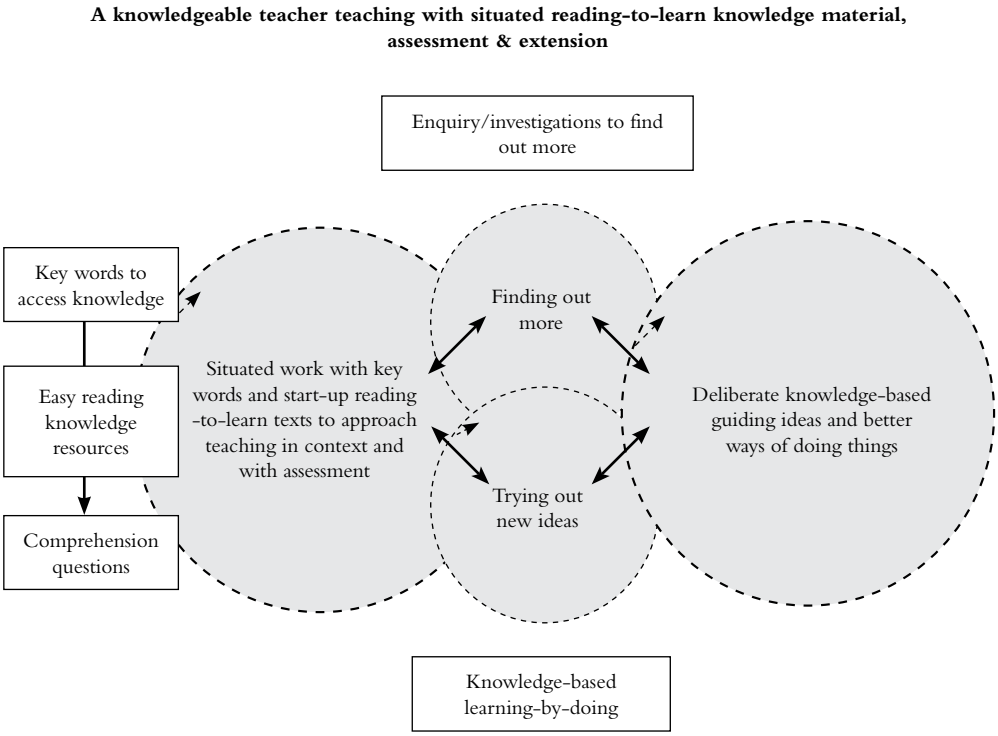
Data analysed included key words, assessment questions and learning sequences produced by student teachers-in-training on climate change content (as produced through working with the heuristic provided in Figure 3).

To address the problem of the limited outcome of the dominant form of knowledge work (identified in Pilot 2), additional elements were added to this Pilot (3) in the teacher education programme. These included stronger conceptual scaffolding using written knowledge texts which focus on core concepts or background content knowledge associated with issues (e.g. concepts such as earth systems which are associated with climate change); giving more attention to what is known about topics and also giving student teachers guidance on innovations (beyond awareness raising) that can enable critical reflection and change through introducing the concept of 'innovation'. This was put forward in another process heuristic that reflects the integrated 'knowledge mix' processes discussed below (Figure 4).

Key findings from this data on subject knowledge, and working with subject knowledge in teacher education programmes showed that:

- Work with prior knowledge (e.g. available scientific information on climate change) and key disciplinary comment (e.g. discussions on the certainty of this knowledge) appears to set up contextual disciplinary tracts for approaching what we know and what we know that we do not yet know. Environment and sustainability questions involve understanding what is already known about the questions (e.g. science of climate change), but also engagement with what is not yet known (e.g. uncertainties surrounding climate change impacts).
- Learning interactions with texts that outline what is now known (reliable content), appears to be very important for providing teachers-in-training with an important sense-making purchase on the environment and sustainability questions or topics that are presented in the curriculum (e.g. climate change; loss of biodiversity). This requires teacher educators to provide teachers-in-training with reliable and high-quality sources of information on relevant curriculum topics; but also to support them to work critically and reflexively with such information.
- Overall there was a stronger sense emerging from the pilot work with content that there is a need in teacher education programmes to carefully review and grasp what is now known (current knowledge status) of curriculum topics, to get a better purchase on a) what the issue is; b) why it is important; and c) what might be done to address it. The latter is a necessary focus if teachers are to steer away from dominant knowledge work that leads only to awareness of, and engagement with, issues in ways that do not fully develop capacity for identifying and practising alternatives.

Figure 4. Heuristic for guiding in-depth work with knowledge, as well as innovation outcomes



Knowledge (Knowing and remembering)	Action/awareness (understanding and applying)	Innovation (analyisis, evaluation and innovation)
WITH ASSESSMENT		
What is known & understood now?	tests & exams	
Are grasp & skills being developed?	translation tasks, practical tasks & activities	
Are there relevant applications?	projects, assignments & case studies	

(Source: O'Donoghue, 2011)

Integrating pilot findings into 'Training of Trainers' programme conceptualisation

The 'Training of Trainers' programme was initially conceptualised as a 'separate project', funded by GIZ as an international initiative, linking up South African partners with others in Germany, India and Mexico to document 'best practices' and to implement ESD competences in teacher education programmes in South Africa. During the course of the project, it became clear that there was a need to align this international donor funded initiative with the South African initiative to establish a sustainable Teacher Education Programme for Environment and Sustainability Education. Key questions driving this piloting were therefore:

- How can the 'Training of Trainers' programme align with the Teacher Education Programme, and yet draw value from the international exchange?
- What needs to be additional to the Teacher Education Programme (other than that which was being piloted above) for a 'Training of Trainers' programme so that teacher educators would have a wider grasp of environment and sustainability issues and environment and sustainability education trends globally, so as to more fully and critically work with the locally constituted initiative?

The full scope of the 'Training of Trainers' programme development process is not dealt with here, only key findings emerging from a piloting of the 'Training of Trainers' programme pilot are highlighted. This involved two large groups of national stakeholders in a total of three days of workshop activities which were also deliberated with national and international partners during the design of the 'Training of Trainers' programme, as they relate to the Teacher Education Programme and the evolving insights being gained from the piloting work (which is still ongoing).

- A situated (African) knowledge practices approach appears to enable generative, learner-led change without fearful alienation amidst the complexity of risk and an uncertain future. This was a critical finding in terms of the orientation of the programme. Instead of focusing on fear, 'nightmares' and 'issues', working with available knowledge and new innovation practices is necessary within new approaches that extend beyond a focus on issues only, and include alternatives and new ways of doing things. This extended focus is necessary not only in curriculum documents, but also in teacher education programmes.
- Heritage knowledge practices and mapping change amidst knowledge of what is now known opens up an engaging learning arena with improved relevance and change potential. This refers to the need to expose students (teachers-in-training) to what is known, and what is known in context, as emerged from the piloting. It is important to support teachers to find out about what is known, and also to work with new, more complex forms of knowledge in teacher education programmes. This means that teacher educators themselves need to engage with knowledge in this way if they are to avoid (paradoxically) reproducing problems associated with dominant knowledge work, and/or superficial readings of knowledge work.

- Work with numerical representations can disrupt ambivalence and open up a more object congruent grasp of reality to support rational change. This refers to making good use of factual material and assessments of what is actually happening. This helps to disrupt and stabilise emotionally constituted knowledge reactions (e.g. fear) and strengthens rationality and rational ways of engaging with complex knowledge problems. It is also important to take full cognisance of different forms and ways of knowing such 'facts' or 'problems'.
- A curriculum journey from intergenerational, lived world contexts of experience and action into more formal and explanatory knowledge systems offers more than a potentially alienating induction into reified abstractions commonly found today. This refers to the need to seek out practice-centred or stories of experience 'starting points' which provide teachers with contextual referents (the local knowledge referred to in the B.Ed Honours case). However, as shown in this case, such knowledge needs to be extended through the 'knowledge mix' work that is required in the Teacher Education Qualifications Framework.
- Expanding the notion of competencies to a framework which recognises the importance of knowledge in shaping competence, and a framework which recognises teachers' and learners' capabilities to define future trajectories that are valued in their societies (Sen, 1990), may be more congruent with the South African policy environment. TED processes must allow teachers the deliberative spaces to negotiate capabilities and develop their knowledge and their competence. The innovations necessary for freedoms to flourish within a quality learning environment is an important orienting feature of such work. This broader view does not only seek to curriculate a set of pre-determined competences for teacher education as is being proposed by UNECE (2011). Curriculating for competence development only may be paradoxical in environment and sustainability education, as a focus on competences may only narrow opportunities for capability development. This calls for deeper theorising of competences, knowledge, learning and capabilities as orientation/s to teacher education.
- Wider knowledge of the emergence of environmental education and its uptake into and transformations under the influence of global education for sustainable development discourse is also necessary for teacher educators to understand the historiography of a newly emerging field of practice that is shaping and that has shaped the South African curriculum landscape substantially. Its implications in relation to the whole curriculum, and other areas of curriculum (e.g. curriculum changes in higher education more broadly) and the wider social knowledge landscape are also necessary elements for a 'Training of Trainers' programme, to avoid narrow interpretations of the Teacher Development Programme in single subject context/s.

As indicated from all of the findings above, there are a number of implications for the design and further development of the South African National Environment and Sustainability Education Teacher Education Initiative. These are discussed next, as part of the reflections on Phase 1 and the planning for Phase 2 process.

Implications of Lessons Learned and Phase 2 Preparation

Curriculum policy and teacher education 'knowledge mix'

As indicated above, the South African curriculum has recently been reviewed (for a third time), and the new Curriculum and Assessment Policy Statement (CAPS) seeks to address problems of knowledge and quality experienced in the first two rounds of post-apartheid curriculum implementation. This has produced a more strongly 'knowledge referenced' curriculum that is more tightly structured, and that has more definitive guidelines for assessment. A key feature of the CAPS is the inclusion of environment and sustainability content and concepts in a wide range of subjects (DBE, 2010; see examples in Appendix A). For this initiative, it has therefore been important to develop an in-depth understanding of what knowledge is contained in the CAPS, and what the relationship is that exists between knowledge, and pedagogical content knowledge (how teachers are expected to teach and assess the learning). This required a review of the CAPS to identify the environment and sustainability concepts and knowledge represented in it, as much of this is 'new knowledge' and contains the features of contemporary environment and sustainability knowledge. It is newly produced (just being integrated into traditional disciplines), it is inter-disciplinary (occurs across different disciplines in different forms), it is complex (not everything is known about the issues concerned) and it is also contested (not everyone agrees on what is currently known). It is also futures-oriented (it has implications for the future and for future practices), but it is, at the same time, historical (the issues emerge from previous practices and knowledge). Environment and sustainability knowledge is therefore *dynamic* and requires that teachers develop the necessary 'knowledge work' skills and competences to a) understand this knowledge, which is an integral part of the curriculum, and b) work with it in open-ended and innovative ways with learners who need to develop a deep understanding of the dynamic nature of this knowledge and its implications for society, now and in the future. To begin to address this the Teachers Development Network partners have undertaken a CAPS review to establish exactly *what* environment and sustainability knowledge is included in the CAPS (see Appendix A for an example of some of this knowledge), and to establish the orientation of this knowledge in relation to contemporary ways of engaging with environment and sustainability issues. Key findings from this review include:

- Environment and sustainability topics are included in all levels and phases of the national schooling system (Foundation Phase, Intermediate Phase, Senior Phase and Further Education Phase) and in a wide variety of subjects. They are, however, very specifically defined, which requires careful engagement with specific knowledge requirements of each phase and grade, particularly in relation to the associated assessment specifications.
- There is a high level of coverage of such topics. In some cases up to 50% of subject knowledge is related to environment and sustainability concerns. This means that a large number of teachers need to be exposed to, and supported by, this programme.
- Most of the environment and sustainability topics included in the CAPS require a mix of general (universal) knowledge and specific (contextual) knowledge, which provides a productive environment for *meaningful* knowledge acquisition (as proposed by Vygotsky, 1978).

- Most of the environment and sustainability topics covered in the CAPS lend themselves to the 'knowledge mix' proposed by the DHET (i.e. for development of disciplinary knowledge, subject knowledge, pedagogical knowledge, practice-based knowledge and situational knowledge). As indicated in Pilot 2 above, this needs to be done in an *integrated manner*, if the spirit of the new policy is to be fully understood.
- The orientation to environment and sustainability in the CAPS reflects the dominant knowledge work issues raised in Pilot 3 above. The focus is on problems and issues and awareness raising, and this fails to focus on core concepts necessary to understand the issues, and social innovations that provide ways forward and 'out of' or 'in response to' the issues presented in the CAPS. This is a serious flaw in the conceptualisation of environmental learning in the CAPS, and needs to be considered critically in teacher education initiatives associated with the CAPS. Teacher education initiatives cannot simply focus on what is in the CAPS, but should present a highly enriched, critically constituted and broader basis for teachers to work critically and productively with these issues in the CAPS, as outlined in the discussion above on what needs to be included in the 'Training of Trainers' programmes, and in the Teacher Education Programme itself.

Course orientation and guidelines for materials development

From all of the above, it has been possible to define a set of principles and guidelines for materials writers to produce the kind of teacher education programme that is at the same time:

- aligned with the CAPS, but expansive and critically constituted in relation to its basic tenets, which allows for a more professional teacher, with competence to both implement a curriculum effectively but also expand it, and critically engage with it; and
- aligned with teacher education policy core concepts, particularly its commitment to a complex 'knowledge mix' in an integrative fashion, while also critically engaging with the more complex dynamics of curriculum knowledge brought forth by the changing nature of knowledge, and the associated social-ecological conditions which produce the need for engaging with such forms of knowledge.

These will be used to guide the further development of the programme, particularly the materials development and the in-service piloting due to take place in 2012 in tandem with the implementation of the CAPS in Foundation Phase and Grade 10; and thereafter as the CAPS curriculum unfolds and is implemented. The course orientation and curriculum guidelines are included as Appendix B.

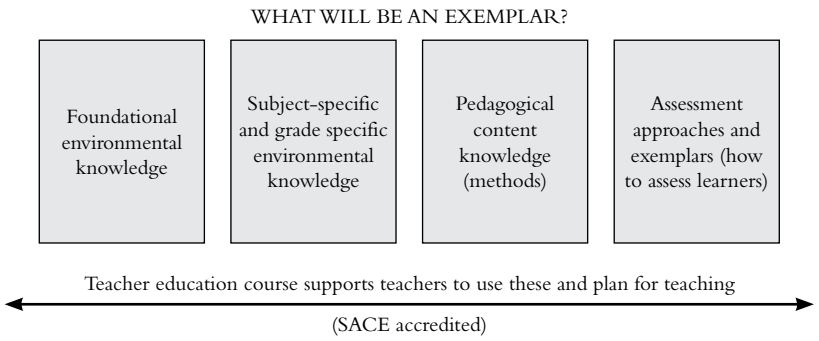
This refinement has also led to a change in the naming of the programme, its general purpose and its core foundational elements. The programme will henceforth be named the 'Environment, Science, Society and Sustainability (E3S) Teacher Education and Development Programme', with the sub-heading 'Transformational curriculum leadership for the future'. This communicates the core focus of the teacher development initiative, and signals its transformative intent. Its core foundational elements include a transformational approach to teacher development which is based on what Kesson and Henderson (2010) call a '3S'

pedagogy, which deepens subject knowledge, self development as a teacher and social learning (the relevance of knowledge and quality teaching practice to society).

Teacher education materials development

One of the most critical areas to be affected in the planning of the initiative was the materials development. Initially it was thought that we, as a network or consortium could simply use old materials that already existed, and that were developed in previous teacher education programmes (the ones that had been used before). However, after developing a deeper understanding of the implications of a content referenced curriculum (CAPS requirements), the teacher education 'knowledge mix' requirements of teacher education policy, and an understanding of some of the knowledge-related issues associated with integrating environment and sustainability knowledge into teacher education (e.g. the complex, new nature of the knowledge, as well as the dominant knowledge practices), it was agreed that a different approach to resourcing the Teacher Education Programme would be needed. This was defined as a 'CAPS plus, plus' approach which oriented teachers to a much wider knowledge scope than that expected by the CAPS, but which at the same time, prepared teachers to teach the CAPS successfully. A decision was made to produce exemplars that provided exemplary knowledge resources as this was identified as a critical need in the piloting, as well as exemplary pedagogical content knowledge and assessment practice resources that could expand teachers' current practices, and that could extend and challenge the trajectory of the dominant knowledge practices in environment and sustainability related education. A framework was developed for these exemplars which will consist of 'core' (relevant across subjects for all subject teachers in all phases), and 'specific' (relevant to specific topics or topic areas, e.g. Biodiversity or Climate Change or Environmental Health), as these related to subjects (to be developed within a phase-based framework) according to the principle of maximum coherence.

Figure 5. Contents of a E3S programme exemplar



Funding has been raised to develop ten such exemplars, a process which has already begun. The next phase of piloting will therefore be focused on piloting the actual content of an exemplar in relation to the actual curriculum expectations and teaching practices for a specific grade (the first one to be piloted will be 'Climate Change' for Grade 10 (FET phase), due to be undertaken in January 2012. This will be followed by 'Biodiversity' for Grade 10 (FET in the second quarter of 2012). These will also be used in the 'Training of Trainers' programme scheduled for 2012, but with additional 'Training of Trainers' elements, as noted above. The materials are being conceptualised as open learning resources, and in 2012 various mechanisms for making them available in this format will be researched.

Partnership formation and differentiation of roles

As indicated above, this initiative was set up in 2010 by the Department of Environmental Affairs and the South African National Biodiversity Institute, supported by the Tony and Lisette Lewis Foundation, and key partner organisations such as the Rhodes University Environmental Learning Research Centre, the WWF, the WESSA Eco-Schools Programme, the South African National Parks, Delta Environmental Centre and the Endangered Wildlife Trust, who agreed to co-operate within a consortium framework to generate capacity and national competence to impact on the national system of teacher education through a co-ordinated effort to integrate environment and sustainability into teacher education programmes and systems in ways that align with the new Teacher Development Policy of South Africa, as well as the new Qualifications Framework for Teacher Education. This network has met five times since its inception to plan and reflect on the above processes, as reported here. The partnership framework has, however, expanded to include 20 of the 23 teacher education institutions, who attended a start-up workshop, and who are slowly beginning to participate in the development of the exemplars. It is expected that their involvement will expand in 2012 as the piloting, monitoring and evaluation and exemplar development process expands. Additionally, other national partners have become involved, such as the South African Environment Observation Network, the DST Centre of Excellence in Global Change Sciences and the Applied Centre for Earth System Sciences, who have in principle agreed to co-fund some of the materials development and some research associated with the programme. Core national partners, such as the DHET, the Department of Basic Education, the South African Council for Educators (SACE) and the Education and Training Development Practices (ETDP) Sector Education and Training Authority (SETA) have also been consulted and have attended project meetings. They have agreed to support the initiative and a business plan has been submitted to the DBE, which will be submitted to the ETDP SETA for funding support for expanding the piloting phase beyond the next small-scale phase which will review the construction and validity of the exemplar conceptualisation in two cases. Following this the materials will be produced for wider use (hopefully with ETDP and DBE support) and piloting can expand through the 'Training of Trainers' programme, which is currently being co-ordinated by the DBE, and supported by GIZ. Faculties of education in universities have been consulted via the deans and, as mentioned above, a large number have shown interest in participating in the programme's expansion in 2012. Their involvement is critical for longer-term sustainability of the initiative, and also for quality enhancement and monitoring.

It has also been important to define different types of contributions within the consortium/networked partnership framework, and this has helped for the various types of activities that need to be done to be completed. For example, some partners have taken the leadership with policy-based and institutional-links development while others have undertaken curriculum analysis. Others are setting up school-based pilots while some will be contributing more to the development of materials and/or fundraising. Higher education partners are particularly important in working with other partners on ensuring quality at levels appropriate to various teacher education qualifications and levels. It is being noted in early work that their contributions in terms of knowledge, teacher education expertise and reflexive review are invaluable.

Conceptual framework refinement and research

As indicated above, the initiative put substantial time and effort aside to undertake conceptual piloting work, to establish a substantively grounded and carefully developed conceptual framework that is not just reproductive of past practices that no longer hold substance within the new policy environment. This has clearly shown benefits (as indicated above), but will require ongoing refinement. Hence a proposal is being put forward to the Department of Science and Technology's ACCESS programme to support ongoing research associated with this initiative. This proposal will be extended to a research proposal involving teacher education institutions in 2012, to expand depth of knowledge and insight into the quality and impact of this initiative, and also to provide a reflexive orientation to the programme's growth and development. This has been formulated as a key objective for Phase2.

Integration with national teacher education development priorities

As mentioned above, the programme has carefully sought to locate itself within a quality development framework that is policy aligned, but which also takes policy further through open and critical processes of quality enhancement. A critical aspect of this initiative has been to integrate it with national teacher education development priorities, which, as noted at the start of this paper, are both focused on supply and demand and on quality enhancement through improved teacher knowledge and practices. The initiative has located itself within the latter priority, and seeks to work with Science teachers, Geography teachers Life Orientation teachers and Foundation Phase teachers to begin with, but within this to develop critical competence in literacy and numeracy skills, as indicated in the pilot testing processes above. Most significantly, however, the initiative seems well-poised to strengthen 'knowledge work' and understanding of 'knowledge work' and the 'knowledge mix' notion of the DHET new teacher development policy. It can therefore potentially contribute to understanding of knowledge practices, and what standards for knowledge practices may look like. This has been identified as one of the actions in the 'Integrated Strategy Planning Framework for Teacher Education and Development in South Africa' (DHET & DBE, 2011). The issue of how this initiative aligns and integrates with national teacher education development priorities will need to be monitored as the programme unfolds.

Business planning and sustainable economy development

As mentioned in the review of earlier programmes, most initiatives undertaken to support teacher development in the area of environment and sustainability have suffered from poor business planning and unsustainable economies. This counts for large-scale internationally funded initiatives such as the NEEP, and locally funded initiatives such as university-based or NGO-funded teacher development initiatives. A key element of this programme is therefore to address this problem, and to do this business planning is taking place that must align with DBE and DHET programmes, as well as with nationally available funding systems, such as funding for teacher education programmes provided for by the ETDP SETA. However, locally provided funding from funding partners such as the Tony and Lisette Lewis Foundation, local corporate donors such as Murray & Roberts' funding for materials development, DST ACCESS funding for research as well as the support in-kind funding provided by the participating organisations and partners, has been essential for establishing the initiative within a partnership framework. GIZ funding for supporting a 'Training of Trainers' initiative has also been welcome in this initial phase, but if such funding is extended, it would be good to use it as counterpart funding with local economy funding (say from ETDP SETA). This could make for a more sustainable initiative in the longer term. At the very least, such funding should ideally be channelled through local structures as is the norm with development funding assistance.

Quality management, evaluation and accreditation

Another key issue to be addressed for longer-term sustainability is quality management and accreditation. Several processes are underway to ensure that this is adequately dealt with. Meetings have been held with SACE, who will be implementing the Continuous Professional Teacher Development programme for the DBE. They will have the mandate for endorsing teacher professional development programmes, assigning professional development points (mandatory for teachers) and endorsing providers who offer these programmes. They are therefore an important quality enhancement partner for the initiative. Similarly, the ETDP SETA quality-assure the content and approach of the programme and its materials according to accredited unit standards. The programme is being aligned to a selected sample of these unit standards to obtain national accreditation through the ETDP SETA. Thirdly, university partners are participating in developing the programme and the materials, and through this network of institutions the best available expertise is being used to support the programme in critical areas such as materials development, training and monitoring and evaluation. A monitoring and evaluation system is also being put in place, and monitoring and evaluation research will also commence in 2012, along with the field-based piloting of the materials and the programme impact at classroom level.

Professional learning communities

As mentioned above, one of the new concepts in the Strategic Planning Framework for Teacher Development is the establishment of professional learning communities. These are to support ongoing interactions with teachers, and ongoing professional learning and development. It is envisaged that through the piloting process, initial clusters of teachers will be involved in

the programme which could constitute the foundation of professional learning communities. Teachers involved in these clusters will be oriented to using the online open learning resources that will be freely available, which will enable them to support other teachers to do the same with the support of district curriculum staff. A key element of enabling the establishment and ongoing functioning of such professional learning communities is involvement of the subject advisory services at district level from the start. This will be included in the piloting processes for 2012. The structuring and functioning of the professional learning communities and their establishment will be the subject of monitoring and evaluation and research in 2012/13, during Phase 2 of this programme's development.

Conclusion and Next Steps

As reported on above, the programme has access to a good policy environment for implementation of environment and sustainability issues in teacher education, with expertise for engaging with this policy environment, even though it is currently changing. Members of the network have high levels of experience of the new policy context and content. The programme also has access to good quality resource materials and hands on experiences of teachers in over 1 000 Eco-Schools in South Africa, a large body of research on the issues influencing implementation of environment and sustainability in South African schools, as well as research capacity. The programme has also had access to key international networks to inform its work, and to seed funding for bringing the network of partners together to begin the process of contextual analysis, curriculum framework development and piloting of concepts and frameworks that emerge. Funding has also been raised for initial materials development work, and negotiations are underway for longer-term support for the initiative, although this has not yet been secured. However, our emphasis has explicitly been on quality, and on working together to attain such quality, as past experience has shown that a fragmented approach is not adequate to respond to the challenges faced in South Africa. This has involved both state and non-state actors in voluntary and collaborative configurations.

So far, a combination of careful review work, together with careful conceptual piloting work, has delivered what seems to be an innovative yet substantive and strongly aligned and quality-oriented approach to supporting teachers to work with the environment and sustainability requirements of the schooling system. The initiative has not fallen into the trap of being 'policy compliant' only, but is seeking rather to develop and expand policy, and to enrich both teachers' and learners' knowledge of environment and sustainability, while ensuring that high quality education is achieved at all levels. A number of broader, systemic issues have been taken into account and are the subject of ongoing development and monitoring work.

Ultimately, the aim of this initiative is to extend its reach and its outcomes via the national network and consortium. This will hopefully expand over time and with more materials that reach and cover the full scope of environment and sustainability topics in the CAPS, for all phases of the schooling system, so that teachers are well-prepared and capable of teaching these areas with quality results (as shown in Table 1 below).

Table 1. Projected outcomes and results of the programme

Item	Results	Reach
Programme and materials	Open education materials for all environmental focus areas in CAPS (available to teachers and teacher educators)	Higher education providers and SACE accredited providers can use materials – projected use in all 9 provinces (3–5 providers per province)
Numbers of people trained	Teachers trained in Phase 1: 120 (20 each in 6 pilot sites)	Seeking to reach 50 000 teachers over a 5-year period (10 000 per annum; with ETDP SETA and HEI support)
Changes in teacher education programmes	Intergration into Higher Education TE Curricula (changing by 2014)	Long-term impact on ongoing teacher education

The next steps in this national case study are to finalise the first sets of exemplars and to pilot test their validity and their quality, as well as their impact and influence on teachers' knowledge (within the 'knowledge mix' framework noted above), and on learners achievement and the quality of learning that takes place in classrooms. Slowly but steadily we seek to achieve quality teaching and learning through careful and consistent collaborative working while keeping focused on the most important outcome of all, the future of the children of South Africa.

Endnotes

1. This document was prepared by ADEA for its Triennial Meeting (Ouagdougou, Burkina Faso, 2012). The theme of this conference is Education and Sustainable Development in Africa. It forms part of a series of three papers prepared by the environmental education community in southern Africa for this continental conference. The other two papers will be published in the forthcoming Southern African Journal of Environmental Education in 2012, which will also feature research supported by the SADC Regional Environmental Education Programme (REEP) to coincide with the thirtieth anniversary of EEASA, and the fifteenth year of the SADC REEP.
2. In collaboration with Ms Waheeda Cavella (Department of Basic Education), Professor Esther Kibuka-Sebitosi (African Renaissance Centre, UNISA), Professor Cheryl le Roux and Dr Soul Shava (UNISA), Professor Rob O'Donoghue, Dr Diane Wilmot, Mr Charles Chikunda, Ms Ingrid Schudel (Rhodes University), Mr Thomas Mathiba and Mr Pandelani Dughudza (Department of Environmental Affairs), Dr Eureta Rosenberg, Ms Renee le Roux, Ms Liz Robson and Ms Vivian Malema (South African National Biodiversity Institute), Tony and Lisette Lewis Foundation, the Biodiversity Human Capital Development Strategy, Dr Jim Taylor, Ms Laura Conde and Ms Anisa Kahn (Wildlife and Environment Society of South Africa), Dr Glenda Raven (World Wide Fund for Nature), Ms Presha Ramsurup and Ms Shanu Misser (Delta Environmental Centre), Ms Sibongile Mokoena (SAEON), Ms Janet Snow (Endangered Wildlife Trust), Ms Maria Moate (South African National Parks), Mr Edgar Neluvhalani (Applied Centre for Climate and Earth System Sciences, CSIR), Mr Caleb Mandikonza

(Teacher Education Network Co-ordinator, UNESCO/SADC ESD Teacher Education Network) and Professor Colleen Vogel (Independent).

3. Note that these terms are used inter-changeably throughout this document (see endnote 4 below for a more detailed explanation).
4. In South Africa, ESD is often synonymous with environmental education, as environmental education has tended to work within the same frameworks and principles of ESD, integrating society, economy and environment. The history of ESD in South Africa is strongly shaped by the history of environmental education, which is similar to the way in which ESD emerged internationally out of the Rio Earth Summit in 1992.
5. It is for this reason that the document refers throughout to 'Environment and Sustainability' or 'Environment and Sustainability Education' when referring to ESD. These terms are used inter-changeably within the document. An environmental focus, as well as social justice and democracy, is a strong focus of ESD in South Africa. This is linked to the history of environmental education in the country, which generated momentum for ESD. To maintain continuity and focus, 'Environment and Sustainability' is used here, as ESD has often been critiqued for lacking clarity of focus and for a loss of history (i.e. it loses its historical trajectory in the changing of terminology). Environmental education has also been strongly conceptualised within an environment–economy–politics–society nexus in South Africa.
6. The 'Training of Trainers' (ToT) component of this initiative will be used to provide training to those teacher educators and teacher education organisations that will run the Teacher Education Programme. It therefore requires broader orientation than what is in the teacher education materials. The ToT programme is being supported by GIZ; while the South African TED programme is being supported by a range of South African partners and institutions (see partnership discussion below).
7. Hedegaard (2007, pp. 251-2) provides the following framework for explaining modern tendencies to differentiate between different forms of knowledge, which appears to be foundational to the DHET policy framework for Teacher Education Qualifications. She differentiates between:
   - Empirical knowledge: reflected in abstract concepts that are attained through observation, description, classification, and quantification (Bruner *et al.*, 1956). This form of knowledge circulates in everyday life, and in many western classrooms.
   - Narrative knowledge: characterised by changeableness in intentions; mutual goals and perspectives which interact; involvement of feelings and emotions (Bruner 1986). Also described as 'folk theories' about daily life events.
   - Theoretical-dialectical knowledge: related to forms of systematic knowledge. Found in theories and models that can be used to understand events and situations, and to organise and experiment with actions (concrete life activities).
8. The DHET (2011:7) note that integrated and applied knowledge should be understood as being both the condition for, and the effect of, scrutinising, fusing together and expressing different types of knowing in the moment of practice. They explain further that, '[t]eaching is a complex activity that is premised upon the acquisition, integration and application of different types of knowledge practices or learning'; and differentiate the following types of learning/knowledge mix as underpinning teacher education qualifications in South Africa:

- Disciplinary learning: disciplinary or subject matter knowledge (study of education and educational foundations and specific specialised subject matter relevant to the subject or discipline e.g. Professional Ethics);
- Pedagogical learning: general pedagogical knowledge (knowledge of learners, learning, curriculum, assessment, etc.) and specialised pedagogical content knowledge (how to teach concepts, methods, etc. of a subject);
- Practical learning: learning in and from practice. Learning from practice = study of practice; Learning in practice = teaching practice experience (work-integrated learning);
- Fundamental learning: learning second language; use ICTs, academic literacy; and
- Situational learning: knowledge of contexts; situations; environments; policies; challenges (e.g. HIV/AIDS, environmental issues).

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Appendix A. CAPS analysis to show cross-cutting environment and sustainability (ESD) content (sample only)

EXTRACT FROM GEOGRAPHY FET PHASE ANALYSIS (GRADE 10–12)						
GEOGRPAPHY GRADE 10			GEOGRAPHY GRADE 11			
Term 2	**Term 3**	**Term 4**	**Term 1**	**Term 2**	**Term 3**	**Term 4**
Natural Disasters (4 hrs) Earthquakes - 4 hrs Volcanoes - 4 hrs (both focus on the impact on people and the environment) **ASSESSMENT** Assessment Task 2 Exam	**Population Growth** World pop growth Managing pop growth **Population Movements** Impact of movements Understanding causes Refugees/Migrants **HIV/AIDS** Impact of HIV/AIDS (South African examples) GIS/Map Reading/ photos, graphs, models **ASSESSMENT** Test	**Water Resources: World and SA** **Water Management in South Africa** Water sources in SA Factors influencing water availability Challenges of free basic water Role of govt in water security Role of municipalities Water purification Strategies for sustainable Water management Govt and individuals	**Africa's Weather** La Nina and El Nino - effect Vulnerability of Africa to drought and desertification (Climate Change Risks for Africa) Management strategies Satellite images/GIS Orthophotos/aerial	**Mass Movement** e.g. impact on people and environment strategies to minimise mass movement in SA	**Concept of Development** Economic, Social Sustainability Examples of development global, regional, local **Frameworks for dev.** Factors influencing Natural resources Environmental degradation Sustainability models Community development Rural – Urban Globalisation – impact on development **Development Issues** Effect of development on environment Role of State and business Development aid (types and impact)	**Resources and Sustainability** **Using Resources** Sustainability, exploitation and depletion Sustainable resource management **Soil and Soil Erosion** Formation, erosion, effect, management **Conventional Energy Sources** thermal, nuclear, hydro Impact of conventional sources – acid rain, waste environmental degradation Nuclear Case Study Potential to meet needs through conventional sources **Non-conventional sources** Solar, wind sources Effects – economy & environ **Energy Management** South Africa's needs Green economy Energy management

EXTRACT FROM LIFE ORIENTATION ANALYSIS: FET PHASE (GRADE 10–12)											
LIFE ORIENTATION (FET)											
GRADE 10				GRADE 11				GRADE 12			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Self in Society (3hrs): confidence, participation in projects, gender, inequalities. **Careers** (3hrs) **Democracy & Human Rights** (4hrs): children & women's rights, discrimination.	**Social & Environmental Responsibilities** (4hrs): impacts on local & global communities, social & environmental justice, social issues (poverty, food security, etc.), social responsibility, youth service and development, participation in projects	**Careers** (5hrs)	**Careers** (3hrs) **Democracy & Human Rights** (3hrs): Religion and indigenous belief systems	**Self in Society** (3hrs): goal-setting, well-being. **Career** (3hrs) **Democracy & Human Rights** (4hrs): democratic participation, structures, principles & practices	**Social & Environmental Responsibility** (3hrs): health, inhumane farming methods, degradation of society & environment, fishing stocks, firewood & land, climate change, participation in community service.	**Self in Society** (5hrs): role of nutrition, role models, etc. **Careers** (5hrs)	**Self in Society (3hrs):** gender roles on health & well-being. **Democracy & Human Rights** (3hrs): diversity of belief systems, cultural practices & traditions	**Self in Society** (5hrs): healthy lifestyle choices, quality of life, environmental factors, personal plan **Careers** (3hrs)	**Democracy & Human Rights** (4hrs): responsible citizenship **Social & Environmental Responsibilty** (3hrs): community, government responsibility, intervention programmes, personal mission statement and impact	**Self in Society** (4hrs): poverty, gender, develop action plan. **Careers** (3hrs)	**Careers** (2hrs)

EXTRACT FROM LIFE ORIENTATION ANALYSIS: FET PHASE (GRADE 10–12)							
LIFE SCIENCES (FET)				LIFE SCIENCES (FET)			
GRADE 10				GRADE 11			
Term 1	**Term 2**	**Term 3**	**Term 4**	**Term 1**	**Term 2**	**Term 3**	**Term 4**
Life at a cellular, molecular level 10 hours Nutrition- minerals and importance in diet. Link to eutrophication, food labelling, loss of arable land 12 hours - plant and animal cells. Possible link with ecology/ biomimmicry 8 hours - cell division - causes of cancer - can link to pollution, nuclear radiation	**Life at a cellular, molecular level** 8 hours - traditional medical knowledge systems, biotechnology/ cloning - link to IKS/indigenous medicine and biomimicry	**Environmental Studies** 24 hours - biosphere. Biomes, human and community impact on the env. Ecosystems. trophic pyramids, energy flow, biotic and abiotic factors. Introduction to human influences on the environment which will be expanded on in grade 11	**Diversity, change and continuity** 4 hours - biodiversity, indigenous and endemic species. Classification (taxonomy) 20 hours - history of life on earth, geological history, SA fossil records, mass extinctions. radiometric testing, key event's in life's history in SA linked to non- renewable energy biodiversity and the environment. Fossil tourism.	**Diversity, change and continuity** 12 hours - biodiversity as related to micro-organisms, symbiosis (e.g. given of ecoli in human intestine, however, other examples can be given, e.g. symbiosis and decomposition in a natural forest. 12 hours - biodiversity of plants, asexual and sexual reproduction, pollination of flowers (SA examples of birds and insects), significance of seeds and seed banks - link to plant extinction 8 hours - biodiversity of animals, phyla	**Life processes in plants and animals** 12 hours - photosynthesis, importance of carbon dioxide in photosynthesis 8 hours - biodiversity of animals, phyla 16 hours - animal nutrition and ecology - link to food chains. animal nutrition - homeostasis and blood sugar control - diabetes. Link to fast foods and nutrition - loss of indigenous/ healthier ways of eating. Diets and religious diets e.g. kosher/halaal and vegetarian diets.	**Environmental Studies** 24 hours - population ecology - population size, interactions in the env. e.g. parasitism, social organisation, human population growth	**Environmental Studies** 28 hours - human impact on the environment. The atmosphere and climate change, water and availability/ quality, biodiversity, food security, acid mine drainage, solid waste disposal (practical observation and local research project)

Appendix B: Principles and Guidelines for Design of Materials and Course Processes

Environment, Science, Society and Sustainability (E3S) Teacher Education Programme: Transformational curriculum leadership for the future

ORIENTATION TO THE COURSE

- **Subject knowledge:** The course focuses on the relationships that exist between environment, science, society and sustainability in specific subjects, e.g. Water Resources Management in Geography; Climate Change in Geography; Biodiversity in the Natural Sciences; Healthy Living in Life Skills; Responsible Citizenship in Life Orientation etc. (See CAPS analysis for environmental content). It offers teachers contemporary understandings of core concepts and core issues relevant to the knowledge that they are required to teach in the CAPS. The course will bring out or bring forward the key themes that are relevant to environment, science, society and sustainability in the specific subjects.
- **Open, critical approach to knowledge:** The course helps teachers to understand knowledge and how it is constructed, framed, contested, validated and how it can change. It also helps teachers to understand how knowledge is selected and represented in curriculum documents and in textbooks, giving teachers the capability to become critical users and interpreters of curricula. It also supports teachers to select materials and make reasoned choices about how and why they use materials and what learning support materials they use.
- **Pedagogical content knowledge and quality assessment practice:** The course provides direct support to teachers to develop their pedagogical content knowledge, as required by the different subjects and the different disciplines, and support for the specific assessment practices required in the CAPS for the different subjects and phases. Besides the specifics relevant to the CAPS requirements, teachers also learn foundational knowledge of assessment and pedagogical content knowledge. The course will focus on Quality Assessment Practice, and foreground this as 'very important' and even as the 'starting point' for development of transformational curriculum leadership (particularly since it has been so neglected).
- **Transformational curriculum leadership:** The course supports teachers to think about their practice as 'transformational curriculum leadership' and is based on a '3S' pedagogy, which deepens Subject Knowledge, Self Development as a teacher; and Social Learning (the relevance of knowledge and quality teaching practice to society).
- **A wide view including systems, heritage, society and self:** The course supports teachers to understand knowledge within a systems, cultural heritage, social relevance, personal meaning-making, practices and future perspective, so that they can develop wider perspective on the issues (not just a technical perspective). This is informed by the broader purpose of the subject/area of study.

- **Transformative reflexive scholars and citizens that can participate in social transformations:** The course works towards supporting teaching practices that enable reflexive scholars (scholars that can think, do, review and reflect on actions in society) and citizens that can participate in social transformations in schools and communities using subject knowledge.

GUIDELINES FOR COURSE PROCESSES

The course will be oriented towards supporting teachers to 'develop, implement and evaluate a learning programme/sequence of lessons' relevant to the CAPS. It will be an accredited programme, and will use a workplace-based assignment (including pre-course, on-course and off-course tasks) to meet the unit standards requirements, and a portfolio of evidence that will reflect the 'knowledge mix' of the Teacher Education Qualifications (a mix of discipline-specific knowledge, pedagogical knowledge, educational knowledge, situational knowledge and practice knowledge). The focus will be on expanding existing knowledge through review of existing practice.

On-line formats, as well as pre-service and in-service applications of the programme will be investigated.

ACCREDITATION OF THE COURSE

The course will be accredited by the ETDP SETA and universities through CHE-accredited short-course programmes that wish to offer the programme. It will also be endorsed by SACE, and providers will be required to a) either be accredited by the ETDP SETA to offer the unit standard; b) affiliated to a HEI that offers the course; or c) SACE endorsed. The focus will be on assessment of subject coherence.

The course can also be integrated (as modules/elements of subject teaching modules or part of EdStuds/situational learning, etc.) into formally accredited qualifications that fall within the framework of the HEQF and the new Teacher Education Qualifications.

GUIDELINES FOR DEVELOPMENT OF CORE TEXTS

Assessment: CORE TEXT

- Ground discussions of assessment in local realities and contexts
- Importance of Assessment Practice 'Starting with Assessment'; working 'outwards' from assessment
- How to establish and recognise Quality Assessment Practice (QAP)
- Assessment of sustainability knowledge and projects
- Inclusion of different ways of assessment and different learning pathways

Knowledge: CORE TEXT

- Ground knowledge in local realities and contexts
- Introduce strategies for being critically reflective of knowledge and how to work critically with knowledge

- Develop understanding of 'knowledge trajectories', progression, increased sophistication, etc.
- Strategies for updating knowledge and working with contemporary knowledge changes

Methods: CORE TEXT

- Ground the discussion of methods in local contexts and realties
- Provide the rationale for different methods and show how methods thinking has changed over time
- Different categories of methods and how and when they are best used (for different learning purposes)
- Make visible the learning theories embedded in methods
- Relationships between pedagogical processes, purposes and methods combinations
- Layered methods
- Learning environments and use of methods (e.g. large classes)

GUIDELINES FOR DEVELOPMENT OF SUBJECT SPECIFIC EXEMPLARS

Assessment Resources: SPECIFIC ASSESSMENT PRACTICE TEXTS FOR SUBJECTS

- Assessment as starting point. Cover the basics well (what needs to be done in the subject/phase/grade), and grow from there
- Provide the rationale for the assessment and type of assessment
- Show clearly what are we assessing for (conceptual understanding; application, knowing, etc.)
- Show the disciplinary specifics in terms of assessment (disciplinary requirements in the subject)
- Cover the range of assessment approaches needed and develop ways for teachers to apply this differently to their own contexts/learner groups, etc.

Knowledge Resources: SPECIFIC SUBJECT KNOWLEDGE EXEMPLARS

- Ground knowledge in specific local realities and contexts
- Focus on the core concepts
- Include an overview of the 'knowledge trajectory' across the phase and provide perspective 'backwards' to phase below; and 'forwards' to show how the knowledge is developing
- Work with an approach that shares 'core background knowledge' that provides teachers with access to find more (where to extend the knowledge introduced)
- Cover core themes including:
  - Shaping patterns (how things have come to be the way they are)

  - What the current knowledge is (what we know now)
  - What the current and projected impacts are (what we don't yet know)
  - What is being done and what more can be done, by whom etc. (responses and action trajectories)
- Ask the interesting and important questions
- Include strategies to keep knowledge contemporary, and maintain a 'knowledge seeking' tone

Methods Resources: SPECIFIC METHODS TEXTS FOR SUBJECTS

- Ground the discussion of methods in local contexts and realities
- Give attention to the integrity of methods in relation to the disciplinary 'fabric' and purposes of the subject; and how methods change as the ESD influence becomes integrated into mainstream disciplinary methods ('e.g. borrowing methods'); sustainability also brings orientations to the way that methods are used (e.g. the concept of strong sustainability)
- Demonstrate or show how 'methods can be used in combination' within a learning process framework

BOUNDARIES OF AN EXEMPLAR

Each exemplar is to be constructed according to the principle of 'conceptual and logical coherence' in relation to what is required in the **phase** (not grade); but should point out **grade specifics/possible applications to grade specific requirements**. It is possible to produce only one exemplar for the E3S focus of each phase, but it may be *necessary* (according to the principle of 'conceptual and logical coherence' to produce more than one exemplar per phase.

Each exemplar should cover the most important concepts/knowledge orientations; pedagogical content knowledge/methods; and **quality assessment practices** (three parts that can be used inter-changeably, but must cohere). They should be easy to access, and should provide 'leads and links' to extension materials that can be obtained 'online' or elsewhere.

Each exemplar should take note of, but extend what is offered in textbooks and should support teachers to do the same (i.e. extend or work critically with textbooks). Exemplars are not textbooks to match the requirements of the CAPS, but extended knowledge and pedagogical content knowledge resource platforms for teachers and learners. They should not be based on the CAPS minimum, but should develop the CAPS approaches (knowledgeable, competent and confident teachers, able to teach their subjects successfully and with 'artistry').

Southern African Journal of Environmental Education, Vol. 28, 2011

Power/Knowledge in the Governance of Natural Resources: A Case Study of Medicinal Plant Conservation in the Eastern Cape

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Abstract

This article explores the power/knowledge relations at the knowledge generating interface between a modern community development organisation and a traditional health practitioner community in a town in the Eastern Cape, South Africa, through the lens of Foucaldian governmentality. This case study is part of a broader study which explores power/knowledge relationships in the representation and application of indigenous knowledges in selected environmental education and community development contexts. This study traces the various loci of power/knowledge and their implications in a project focusing on the conservation of traditional medicinal plants in which the community development organisation and traditional health practitioner community were involved as key partners. The case study provides a micro-setting to analyse natural resource governance, which reveals how power located in modern institutions is reinforced by the generation and accumulation of disciplinary (scientific) knowledge as a hegemonic regime of truth that is applied in the governance of medicinal resources. It also reveals the location of power within the traditional healer community on the other hand and how this is maintained by the resilient cultural retention of medicinal knowledge and related practices within the community against a background of dominant Western medical practice.

Introduction

Indigenous knowledges of local communities still remains to a large extent marginalised within mainstream education, research and development contexts. This is despite the fact that modern research and education institutions generate knowledge through interactions with local communities and derive their information from them. This case study explores the influence of power/knowledge relationships (Foucault, 1980) in the way indigenous knowledge on medicinal plants is represented from knowledge generation processes at the interface between a community development organisation and a community of traditional health practitioners in a medicinal plant conservation project. It attempts to reveal the various mechanisms used in the knowledge generation processes and their implications in the politics of knowledge representation and the governance of medicinal plant resources on the ground. The study forms part of a bigger study that explores the representation and application of indigenous knowledges in environmental education and community development contexts (Shava, 2008).

The medicinal plant conservation project emerged as an initiative of the community development organisation. The premise of the project was based on the scientific imperative

to promote the conservation of medicinal plants in the Eastern Cape, drawing from scientific research into the use of medicinal plants that states that the demand for medicinal plants exceeds supply (Mander, 1998; Wiersum *et al.,* 2006), hence the need for initiating education, awareness and agency to propagate and conserve medicinal plants among users. This conservation imperative falls within a broader mandate to conserve indigenous plants in the Eastern Cape bioregion, which in itself falls within the national and global imperative to conserve biodiversity and nature. Emerging from this is a dominant discourse, a regime of truth, of the limits of the earth's resources that necessitates their regulation and management, which forms the central tenet/theme of global environmental politics (Rutherford, 2007). This project was funded by an external donor with a focus on community gardens for sustaining a horticultural and botanical legacy (through conservation of biocultural diversity).

The approach to the project was to target and involve local traditional health practitioners (traditional healers), who comprise a significant component of medicinal plant resource users, and work with them through raising awareness amongst them on the threatened and endangered status of medicinal plants in their vicinity and the need for their cultivation. The traditional healers are nationally governed by the Department of Health through the Traditional Health Practitioners Act of 2004.

Research design

An ethnographic case study approach was used in this research (Bassey, 1999; Kyburz-Graber, 2004). The research sample comprised staff members from the community development organisation that were directly engaged in the medicinal plant project and a group of 29 members of the traditional healer community. The research instruments employed were individual and focus group interviews, observations and document analysis. Individual interviews were done with each of the three key staff members engaged in the project using unstructured open-ended questions to avoid restricting the participants' answers (Schurink, 1998). For the traditional healers, a focus group interview was done with a group of eight members to capture the collective views of the healers on different aspects of the project. Observations of interactions between the staff of the community development organisation and the traditional health practitioners during meetings and training sessions were recorded. The traditional healers' attendance during the meetings and training varied from between 21 to 29 participants. Document analysis was done on reports and minutes made by the community development organisation, which served as primary data sources (Sifuna, 1995). The data generated was then analysed using Foucault's genealogical analysis method (Tambouku, 1999; Smart, 2004) with a specific focus on governmentality. Genealogical analysis brings into play previously subjugated knowledges such as indigenous knowledges of local communities (Foucault, 1997).

Research methodology

Natural resource governance entails a nexus of power/knowledge relations that shape how we come to understand certain knowledge representations with regards to natural resources as the truth. In defining governance, Swiderska *et al.* succinctly captures its essence by stating that:

> Governance is about who decides and how, and encompasses policies, institutions, processes and power. (2008:1)

Taking into consideration the institutions (formal and informal) involved in this case study and their interests, Foucault's concept or notion of governmentality (1991) will be used as an analytical lens to articulate the power/knowledge relationships in this study. Governmentality, the 'conduct of conduct', expounds the issue of power/knowledge relationships beyond the realm of government into everyday life. Governmentality is defined as:

> The ensemble formed by institutions, procedures, analyses and reflections, the calculations and tactics that allow the exercise of this albeit complex form of power, which has as its target population, as its principal form of knowledge political economy, and as its essential technical means apparatus of security. (Foucault, 1991:102)

The application of this definition is elaborated by Michael Dean in the following statement:

> An analysis of government, then, is concerned with the means of calculation, both qualitative and quantitative, the type of governing authority or agency, the forms of knowledge, techniques and other means employed, the entity to be governed and how it is conceived, the ends sought and the outcomes and consequences. (Dean, 2004:11)

Governmentality actually extends beyond the realm of influencing the conduct of others into the realm of self, that is, the way in which individuals question their own conduct. Here the focus is on how we as individuals behave, act and create our identities in order to better govern it. To govern therefore refers to 'how we structure the field of possible action, to act on our own or other's capabilities for action' (Dean, 2004:14).

Governance in the Medicinal Plants Project

In analysing governance in this study, the primary aspects I considered (following Dean, 2004) were:

- *Visibility (truth):* the ways of seeing and representing reality (the episteme);
- *Knowledge:* distinctive ways of thinking and questioning, vocabularies and procedures used for the production of regimes of truth which circumscribe how the world is perceived/apprehended;
- *Techniques and technologies of government (forms of power):* tactics, mechanisms and procedures used to deploy rules and construct experts;
- *Biopolitics (identity):* the formation of particular kinds of subjects, the shaping of agency and direction of desire through various techniques or strategies of knowledge gathering, measurement and assessment.

Visibility

Visibility makes reference to knowledge world views of epistemologies. In the medicinal plant project two world views are evident. On the one hand there is the Western scientific world view of modern institutions. This view emphasises the bounded nature of the earth and the limits of its resources and forms the basis for global environmental governance. This is made visible through maps, charts, graphs and other means of surveillance for capturing, documenting and presenting evidence in established modern institutional structures and systems. From the Western scientific perspective nature has been reduced to a collection of quantifiable resources, such as medicinal plant species, which need to be managed as an economic commodity. This is the basis for its logical argument to stem plant biodiversity loss and to ensure constant supply to users through the cultivation of medicinal plants.

On the other hand there is the traditional healers' world view which is grounded in the traditional healing culture. From the traditional healers' perspective medicinal plants are inscribed into the holistic context of everyday life, are a gift from the ancestors and from God, are unlimited and for them to be effective they have to be obtained from the wild. The knowledge of traditional healers is made visible through its application in practices of healing, that is, the practical knowledge of which plants in the lived environment can be used to heal different ailments.

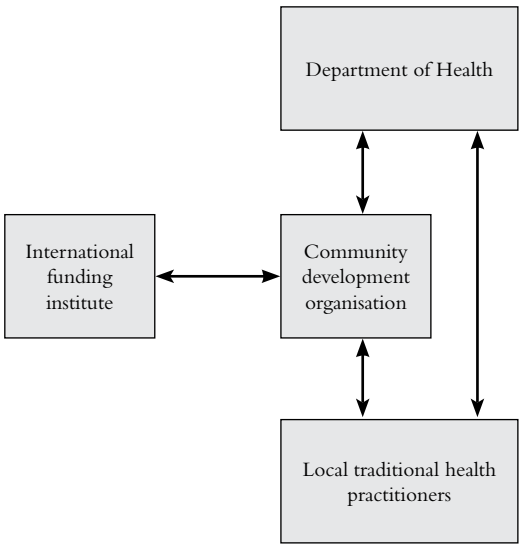
Knowledge: Regimes of truth

Western scientific knowledge generation is supported by its normalising mechanisms, techniques and technologies of representing reality. These include evidence gathered through statistical information, assessment, observation and recording processes on the studied entity. The forms of knowledge generated, the thought systems and the experts involved in generating that knowledge comprise important components for establishing and validating the regimes of truth. However, power is expressed not only in the scientific discourses but in the power/knowledge relationships in which those discourses are brought into play. Here the prolific generation of Western scientific knowledge on medicinal plant scarcity and the global plant biodiversity threats and its dissemination in formal research, education and socio-economic contexts ensures that it is the accepted reality or recognised regime of truth that is applied in the governance of medicinal plant species. As a result, Western knowledge hegemony is entrenched while the locally contextualised cultural knowledge, views and practices of traditional health practitioners are excluded and marginalised and subsumed by the widely recognised Western science discourses.

Technologies and techniques of government

These are mechanisms, tactics, techniques or procedures that are used to rationalise action in order to achieve intended ends, such as imposing limits to harvesting and proposing the cultivation of medicinal plants. A stratified structure of governance is evident with regards to different stakeholder influences, reflecting plural forms of governance that are interwoven with a thread of continuity (Foucault, 1991). This is represented in Figure 1 below. Each institution utilises various techniques of government to entrench itself and influence the conduct of others.

Figure 1. The tiered governance structure in the Traditional Plants Conservation Project



In the above stratified structure:

a) The c*ommunity development organisation* serves as an information hub and conduit that provides an enabling platform for deliberation and agency on medicinal plant biodiversity conservation. It also serves to interpret related policy and to facilitate deliberations on policy implications and advocacy for policy transformation processes. For the traditional health practitioners, the institution is made to serve as an interlocutor, providing a voice for the voiceless. The institution has therefore strategically positioned itself as a primary knowledge source, broker, interlocutor and advocate on behalf of the traditional health practitioners. However, the main role of the institution is to promote: the conservation of medicinal plant populations through awareness of their threatened or endangered status; the cultivation of medicinal plants; and the application of sustainable harvesting practices. Its reason is medicinal plant biodiversity conservation in the Eastern Cape biome. Its techniques are the mobilisation and control of human, financial and infrastructural resources for providing a training programme for the cultivation and sustainable harvesting of medicinal plants and a platform for deliberations on medicinal plant biodiversity conservation, intellectual property rights and policy issues. Its subjects are: local traditional medical practitioners (who are the project's primary target group), whom it intends to transform into agents of conservation; policy makers such as the Department of Health; and researchers and research institutions interested in the knowledge of medicinal plants.

b) The *local traditional health practitioners* are mobilised into a loosely structured institution that presents itself as a community of practice around a shared common concern of sustaining traditional health practices. This arrangement gives them

a common (agential and resistance) voice and protects their interests as well as regulates external interactions (by determining criteria on whom they do or do not work/collaborate with). Their reasons are the sustenance of the culture of traditional health practice and the protection of medicinal plant knowledge and healing practices, which are the source of their livelihoods. Their subjects are: researchers and research institutions (through appropriation); plant traders (through wrong prescription and culturally incorrect collection of medicinal plants); and government (through negative policy) that threatens their practice.

c) The *international funding organisation* provides funding for the development of medicinal plant gardens and mandates the community development training institution to facilitate this. Its reason is plant biodiversity conservation. Its technique is the sourcing and provision of financial resources for indigenous plant conservation through garden development initiatives. Its subjects are: the community training organisation, which furthers its cause; and the traditional health practitioners, who have been instrumentally co-opted as the agents to implement the medicinal plant gardening initiatives.

d) The *Department of Health* is a formal government institution with an overall regulatory function on health practitioners. To this effect it has formulated an overarching policy framework that aims to regulate local traditional health practitioners and their practices. Its reasons are safe health provision for all. Its techniques are the regulation and standardisation (that is modification and westernisation) of traditional health practices through a nationalised system of human, financial, systematic (policies and legal instruments) and infrastructural resources. It subjects are the traditional health practitioners, whom it has to regulate and whose practice it is attempting to standardise.

What is evident in techniques and technologies of government in this case study is the fact that governing medicinal plant resources occur in multiple sites and through the application of a myriad of techniques (Rutherford, 2007).

Biopolitics: Formation of identities

Governance of populations is achieved by effects on the identity (agency) of the targeted entity, what Foucault refers to as biopolitics. Dean explains that government seeks to 'shape conduct by working through our desires, aspirations, interests and beliefs, for definite but shifting ends' (2004:11). Legg (2005) explains that governmentality works through the concept of information and calculation, utilising the data gathered for defining what constitutes the truth through positing academic disciplines as the gatekeepers of knowledge. In the governance of medicinal plants, two populations are involved and affected, firstly the medicinal plants and secondly the traditional health practitioners.

With regards to medicinal plants, while the identity of these plants and their use as medicines originates from the traditional health practitioners who use them, they have now been re-defined within the regimen of Western scientific discourse through various techniques or strategies of Western knowledge representation. These plants, through normalising processes of

control, selection, organisation and distribution – such as assessment, statistical quantification of the population and re-classification – have been appropriated from the domain of traditional medical practice into the realm of global Western scientific environmental discourse of scarcity (threatened or endangered) and prioritised for conservation, thereby making them entities for Western modes of environmental governance. In other words, the scientific discourse on medicinal plants shapes how we perceive them, thereby transforming them from a local resource available for use by traditional medical practitioners to plants that are endangered or threatened with extinction and therefore needing protection from human exploitation through regulatory processes.

The traditional healers, due to their being identified as resource group users that impact on the availability of medicinal plants, have been selectively targeted for involvement in this project. The community development organisation, while acknowledging the significant role played by traditional healers in the provision of health services to the local communities, also contends that the harvesting of medicinal plants in the wild is not sustainable and that traditional conservation practices are ineffective. The basis for this argument is scientific evidence of declining populations of local medicinal plant species that could become extinct. Despite the traditional healers' cultural (and also scientifically supported) belief in the fact that the potency of medicinal plants is derived from their growing in their natural habitat, the discourse of declining species occurrence provides a convincing argument that can or will transform traditional healers into environmental subjects who are willing cultivators and users of cultivated medicinal plants. Therefore, by invoking a focus on this particular form of truth (on the scarcity of medicinal plants), the community development organisation is able to influence and regulate the conduct of the traditional medical practitioners that it is working with.

Locating Power/Knowledge and Its Implication for Agency

In this section I will attempt to trace the loci of power/knowledge in the medicinal plant project.

Foucault describes power as diffuse, capillary and productive, producing subjects and utilising knowledge (1990). This focus on power is not only on individuals and institutions and how they impose their authority over others, which usually results in skewed power relations that favour the powerful over the less powerful. Rather, the focus is more on the de-centred, rhizomatic distribution of power, how it permeates all subjects and social relationships, as well as the exercise of power. Foucault (1980) claims that power is neither possessed, given, exchanged, nor recovered; rather, it is exercised. Individuals are vehicles for the transmission of power, always in a process of simultaneously undergoing and exercising power. Power circulates and is never localised, it is not a commodity but a strategy, a multiplicity of force relations comprising dispositions, manoeuvres, tactics, techniques and functions. Foucault (1984:83) refers to power/knowledge relationships as the 'hazardous play of dominations' and a 'strategic game between liberties'. Foucault brings into perspective another useful aspect of power besides its usually repressive effect, that is, its productive effect and its networked strategic nature (Foucault, 1995).

Foucault also argues that power and knowledge are intertwined and are always and necessarily interdependent. Power produces knowledge and knowledge in turn enables the exercise of power (Foucault, 1980; 1995).

In this case study the community development organisation was informed by Western scientific evidence in the form of knowledge of the taxonomic identity, availability and spatial distribution of medicinal plants in the area, and uses this as the basis for the project. In addition to Western knowledge symbolic capital, the organisation also had human capital in the form of experienced staff qualified in Western science (botanists and horticulturalists), and financial capital in the form of funding provided by the external international donor. Through these various forms of capital the community development organisation was able to exercise power to influence the direction of the project in order to achieve its intended goal of medicinal plant conservation through education and awareness, leading to traditional healer agency for the cultivation and sustainable harvesting by the traditional healers as the targeted users. This was in line with the external donor's goal to develop community gardens for medicinal plant conservation purposes.

However, despite this authoritative position, the community development organisation was aware that it could not undertake the project without the involvement and willing participation of the traditional healer community as a key stakeholder. This then involved yielding power to the traditional healers and allowing them to have a representational say in the project's decision-making processes. The awareness of the community development organisation of the power of traditional healers was evident by the sensitivity with which they treated the healers in the project and their efforts to avoid confrontational issues with them. This was revealed in their consulting the healers on what plants can be grown and how to cultivate them without infringing on cultural taboos and in their respecting the privacy of healers' knowledge on the use of medicinal plants, thereby protecting their intellectual property rights. It was also expressed in the protective exclusion of other researchers who wanted access to the healers but with whom the healers did not want to interact.

However, a major threat to the long-term success of the cultivation of medicinal plants was the scepticism that traditional healers, especially older, senior ones, have towards the effectiveness of cultivated medicinal plants. The acceptance or non-acceptance of medicinal plant resources from cultivated sources is therefore in the power of the traditional healers, which has implications in the sustainability of the project.

Traditional health practitioners, as a community of practice, derive authority from their indigenous knowledge and practices of healing utilising local medicinal plants within their cultural–spiritual worldview. This knowledge and practice is their cultural capital that has enabled them to sustain their medical practices parallel to the dominant modern medical practices. However, lack of access to medicinal plants due to scarcity resulting from changes in land use patterns (proliferation of private game farms), makes previously accessible natural vegetation areas no longer accessible and leads to an over-exploitation of herbal medicines by commercial traders (from both within and outside the local community context) who mass harvest medicinal plants and pose a major threat to their practice.

The impact of other open-access resource users, such as commercial medicinal plant harvesters, as well as the impact of changing land use patterns, such as the transformation of agricultural land into private game farms which are inaccessible to traditional healers, needs to be carefully articulated and given due consideration in the project. In essence, traditional healers are disempowered with regards to control over land and medicinal plant resources as most of the land belongs to private individuals, corporations or to government (Swiderska *et al.*, 2008). Medicinal plant resources on common property areas that the traditional healers have access to are also accessible to everybody, resulting in the 'tragedy of the commons' phenomenon (Hardin, 1968). Because the land does not belong to the community, they are not capable of managing and controlling the resource use therein. It is this aspect that has driven the traditional health practitioners to embrace the new Western scientific reality of plant scarcity and the possibility of extinction and to explore alternative means of ensuring continued access to medicinal plant resources. Their consent to participate in the project, while in itself an exhibition of freedom, also exposed them to forms of subjectification and states of domination.

Environmental education processes should reveal all the interrelated factors contributing to an environmental issue, leading to a more holistic view of the issue. In the case of medicinal plant scarcity, the role of other stakeholders needs to be highlighted as this has significant bearing on the success of the project. Raising awareness and engagement with these other stakeholders, such as commercial gatherers, private game farmers and private game reserves, is crucial for a more comprehensive approach to effectively address medicinal plant scarcity.

One imposition on the traditional healers was the intention by government to regulate them through the Traditional Health Practitioners Act, which attempts to standardise their practices to conform to Western medical practice and international policies. From a global perspective, the World Health Organisation's global survey report (WHO, 2005) on national policy on traditional medicine and the regulation of herbal remedies found the non-regulation of traditional health practitioners and herbal remedies a challenge and advocated for the development of international standards and appropriate methods for evaluating traditional medicine. It outlined the key elements for developing a national policy on traditional medicine as a regulatory framework. The WHO advocates for the institutionalisation of traditional medicine (WHO, 2011) and for its regulation and control (Robinson and Zhang, 2011). This reveals the extent of the external influence of the international organisations who are powerful actors in generating the regulatory discourse and mapping the future direction of traditional medicine and, overall, of drugs and medicinal practice in the global arena. The traditional healers were aware and concerned that they were being measured against the yardstick of modern medicine and that most modern medical practitioners view traditional medicinal practice as inferior to modern medicine (Shava, 2008). It was this that prompted them to challenge the development and negative implications of the Traditional Health Practitioners Act of 2004. The main threat from the Act was the imposed requirement for healers to be registered under the Act. This has the possibility of excluding and criminalising those individual practitioners not registered under the Act who are already engaged in the practice and recognised and respected by their communities. The community development organisation played a significant educational role in raising awareness among traditional healers of the implications of the Act

and how they could include their voice in its development. However, this should also have extended to incorporate the influence and interests of global players such as the WHO.

One major bone of contention with the Act is the attempt to standardise traditional healing practices in an effort to ensure safety in health provision. Traditional healers argued that traditional medical practice cannot be standardised as it is a calling from the ancestors through dreams and visions and that each person is called differently, hence there can be no uniformity in traditional healing practice. They pointed out that the gift of healing differs in each healer and therefore one healer can be gifted in healing a particular ailment while another is gifted in a different area. Incidentally, this aspect of specialisation is an accepted norm in modern medical practice. Similarly, traditional healers also query the hospital referral system which tasks them to refer patients that they suspect have HIV/AIDS to hospitals. It fails to reciprocate the practice by referring patients which modern medicine cannot treat who could be helped by traditional medicine (Shava, 2008). They also claim their role as equivalent to that of a modern physician or doctor because they have the ability to diagnose and treat patients. They refuse to be equated to or undermined by a nurse who takes instructions from a doctor. The traditional healers' response to the Traditional Health Practitioners' Act supports Foucalt's notion that:

> Where there is power, there is resistance, and yet, or rather consequently, this resistance is never in apposition of exteriority in relation to power. (1990:95)

In essence the Act is challenged for its top-down imposition on, and failure to represent the interests of, the traditional health practitioners that it intends to govern.

Traditional healers recognised the strengths of the community development organisation (through its various forms of capital) in that they saw them as a knowledgeable authority that would serve as educators to the traditional health practitioners. In this regard, the traditional healers yielded to the power wielded by the community development organisation and played a subordinate and recipient role in the project. However, the traditional healers have, on the other hand, been able to strategically leverage the advantage of working with the community development organisation to their benefit. This has included using the influence of the community development organisation to seek access to medicinal plant resources on farms, to secure land from the municipality for their organisation, to obtain animal hides and remains required for their practice from taxidermists and to acquire certification as registered traditional healers to further their cause. Similarly, the formal training provided by the community development organisation also adds clout to the traditional healers. Overall, this reveals the positive and productive aspects of power in interactions with the community development organisation.

In attempting to trace the loci of power in this case study, one can conclude that power is everywhere and is exercised from innumerable points through various practices, agents, discourses and institutions (Foucalt, 1990; Rutherford, 2007). This is evidenced in the power of the community development organisation (through is knowledge and human resource and financial capital), the traditional health practitioners (through their choice to participate, and their knowledge and cultural practices and the ability to use the influence of the community

development organisation to their benefit), the Department of Health (through its regulatory framework) and the donor organisation (through its funding preferences or interests). The case study reveals a strategic interplay of power relations, of domination and resistance, consensus and will. Foucault explains that:

> governing people is not a way to force people to what the governor wants; it is always a versatile equilibrium, with complementarity and conflicts between techniques which assure coercion and processes through which the self is constructed or modified by himself. (1993:203–204)

Conclusion and Recommendations

What is evident in the relationship between the traditional healers and the community development organisation, together with other modern stakeholder institutions (the donor organisation and the Department of Health), are the complex and dynamic power struggles which bring into perspective what Foucault (1987:130) refers to as the 'strategic game between liberties' in the governance of medicinal plant resources. This reveals that power is not located within one powerful entity and that it is not uni-directional in nature. Rather it is distributed across and expressed through various entities within the project during their interactions in order for each to achieve their intended ends.

The power of modern institutions derives from their generation, recording, accumulation and application of Western knowledge discourses as a hegemonic regime of truth that permeates the global arena. However, it should be exposed that the knowledge on medicinal plants is derived from traditional healers and is appropriated into Western scientific knowledge where it is then represented in the discourse of limited earth resources that need to be scientifically governed (while traditional conservation practices are silenced).

Traditional health practitioners, on the other hand, rely on the application of time-proven traditional knowledge and cultural medical practices in the local context as the basis for their practice that defiantly resists and exists parallel to the dominant modern medical practices. However, while the traditional medical practice is locally sustained by the healers' agency, knowledge generated from modern institutions currently remains dominant and it negatively influences the practice of traditional healers from a global and national level.

The productive aspects of power are clearly revealed by the way that traditional healers leveraged on the power/knowledge capital of the community development organisation to further their cause. This was clearly a positive spin-off from the healers' interactions with the modern community development institution and reveals that such interactions are not necessarily negative to local communities.

In conclusion, environmental education processes should seek to critically interrogate and bring to the fore the interplay of power/knowledge relations and reveal their implications in the way knowledge is represented from knowledge generation processes involving the interaction of modern institutions and local communities. This critical approach challenges the

normalised institutional knowledge generation processes that appropriate local knowledges and subsume them into Western science knowledge discourses. This then creates spaces for the inclusion and representation of indigenous voices in the academy and its application in community development contexts.

Note on the Contributor

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Southern African Journal of Environmental Education, Vol. 28, 2011

Climate Change Literacy among Postgraduate Students of Addis Ababa University, Ethiopia

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Abstract

The primary objective of environmental education is believed to be developing environmental literacy. The environmentally literate person is described as a person who possesses the values, attitudes and skills that enable knowledge to be converted into action. This study was aimed at assessing the level of climate change literacy among graduate students in four programmes at Addis Ababa University, Ethiopia. To this end, a questionnaire was developed and administered to a total of 91 students. An attempt was made to include all the major conceptual and geographical aspects of climate change literacy. Results indicate that the students who participated in the study demonstrated a 'just above average' performance on the whole, but clearly poor performance in some of the key areas related to the science behind climate change, past trends in rainfall and temperature and the impact of climate change on Africa. It is particularly worrisome that many of the students had inadequate or no information about the projected or actual impacts of climate change on poor countries, including those in Africa. Students' awareness about some of the key measures proposed at the global level is also inadequate. It is therefore strongly recommended that follow-up studies be conducted to see the effects of such factors on programme syllabi, teaching approaches used, key sources of information, etc., and on students' climate change literacy.

Background

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as a 'change in the state of the climate that can be identified … by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer' (IPCC, 2007:30). It is also noted that climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity. Recent assessment reports of the IPCC conclude (based on observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level) that 'warming of the climate system is unequivocal'. Such declarations from the IPCC and other reputable sources seem to have led to an unprecedented level of concern about climate change over the last two decades.

Though there is no part of the world immune from the impact of climate change, the impact appears to take different forms in different parts of the world. For instance, over the period ranging from 1900 to 2005, precipitation increased significantly in eastern parts of North and South America, northern Europe and northern and central Asia, whereas precipitation declined

in the Sahel, the Mediterranean, southern Africa and parts of southern Asia (IPCC, 2007). In terms of impact and vulnerabilities, there are also sharp differences across regions. Those in the weakest economic position are often the most vulnerable to climate change and are frequently the most susceptible to climate-related damage.

Impact of climate change on Africa

Recent studies confirm that Africa is one of the continents most vulnerable to the impact of climate change because of multiple stresses and low adaptive capacity (IPCC, 2007:65). Nyong (2005) argues that climate change can seriously hamper the realisation of the development goals and aspirations of the continent. A report by the Economic Commission for Africa (ECA) and the African Union Commission (AUC) substantiates that climate change 'is already eroding decades of hard-won development gains' (ECA and AUC, 2010:1). Bauer and Sholtz (2010) thus underscore that any effort to promote sustainable development in sub-Saharan Africa will need to account for the probable impact of global climate change. The following are some of the more specific kinds of impact projected to occur on the African continent:

- By 2020, 75 to 250 million people are projected to be exposed to increased water stress;
- By 2020, yields from rain-fed agriculture could be reduced in some countries by up to 50% thereby adversely affecting food security;
- Towards the end of the twenty-first century, projected sea level rise will affect low-lying coastal areas with the cost of adaptation amounting to at least 5 to 10% of GDP; and
- By 2080, an increase of 5 to 8% of arid and semi-arid land is projected (IPCC, 2007:50).

Impact of climate change in Ethiopia

The recently published 'Ethiopia Environment Outlook' report discloses that climate variability and change are among the pressing issues already affecting the livelihood of most Ethiopians (EPA and UNEP, 2008). Climate-related hazards in the country include drought, floods, heavy rains, strong winds, frost, heat waves, etc. Drought is believed to be the single most important climate-related natural hazard affecting the country (FDRE, 2007). The other climate-related hazard that affects Ethiopia is flooding. Major floods causing loss of life and property occurred in different parts of the country in 1988, 1993, 1994, 1995, 1996 and 2006 (FDRE, 2007). Causes for vulnerability to climate variability and change in Ethiopia include very high dependence on rain-fed agriculture (which is very sensitive to climate variability and change), underdevelopment of water resources, low health-service coverage, high population growth, low economic development levels, low adaptive capacity, inadequate road infrastructure in drought prone areas, weak institutions and a lack of awareness. (FDRE, 2007:5).

Efforts to address climate change

The past two decades saw noteworthy efforts in Ethiopia to address, a least at policy level, issues related to environmental degradation in general and climate change in particular. An important case in point is the effort to mainstream environment and climate change into the recently launched 'Growth and Transformation Plan' (GTP). The GTP is a medium-term strategic framework for the five-year period 2010/11–2014/15. One of the cross-cutting

issues identified in the plan deals with 'environment and climate change' (MoFED, 2010). The document (GTP) duly emphasises that environmental conservation makes a vital contribution to sustainability of development and calls for 'building a carbon neutral and climate resilient economy and enforcement of existing environmental laws' as priority actions (MoFED, 2010:77). The document also underlines that 'the formulation and implementation of a climate change adaptation programme is a dictate of Ethiopia's survival'.

The Role of Education in Combating Climate Change

> People who do not know the ground on which they stand miss one of the elements of good thinking which is the capacity to distinguish between health and disease in natural systems and their relation to health and disease in human ones. (Orr, 1992:86)

The international community adopted the United Nations Framework Convention on Climate Change (UNFCCC or FCCC) at the United Nations Conference on Environment and Development (UNCED) in 1992 in order to combat anthropogenic climate change. To this end, a wide range of mitigation and adaptation measures have been proposed. Article 6 of the UNFCCC deals specifically with education, training and public awareness (United Nations, 1992:10). This Article calls for the development and implementation of educational and public awareness programmes on climate change and its effects; public access to information on climate change and its effects; public participation in addressing climate change and its effects and developing adequate responses; and the training of scientific, technical and managerial personnel.

Ethiopia ratified the UNFCCC in April 1994 (FDRE, 2001). One of the official documents (related to climate change) produced by the Ethiopian government underscores that Ethiopians need to be made aware of the commitments of the country under the convention, the impacts of climate change, adaptation and mitigation options as well as of measures that can be taken at the individual level to combat climate change (FDRE, 2001). The document also lists some of the efforts already made to this end. The Ethiopian Ministry of Education (MoE) has, for instance, made efforts to introduce environmental education into the school curricula at various levels. Topics on climate change have been infused into school subjects like Geography, Agriculture and Biology. Notwithstanding the important steps taken so far, the level of awareness about the environment in general and climate change in particular remains very low among most Ethiopians (FDRE, 2001).

The Problem

The Ethiopian education policy requires higher education at diploma, degree and graduate level 'to be practice oriented, enabling students to become problem solving professional leaders in their fields of study and in overall societal needs' (FDRE, 2004:12). A review of environmental policies in Ethiopia issued over the past two decades also shows that remarkable efforts have been made to address climate change at policy level. The implementation of the various

environment-related policies has, however, been constrained mostly by the gaps between policy and practice and limited stakeholder participation (McKee, 2007). It is also argued that the level of awareness among policy makers, professionals and the general public in Ethiopia about climate change is very low. The same source (FDRE, 2001) discloses that the country's participation in the climate change negotiation process is very weak due to inadequate negotiation and language skills as well as financial constraints. All these issues highlight the need for strengthening climate change literacy at institutions of higher education from which future climate change negotiators and teachers will emerge. The purpose of this study was therefore to assess the actual state of climate change literacy among postgraduate students in selected programmes at Addis Ababa University.

Rationale and Objectives of the Study

The major aim of environmental and sustainability education at university level is to help prospective graduates to not only develop a broad conceptual framework but also to gain specialised knowledge and technical skills which could, in turn, be applied in natural resource management and environmental protection (Belal & Springuel, 1998). Higher education institutions are also expected to contribute towards climate change literacy. In line with such an expectation, some efforts have been made in recent years to assess the extent of climate change literacy among students at higher education institutions (Boyes *et al.* 1995; Dove, 1996; McBean & Hengeveld, 2000; Summers *et al.*, 2000; Cutter & Smith, 2001; Khalid, 2003; Spellman *et al.*, 2003; Papadimitriou, 2004; Pe'er *et al.*, 2007; Cordero, 2008).

Spellman *et al.* (2003) assessed the awareness of higher education students in the United Kingdon about global climate change. Their study indicates that higher education students are well informed on the issues. The writers thus conclude that 'the government, education and media in the United Kingdom have been successful in promoting scientifically and environmentally literate citizens in this age group' (Spellman *et al.*, 2003:218). A study by Summers *et al.* (2000), which assessed primary school teachers' understanding of biodiversity, the carbon cycle, ozone and global warming, indicates that primary teachers had substantial understanding of some aspects of the science underpinning the four environmental topics investigated though 'other key scientific ideas underlying these topics were far less well understood' or absent (Summers *et al.*, 2000:307).

Cordero's study on climate change education points out significant misconceptions among university students (Cordero, 2008:870). The misconceptions in this case were explained in terms of factors such as the way media portrays global warming and how these topics are covered in K-12 classes (kindergarten to grade 12). Papadimitriou (2004) suggests that misconceptions and misunderstandings about climate change are not limited to students - teachers can have such misunderstandings as well. A study by Khalid confirms that 'pre-service secondary science teachers had a tendency to combine one issue with the other. They showed misconceptions when they tried to interconnect the apparently independent phenomena of the greenhouse effect and ozone depletion in the upper atmosphere' (2003:36).

Many of the studies related to climate change literacy underline the need for identifying

possible misconceptions among students about the causes, consequences and cures of climate change. This is particularly important in teacher training programmes. Unless the misconceptions are rectified while the prospective teachers are still in their training institutions, they 'might pass on false information to or fail to correct the children they eventually teach' (Dove, 1996:99–100). Papadimitriou (2004:300) also argues that prospective teachers should acquire a better and deeper understanding of the subject themselves to be able to teach properly about climate change and not to pass their own misconceptions to pupils. In general, discovering misconceptions held by students before teaching specific courses would enable lecturers 'to avoid students trying to attach new knowledge to existing false ideas' (Dove, 1996:99–100). The aim of the study reported here was assessing the level of climate change literacy among postgraduate students of Addis Ababa University including prospective teachers. The study has the following specific objectives:

- to assess the level of awareness of graduate students about the key aspects of climate change literacy: scientific basis, effects, causes and mitigation and adaptation measures; and
- to examine differences between students from various programmes: Environmental Science, Geography and Environmental Education; and Geography and Environmental Studies.

Methodology

Climate change literacy operationalised

Climate change literacy is understood in this paper as the ability to recognise the basic science underlying climate change; to identify the major causes and effects of climate change; and to distinguish the key measures to mitigate and adapt to the impact of climate change.

Instrument

A questionnaire, prepared on the basis of review of current knowledge related to climate change has been used as a principle tool for gathering data for this study. The questionnaire is composed of 56 statements each having three options: 'correct', 'incorrect' and 'I don't know'. The last option was included to give students the 'freedom' to express doubts about their awareness. The students' responses thus represent the three states 'informed', 'misinformed' and 'uninformed' (Spellman *et al.*, 2003). It is important to note here that four different scales have been developed to measure the four aspects of climate change literacy: basic science (17 statements), effects (19), causes (9) and mitigation and adaptation measures (11). An attempt has also been made to include national, continental and global dimensions of climate change literacy. Box 1 shows sample statements from the four scales developed to measure climate change literacy.

The initial version of the questionnaire was administered to 25 students in a master's programme at Addis Ababa University. The students were first asked to fill out the questionnaire, which was then collected, mixed up and distributed back to the students to correct. Students were advised to correct the responses of their fellow students by assigning '1' to correct responses, '0' to 'don't know' and '-1' to incorrect responses. The correction was done in a regular 'class'

by reading the statements one after another and then deciding whether the given statement is correct or not. This process led to a heated debate in class (on whether some statements were to be accepted as correct or not). The process eventually resulted in the refinement of the wording in a number of statements.

Box 1. Sample statements

Basic science

Statement 15: The greenhouse effect is a phenomenon that keeps the temperature on the earth's surface averaging at 15°C. *(Correct)*

Statement 1: The greenhouse effect is caused by gases that trap rays radiated from the sun. *(Incorrect)*

Effects

Statement 13: The total global sea level rise in the twentieth century amounted to 1.7 metres. *(Incorrect)*

Statement 46: In Ethiopia, the frequency of droughts increased from 'once every ten years' in the 1950s to 'every second to third year' at present. *(Correct)*

Causes

Statement 45: The largest source of human emissions contributing to global climate change is methane. *(Incorrect)*

Statement 5: China is at present the biggest emitter of overall greenhouse gases. *(Correct)*

Mitigation and adaptation measures

Statement 51: Adaptation measures are aimed at exploiting beneficial opportunities that result from climate change. *(Correct)*

Statement 42: There are technological alternatives developed over the last five years that could replace fossil fuels quickly and cheaply. *(Incorrect)*

Participants

Participants of the study included graduate students (these are students working towards their master's degree) in three colleges of the Addis Ababa University, namely the College of Natural Sciences, the College of Social Sciences and Humanities and the College of Education and Behavioural Studies. A total of 91 students took part from four different programmes: Environmental Science (regular), Geography and Environmental Education (regular), Geography and Environmental Education (extension) and Geography and Environmental Studies (regular). These particular programmes were selected because of their overt interest in environmental issues in general and climate change in particular. The Geography and Environmental Studies Department (former Department of Geography) is one of the oldest departments at Addis Ababa University, whereas the other three programmes are among those programmes that have been initiated more recently, partly because of the growing interest in environmental issues both globally and locally. The great majority of the participants (92.3%) were male students.

Data gathering and analysis

The questionnaire was administered during regular lecture sessions by the writer or (in the case of the Environmental Science Programme) another professor. Participants were instructed to choose one of the three options: 'correct', 'incorrect' and 'I don't know'. Quantitative data analysis was undertaken using the SPSS software. ANOVA was run to check the significance of the mean difference between the various groups. The reliability of the four scales that make up the questionnaire was checked using the WINMIRA 2001 programme. Accordingly, the ANOVA reliability for the first scale (basic science) was 0.66; 0.72 for the second scale (effects); 0.49 for the third scale (causes); and 0.55 for the fourth scale (mitigation and adaptation measures).

Findings

Overall performance

The overall performance of the students has been summarised in Table 1. The figures in the table indicate that the students demonstrated climate change literacy that can be rated as 'just above average', with 31 correct responses on average out of 56 statements (54.7%). The highest score was 43 out of 56 (76.8%) and the lowest 15 (26.8%). Interestingly, both the highest and lowest scores come from the same programme: Geography and Environmental Education (extension). It is also important to note that 39.3% of the statements received less than 50% correct responses. On average, 14.3% of the statements received less than 25% correct responses.

Table 1. Key performance indicators

Indicator	Value
No. of statements	56
Minimum correct score (out of 56)	15
Maximum correct score (out of 56)	43
Mean	30.65
No. of statements with more than 75% correct responses	16 *(28.6%)*
No. of statements with 50-75% correct responses	18 *(32.1%)*
No. of statements with 25-49% correct responses	14 *(25.0%)*
No. of statements with less than 25% correct responses	8 *(14.3%)*

Performance by programme

Table 2 provides more specific information about performance by programme. Accordingly, participants from Geography and Environmental Education (regular) achieved the highest average score, whereas those from the Geography and Environmental Education (extension) programme scored the lowest. The former are students who are currently being trained to teach Geography in high schools and colleges or universities. The group with the lowest average score is composed of relatively older participants, most of whom are currently teaching Geography in high schools in Addis Ababa. The results thus reveal that those who are actually teaching

Geography in high schools performed far worse than those who are not. This is perhaps due to the difference in the curriculum at the bachelor's level. The recent Geography curriculum has more courses related to contemporary global environmental issues than previous curricula (Dalelo, 2010). It could also be due to the paucity of information on climate change at school level. McBean and Hengeveld suggest that 'most educators within elementary and secondary schools have limited access to peer-reviewed scientific literature or current science assessment reports' (2000:19–200).

Table 2. Performance by groups

Groups	No. of participants	Mean (out of 56)	SD	Min.	Max.
Environmental Science (ES)	16	32.3 *(57.7%)*	5.053	22	41
Geography and Environmental Education Regular (GEEd.R)	25	34.6 *(61.8%)*	3.215	28	40
Geography and Environmental Education Extension (GEEd.E)	23	26.7 *(47.7%)*	7.475	15	43
Geography and Environmental Studies (GEES)	27	29.4 *(52.5%)*	5.064	20	40
Total	91	30.7 *(54.8%)*	6.114	15	43

In most cases, the differences between the groups are found to be statistically significant at 0.05 level. Accordingly, students of the Environmental Science programme performed significantly better than those of Geography and Environmental Education (extension), and students of Geography and Environmental Education (regular) performed significantly better than those of Geography and Environmental Education (extension) and Geography and Environmental Studies.

Table 3 reveals an interesting pattern of performance across the different programmes against the four aspects of climate change (CC) literacy.

Table 3. Percentages of correct responses by programme and category

	Category			
Programme	**CC: Basic science**	**CC: Effects**	**CC: Causes**	**CC: Measures**
EnS	**53.2***	49.5	**51.1**	**61.8**
GEEd.R	46.7	**62.1**	43.3	**64.5**
GEEd.E	35.3	43.2	41.1	43.6
GEES	44.1	**53.7**	48.9	**57.3**

* Figures in bold show mean values greater than 50%.

Students of the Environmental Science Programme achieved a mean score of more than 50% in three of the four aspects of CC literacy. On the contrary, students of Geography and Environmental Education (extension) failed to score more than 50% in any of the four aspects. In relation to this, Boyes *et al.* (1995:143) report that students with an arts-based background were less sure of some of the issues surrounding a major environmental problem compared to their counterparts with a science-based background. Participants from the GEEd.R and GEES programmes scored above 50% in two of the four aspects of CC literacy as defined in this paper.

Level of difficulty of the various aspects of climate change literacy

Table 4 also provides important hints as to the relative ease or difficulty of the specific categories of CC literacy. Accordingly, categories 1 and 3, scientific basis and causes, seem to be relatively more difficult for the participants (only one of the four groups being able to score more than 50%). On the other hand, the fourth category, measures, is found to be relatively easier, with three of the four groups scoring above 50%. This is perhaps due to the impact of the Ethiopian public media (TV and newspapers), which tend to emphasise effects of climate change and actions that must be taken. At this juncture, it is important to note that the present study did not gather information on students' sources of information.

Table 4 shows that the difference between the groups is significant at 0.05 level for all categories of CC literacy except category 3 (causes). All the groups performed quite poorly in this category. Only the Environmental Science programme achieved above average performance.

Table 4. Significance of difference between programmes against the four categories

Categories	Difference	Sum of squares	Df*	Mean square	F	Sig.
1. CC: Scientific basis	Between groups	94.429	3	31.476	6.054	*.001*
	Within groups	452.318	87	5.199		
	Total	546.747	90			
2. CC: Effects	Between groups	160.520	3	53.507	6.722	*.000*
	Within groups	692.469	87	7.959		
	Total	852.989	90			
3. CC: Causes	Between groups	10.367	3	3.456	2.429	.071
	Within groups	123.743	87	1.422		
	Total	134.110	90			
4. CC: Measures	Between groups	73.534	3	24.511	12.498	*.000*
	Within groups	170.620	87	1.961		
	Total	244.154	90			

* Degree of freedom

Statement Analysis

The science behind climate change

Understanding of and participation in discussions and debates pertaining to climate change require precise knowledge about certain essential concepts. This study assessed the level of understanding about five such concepts: weather, climate, El Nino/La Nina and the greenhouse effect. The participants of the study demonstrated a good understanding about the meanings of weather (s53) and climate (s1) (with 83.5% and 90.1% correct responses respectively). The definition of El Nino (s30) seemed, however, to be more difficult. It received correct responses from less than half of the respondents (45.1%); and almost an equal percentage of the students (44%) had no idea at all (Table 5). Though El Nino and La Nina are not caused by climate change, global warming is believed to change the way they behave (s27). This statement received correct responses from only 34.1% of the students.

The natural greenhouse effect (or the heat trapping property of the atmosphere) keeps the annual average surface air temperature of the earth at about 15ºC thereby making it liveable for organisms including humans (FDRE, 2001). Without this natural phenomenon the earth's annual average temperature would be minus 18ºC. This fact (s15) was known to a mere 16.5% of the respondents. A similar statement – (s2): 'Although the greenhouse gases are present in the atmosphere at only small concentrations, they warm the surface by 33˚C' – got correct responses from only one fifth of the students (Table 5).

The role of water vapour as the most prevalent greenhouse gas (s50) is known to only one third of the respondents whereas close to one third (31.9%) wrongly endorsed the statement 'The greenhouse effect is caused by gases that trap rays radiated from the sun' (s7). On the other hand, both the use of chlorofluorocarbons (s9) and their contribution to the creation of an ozone 'hole' (s29) seem to be well understood by the participants (87.9% and 93.4% responded correctly). The latter statement received one of the highest frequencies of correct responses hinting that students who participated in this study had a higher degree of awareness about ozone depletion than global warming (Table 5).

A little more than 60% of the participants were aware of the fact that oceans are 'the largest active carbon "sink" on earth' (s32). Similarly, the statement related to the amount of CO_2 absorbed by an average tree (s35) got correct responses from 54.0% of the participants. Some studies indicate that accumulation of CO_2 in the lower atmosphere can stimulate plant growth thereby increasing yield for some crops. Such an advantage of accumulated CO_2 (s56) is known to 35.2% of the students.

Renewable sources of energy are often presented as effective alternatives to fossil fuels. It is also known that most renewable sources generate energy only intermittently: when the sun is shining or the wind is blowing. More than half of the students (57.2%) were not aware of this feature of renewable sources of energy (s55). The other feature of renewable energy sources is their low power density (s28). Only one third of the respondents got this correct (Table 5). The uncertainties characterising the CC science (s19) is recognised by 58.2% of the participants. Current studies indicate that predicting the localised effects of climate change is far more challenging than predicting global effects (s25). This fact was recognised by 70.3% of the respondents.

Table 5. Performance in statements related to category 1: Scientific basis

Code*	Issues addressed in the statements	Correct (%)	wrong (%)	'Don't know' (%)
s29	Formation of ozone 'hole'	93.4	5.5	1.1
s1	Climate: definition	90.1	7.7	2.2
s9	CFCs: definition	87.9	7.7	4.4
s53	Weather: definition	83.5	14.3	2.2
s25	Difficulty related to predicting localised effects of CC	70.3	26.4	3.3
s7	Explaining the greenhouse effect	65.9	31.9	2.2
s32	Oceans as the largest carbon sink on earth	61.5	11.0	27.5
s19	Uncertainties related to the impact of CC	58.2	40.7	1.1
s35	Role of trees as carbon sink	54.0	5.5	39.6
s30	El-Nino: definition	45.1	11.0	44.0
s55	Characteristic features of renewable energies (being intermittent)	44.0	42.9	13.2
s56	Role of CO2 in increasing crop yield	35.2	37.4	27.5
s27	Relation between global warming and El Nino/La Nina	34.1	30.8	35.2
s50	Water vapour as the most prevalent greenhouse gas	33.0	60.4	6.6
s28	Characteristic features of renewable energies (low power density)	33.0	41.8	25.3
s2	Capacity of GHGs to warm the earth's surface	19.8	37.4	42.9
s15	Role of greenhouse effect (maintaining average global temperature)	16.5	56.0	27.5

* The code refers to the serial number assigned to each statement in the original questionnaire

The effects of climate change

Participants of this study demonstrated a very low awareness about the pattern of change in temperature and rainfall across the world over the last century. More than two thirds (70.4%) either wrongly thought that in the twentieth century, 'precipitation decreased significantly in parts of the Americas, northern Europe and northern and central Asia' (s4) or had no idea (Table 6). The proportion of respondents who gave wrong answers or had no idea went down to 51.7% with regard to the pattern of rainfall in areas closer to Africa (s38). In Ethiopia, there has been a warming trend in the annual minimum temperature over the past 55 years. On the other hand, the trend analysis of annual rainfall shows that rainfall remained more or less constant when averaged over the whole country. Interestingly, more than two thirds of the respondents (68.1%) wrongly thought that 'In Ethiopia, rainfall declined significantly when averaged for the whole country over the last fifty years' (s24). With regard to patterns of temperature in Ethiopia over the past 50 years (s3), the proportion of correct response improved to 74.7% (Table 6).

Table 6. Performance in statements related to category 2: Effects

Code	Issues addressed in the statements	Correct (%)	Wrong (%)	'Don't know' (%)
s43	Effects of CC on crops' growing season	84.6	13.2	2.2
s41	Effects of CC on progress towards sustainable development	83.5	13.2	3.3
s12	Differentiated effects of CC (warming vis-à-vis cooling)	80.2	17.6	2.2
s6	Species' extinction as effect of CC	76.9	15.4	7.7
s3	20th century trends in temperature in Ethiopia	74.7	6.6	18.7
s46	Frequency of drought occurrence in Ethiopia	70.3	13.2	16.5
s40	Probability of anthropogenic warming to continue	68.1	19.8	12.1
s36	Effect of CC on distribution of malaria	64.8	23.1	12.5
s44	Magnitude of water scarcity in Africa	61.5	7.7	30.8
s31	Magnitude of shrinkage of ice cap on Mount Kilimanjaro	54.9	5.5	39.4
s48	Developing countries as primary victims of extreme weather	54.9	39.6	5.5
s17	Average global temperature rise since 1900	53.8	9.9	36.3
s38	20th century trends in precipitation in the Sahel, the Mediterranean and southern Africa	48.4	20.9	30.8
s20	Magnitude of shrinkage of glaciers in European Alps	42.9	9.9	47.3
s22	Magnitude of thinning of sea ice around the North Pole	33.0	4.4	62.6
s4	20th century trends in precipitation in America, Europe and Asia	29.7	23.1	47.3
s18	Reduction in illnesses/death due to cold as effects of global warming	19.8	65.9	14.3
s13	Magnitude of global sea level rise in the 20th century	16.5	30.8	52.7
s24	20th century trends in precipitation in Ethiopia	15.4	68.1	16.5

The participants of this study had inadequate information about the magnitude of global warming that took place over the past century. A little more than half gave correct answers to the statement: 'Average global temperature had risen by about 0.6°C since 1900' (s17). More surprisingly, only 16.5% of the respondents had correct information about the magnitude of sea level increases in the twentieth century. Similarly, close to half of the participants (47.3%) had no information about the magnitude of the loss of glaciers in Europe (s20). The proportion of participants who had no information grew to 62.6% for a statement related to the thinning of sea ice around the North Pole (s22). On the other hand, more than half of the participants knew that 'Mount Kilimanjaro has lost three quarters of its ice cap in the last century' (s31).

It is projected that 'climate change could threaten the existence of over one million species' (s6), a fact endorsed by more than three quarters of the respondents (76.9%). It is also widely

believed that '[e]ven if greenhouse gas concentrations were kept constant at today's level, some anthropogenic warming would continue for many centuries' (s40). This fact was endorsed by 68.1% of the respondents. Furthermore, the ongoing change in climate is highly expected to 'slow the pace of progress toward sustainable development' (s41). A great majority of the participants (83.5%) endorsed this prediction.

The fact that climate change leads to warming in some areas and cooling in others (s12) was known to 80.2% of the respondents. Similarly, the impact of climate change on crop production, namely its potential to 'reduce crop growing season thereby forcing some regions to abandon production altogether' (s43) was recognised by 84.5% of the respondents. However, the positive impact often associated with global warming, namely its potential to 'reduce the number of deaths and illnesses resulting from extremely cold weather' (s18) was known to only about one fifth of the respondents (Table 6).

Recent reports also reveal an inconvenient truth that 'almost all deaths in the world due to weather-related disasters take place in developing counties' (s48). This fact was recognised by 54.9% of the respondents. Nearly 40% rejected this statement as wrong, showing that a large proportion of graduate students do not appreciate the heavy burden put on developing countries due to global climate change. With regard to the African continent, experts estimate that 'every fourth African already suffers from a shortage of water' (s44). This was known to 61.5% of the respondents. In Ethiopia, the frequency of drought increased from 'once every ten years' in the 1950s to 'every second or third year' at present (s46). This was known to 70.3% of the respondents. On the other hand, nearly one quarter of the respondents (23.1%) were not aware of the current change in the pattern of distribution of malaria in Ethiopia (s36) (Table 6).

The causes of climate change

Nine out of the 56 statements are related to the causes of climate change. The statement related to the relative contribution of fossil fuels to the world energy mix (s8) and received correct responses from 57.1% of the respondents, whereas close to two thirds of the respondents rightly rejected the statement: 'The largest source of human emissions contributing to global climate change is methane' (s45). More than four fifths of the respondents (81.3%) knew that chlorofluorocarbons (CFCs) 'trap heat thereby contributing to global warming' (s23). An even larger proportion of the respondents knew the fact that renewable sources of energy result in less pollution (Table 7). On the other hand, close to 60% of the respondents had no idea as to the role El Nino plays in influencing the global pattern of temperature and rainfall (s11). This is one of the statements that received the lowest proportion of correct responses. Another area of difficulty relates to the use of oil for the production of plastics. More than half of the respondents (52.7%) did not know that 'oil is used for the production of plastic bags' (s33), a reality that compounds the contribution of plastics to environmental pollution.

At present, China is the largest contributor to overall greenhouse gas emissions (s5), a fact known to more than four fifths of the respondents (76.9%). It is also evident that the the African continent's contribution to global warming via emissions is insignificant. However, one third of the participants of this study either had wrong information or no information with regard to Africa's contribution to global climate change. Interestingly, 16.5% of the respondents wrongly

approved the statement: 'Africa is responsible for about one quarter of global emissions of greenhouse gases' (s26). Like other poor countries in Africa, 'Ethiopia is extremely vulnerable to climate change mainly because of high dependence on rain-fed agriculture' (s49). A great majority of the respondents (93.4%) gave a correct response to this statement. This is one of the statements which received the highest proportion of correct responses (Table 7).

Table 7. Performance in statements related to category 3: Causes

Code	Issues addressed in the statements	Correct (%)	Wrong (%)	'Don't know' (%)
s49	Factors behind Ethiopia's vulnerability to CC	93.4	6.6	0.0
s37	Characteristic features of renewables (no severe air pollution)	87.9	11.0	1.1
s23	CFCs as contributors to global warming	81.3	18.7	0.0
s5	China as the biggest emitter of overall GHGs	76.9	15.4	7.7
s26	Contribution of Africa to emission of GHGs	67.0	16.5	16.5
s45	The gas making the largest contribution to CC	62.6	22.0	15.4
s8	Share of fossil fuels in global energy mix	57.1	16.5	26.4
s33	Use of oil for the production of plastic bags	29.7	17.6	52.7
s11	Influence of El Nino on temperature and rainfall distribution	18.7	22.0	59.3

Adaptation and mitigation measures

It is difficult to 'completely prevent global warming from happening though one can influence how much harm it does' (s34). This statement was endorsed by 84.6% of the respondents. The highest proportion of correct responses in this category (95.6%) goes to the definition of adaptation to climate change (s14). Adaptation measures are aimed not only at 'moderating harm caused by climate change' (s47) but also 'exploiting beneficial opportunities that result from climate change' (s51). The first part of this assertion was approved by three quarters of the respondents whereas a relatively lower proportion of the participants (62.6%) regarded the second part as correct. It is thus interesting to note that 26.4% of the participants seemed to have no information about the 'beneficial opportunities that result from climate change' (Table 8).

The statement that declares: 'The African continent has the highest capacity to adapt to climate change' (s10), was rightly rejected by 68.1% of the respondents. It is, however, worrisome that nearly one third of the participants either had wrong information or no information about the capacity of the African continent to adapt to climate change. In Ethiopia, 'consumption of wild foods is one of the traditional coping mechanisms to climate change' (s52). Strangely, one third of the respondents rejected this fact as incorrect (Table 8).

The participants of this study seemed to be well-informed about the notion of climate change mitigation (s54). However, a little more than one quarter (28.6%) knew the key requirements of one of the international conventions (s16). Besides, more than half (52.7%) of the respondents wrongly thought that industrialised countries agreed to cut greenhouse gases

by 25%! Similarly, the information with regard to the targeted ceiling of global temperature increase seems disturbingly poor. The statement (s21): 'Scientists recommend that increase in global temperature should be kept below one degree Celsius so as to prevent dangerous anthropogenic interference with the climate system' was rightly rejected by only 7.0%. More than 90% of the participants either wrongly approved the statement (61.1%) or had no idea (32.6%).

Table 8. Performance in statements related to category 4: Mitigation and adaptation measures

Code	Issues addressed in the statements	Correct (%)	Wrong (%)	'Don't know' (%)
s14	Adaptation to CC: definition	95.6	3.3	1.1
s54	Mitigation measures: definition	87.9	7.7	4.4
s34	Difficulty to completely prevent global warming	84.6	11.0	4.4
s47	Adaptation as a strategy to moderate harm caused by CC	75.8	14.3	9.9
s10	Capacity of Africa to adapt to climate change	68.1	18.8	12.1
s51	Adaptation as a strategy to exploit benefits of global warming	62.6	26.4	11.0
s52	Consumption of wild foods as CC coping strategy in Ethiopia	47.3	33.0	19.8
s39	Function of carbon sequestration	46.2	14.3	39.4
s16	Magnitude of emission cuts as per Kyoto Protocol	28.6	52.7	18.7
s42	Availability of technological options to replace fossil fuels	23.1	60.4	16.5
s21	Recommended ceiling of global temperature increase	7.0	61.1	32.6

Carbon sequestration as a process of trapping and storing carbon (s39) is known to 46.2% of the respondents. Another interesting finding is that 60.4% of the respondents wrongly approved the statement: 'There are technological alternatives developed over the last five years that could replace fossil fuels quickly and cheaply' (s42).

Discussion

The analysis of the students' responses reveals a number of issues worth discussing in some depth. However, space does not allow us to discuss all the interesting aspects of the responses. The paper therefore focuses on three of the key findings and their implications.

A blurred understanding of the scientific base of climate change

Many students seemed to attribute all the greenhouse effect to anthropogenic causes. A study by Boon (2010:109) also came up with a similar observation that both secondary students and pre-service teachers demonstrated 'a very low rate of understanding of the science of the greenhouse effect'. Furthermore, most of the students did not understand the role of water

vapour as the most prevalent greenhouse gas. A study by Darcin (2010) also shows that only 17% of the trainee science teachers knew water vapour was a factor in increasing the greenhouse effect. Similarly, Dove (1996:92) indicates that greenhouse gases such as 'methane were hardly mentioned and nobody referred to nitrous oxide and water vapour'. Close to one third of the students who took part in this study wrongly endorsed the statement: 'The greenhouse effect is caused by gases that trap rays radiated from the sun'. In relation to such a misconception, Dove (1996:92) reported a more dramatic result that only 4% of the students who took part in his study correctly distinguished incoming solar, short-wave radiation from out-going, long-wave, trapped rays. One can thus see that the observed gap in students' knowledge about key scientific principles underlying climate change could affect their contribution as would-be teachers and/or workers in one or another area related to environmental management.

Poor knowledge about past trends in rainfall and temperature

More than two thirds of the respondents wrongly thought that 'in Ethiopia, rainfall declined significantly when averaged for the whole country over the last 50 years'. It thus appears that the all-too-common (but scientifically unfounded) association of Ethiopia as drought-ridden blurred views about the pattern of spatio-temporal distribution of rainfall in the country. Similarly, many students had inadequate information about the magnitude of global warming that took place over the past century (only 16.5% of the respondents had, for instance, correct information about the magnitude of sea-level increase in the twentieth century). What is more, students' knowledge about the targeted ceiling of global temperature increase is found to be disturbingly poor. The same is true of their understanding about some of the key conventions on climate change (for instance, more than half of the respondents wrongly thought that industrialised countries agreed to cut greenhouse gases by 25% as part of their commitment to the Kyoto Protocol). These results, taken as a whole, imply that participants of this study clearly have inadequate information about issues underpinning global climate change negotiations.

Poor knowledge about the impacts of climate change on Africa

It is known that warming in Africa occurs faster than the global average, while its greenhouse gas emissions represent only a minuscule fraction of the global total (Bauer & Sholtz, 2010). A large proportion of the students failed to appreciate such a heavy burden already put on Africa owing to global climate change. Surprisingly, 16.5% of the respondents wrongly approved the statement: 'Africa is responsible for about one quarter of global emissions of greenhouse gases'. This is more evidence for the urgency to build the capacity of university students, some of whom expected to represent Africa in international climate change debates and negotiations.

Conclusions and Recommendations

Dr Knapp, President of the University of Georgia, is said to have made the following statement with regard to the need for promoting environmental literacy throughout his university system: 'we can no longer afford to grant degrees to students who are environmentally illiterate … I will be asking the faculty and my administration to consider basic policy changes in three separate areas that will address the University's ability to address environmental issues: curriculum, organisational issues and financing' (Roth, 1992:40). Roth (1992:17) emphasises that developing environmental literacy at some level of competency is the primary objective of environmental education.

The study reported here was aimed at assessing the level of climate change literacy among graduate students in four programmes that lead to a master's degree in Environmental Science; Geography and Environmental Education; and Geography and Environmental Studies. To this end, a questionnaire was developed and administered to a total of 91 students. An attempt was made to include all the major conceptual and geographical aspects of climate change literacy. Results indicate that the students who participated in the study demonstrated an average performance on the whole but clearly poor performance in some of the key areas related to the science behind climate change; past trends in rainfall and temperature; and the impacts of climate change on Africa. It is particularly worrisome that many of the students had inadequate or no information about the projected or actual impact of climate change on poor countries including those in Africa. Students' performance in issues related to measures proposed at global level is also low.

Participants from Geography and Environmental Education (extension) programme had the lowest score on average. This group is composed of relatively older participants most of whom are currently teaching geography in high schools in Addis Ababa. The results thus reveal that those who are actually teaching Geography in high schools performed far worse than the others. This, in turn, implies that the teachers are likely not to be in a position to properly handle issues related to climate change. With regard to this, Spellman *et al.* (2003: 214) suggest that despite considerable media interest in climate change, 'many geography teachers have opted to omit the meteorology section. This could be due to the complexity of the issues involved, or the feeling that they did not possess expertise or competence in these areas, compared with other options in physical geography.'

This study has not tried to investigate factors that could explain the observed level of climate change literacy. It is therefore strongly recommended that follow-up studies be conducted to see the effects of such factors as programme syllabi, teaching approaches used, key sources of information, etc., on students' climate change literacy. Sanni *et al.* (2011) suggest, for instance, that 'as important as study of climate change is, very few universities in the world have climate change as a distinct course of study at the undergraduate level'. The extent to which climate change has been integrated into the curricula for higher education institutions in Ethiopia needs to be assessed in order to better understand the roots of the deficiencies in the key aspects of climate change literacy observed in this study.

Note on the Contributor

Dr Aklilu Dalelo is an associate professor of Geography and Environmental Education at the Graduate School of Education, Addis Ababa University, Ethiopia. He is a geographer by training with a particular interest in environmental and sustainability education. Dr Dalelo has done extensive research over the past 15 years mainly on energy and environmental education and published more than ten articles in reputable national and international journals. He is currently an Alexander von Humboldt Research Fellow at the Institute of Environmental and Sustainability Communication, Faculty of Sustainability Sciences, University of Luneburg, Germany. Email: akliludw@gmail.com; dalelowa@leuphana.de

Acknowledgements

This paper was written during my stay as the Alexander von Humboldt Research Fellow at the Institute of Environmental and Sustainability Communication (INFU), University of Luneburg. I would like to express my gratitude to INFU and its director, Prof. Gerd Michelsen for providing office space, resources and much more. I would also like to thank Dr Muluneh W/Tsadik and Dr Zemede Asfaw, Addis Ababa University, for their support during data gathering and Dr Horst Rode, University of Luneburg, for his support during data analysis.

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A Research Tool for Analysing and Monitoring the Extent to which Environmental Issues are Integrated into Teachers' Lessons

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Abstract

South Africa enjoys strong policy support for the integration of environmental issues into school curricula. However, much doubt exists over the extent to which this has been converted into appropriate classroom practice at the majority of under-resourced rural schools in the country. This article reports on a study which piloted a research tool which can be used to analyse teachers' lessons, with the aim of gaining insight into the extent to which they integrate natural resource management issues. The research tool was based on Bernstein's concept of classification and consisted of five indicators of natural resource management integration into Life Sciences lessons. The study contributes to the design of research tools that can be used to analyse and monitor the integration of environmental issues into teachers' lessons. It also provides some insight into the environmental content of a sample of Grade 10 Life Sciences lessons at four rural under-resourced schools in the Eastern Cape.

Introduction

South Africa's post-apartheid school policy gives recognition to the importance of environmental education as a means of creating environmental awareness and equipping South Africans with the right skills, attitudes, values and knowledge that are necessary to ensure environmental sustainability and human wellbeing. This view was highlighted in the country's White Paper on Education and Training (DoE, 1995:342), where it is stated that:

> Environmental education … must be a vital element of all levels and programmes of the education and training system, in order to create environmentally literate and active citizens and ensure that all South Africans, present and future, enjoy a decent quality of life through the sustainable use of resources.

One feature which characterises environmental education policy in South Africa is its integrated and multi-disciplinary approach to teaching and learning. Under this approach, rather than being treated as a separate subject, environmental education processes are incorporated into all subjects across the school curricula and in all grades. This holistic approach to environmental education is promoted as the best educational strategy to deal with the multi-faceted and complex nature of environmental issues and risks (Janse van Rensburg & Lotz, 1998). It is also in accordance with the principle of knowledge integration, which underpinned South

Africa's first two major post-apartheid curriculum frameworks, Curriculum 2005 (C2005), and its revised and streamlined version called the Revised National Curriculum Statement (RNCS). This approach to environmental education has remained intact in South Africa's latest curriculum framework, called the Curriculum and Assessment Policy Statement (CAPS), which is to be introduced in schools from 2012 (Motshekga, 2009).

Status of environmental learning in rural schools

Little is known about the status of environmental education processes at the majority of rural under-resourced schools in South Africa. This is not surprising given their isolation from major urban centres and South Africa's poor record on research into teachers' classroom practice (Taylor, 2000). However, some of the insight into environmental education practices at some of these schools was generated by the 'Learning for Sustainability' project (Janse van Rensburg & Lotz-Sisitka, 2000), the 'National Environment Project for General Education and Training' (NEEP-GET) (Lotz-Sistika, 2004) and the evaluation of the Eco-Schools programme in South Africa (Rosenberg, 2008). Additional data has come by way of case study investigations that have been conducted by post-graduate scholars into environmental education practices at various rural schools in South Africa, for example Nduna (2003), Ruhinda (2004), Mvula-Jamela (2006) and Jenkins (2007). However, much remains unknown about the extent to which the teachers in the Eastern Cape's rural under-resourced schools integrate environmental issues into their lessons.

Taylor (2000:8) notes that a lack of information on classroom practice 'severely constrains the design of curricula which are appropriate to local conditions … and renders impossible any effort … to track any improvement or deterioration over time'. Ellis and Fouts (2001) observe that there is a general lack of carefully crafted studies on curriculum integration, and that decisions regarding this curriculum approach seem to be based on rhetoric rather than on research. They identified the lack of suitable research methods as one of the factors which impede empirical research on curriculum integration. It is out of these concerns that this study was conducted.

Study Context

The study took place in the Eastern Cape, one of South Africa's poorest provinces. Education challenges in this province are immense and include a high proportion of rural under-resourced schools, lack of effective curriculum support to teachers at provincial and district levels, large numbers of untrained or under-trained teachers, over-crowded classes, low attainment levels among learners and an irrelevant curriculum (NMF, 2005).

Natural resource management (NRM) education is a form of environmental education that focuses on the protection and wise use of natural resources, to ensure present and future environmental sustainability and human wellbeing. Effective integration of NRM issues into the curricula of rural schools in the Eastern Cape (and elsewhere in southern Africa), can enhance the quality and relevance of rural education, and at the same time contribute to environmental sustainability in these areas (Lotz-Sistika *et al.*, 2005). This is especially relevant

given the government's interest in economic growth and sustainable livelihoods in rural areas of the country (ANC, 2009), and the growing interest in environmental education initiatives that are based on the needs and strengths of local communities (Vandenbosch, 2007; Namafe, 2008; Hogan, 2008).

Research Goal

The study was carried out with two main objectives in mind. The first objective was to design and pilot a research tool for analysing teachers' lessons in order to find out the extent to which they integrate environmental issues. The second aim of the study was to provide insight into the extent to which NRM issues are integrated into a sample of Grade 10 Life Sciences (Biology) lessons at four rural under-resourced schools in the Eastern Cape.

Theoretical Framework

The design of the research tool that was piloted during the study was based on the concept of 'classification'. Bernstein (1971, 1996) coined the term 'classification' to conceptualise and describe relationships between different categories in pedagogic contexts, for example, between subjects in a given curriculum. According to Bernstein (1996), if there is strong insulation between subjects in a curriculum, it implies the existence of a strong principle of classification, which creates specialised, distinct subjects. Weak classification, on the other hand, is associated with weak insulation between subjects, which allows cross exchanges to take place between them, resulting in more integrated and less specialised subjects.

Bernstein proposed a four-point scale of classification levels for describing different extents of integration between subjects in a curriculum:

- C+ +: very strong classification (very strong insulation)
- C +: strong classification (strong insulation)
- C-: weak classification (weak insulation)
- C - -: very weak classification (very weak insulation) (Bernstein, 1990:51).

The research tool that was piloted in this study used the notion of classification as a theoretical 'lens' through which the boundary between NRM and Life Sciences knowledge in a sample of Grade 10 Life Science lessons was analysed in order to gain insight into the extent to which they were integrated. Bernstein's four-point scale of classification levels provided the theoretical language with which the nature of the boundary between NRM and Life Sciences knowledge in the lessons was described and illustrated.

Research Design

Four schools were purposely selected to take part in the study, the major selection criteria being that they were rural, under-resourced in terms of physical structures and educational resources and had at least one Grade 10 Life Sciences class. For reasons of maintaining confidentiality, the

schools are referred to as Schools A, B, C and D. The study adopted a constructivist approach to research, in which reality is believed to exist in the form of respondents' beliefs, attitudes, experiences and actions (Cohen *et al.*, 2007). Data were generated using classroom observation of Grade 10 Life Sciences lessons, content analysis of texts that were produced during these lessons and semi-structured interviews with Grade 10 Life Sciences teachers.

The research tool

The research tool that was piloted during the study consisted of five procedural steps:

1. Construction of an analytical framework from key criteria of Grade 10 Life Sciences lessons;
2. Selection of suitable key indicators of NRM integration for each criterion;
3. Generation of data on the selected indicators regarding the extent of NRM integration in each criterion;
4. Grading the performance of each indicator with regard to the extent of NRM integration according to Bernstein's classification scale; and
5. Illustration of the results with the aid of radar diagrams.

The details of each step are discussed in the following sections.

Step 1: Construction of an analytical framework

The analytical framework consisted of what were judged to be key criteria of Grade 10 Life Sciences lessons, and that have the potential to integrate NRM. This step facilitated the analysis of the lessons by breaking them into smaller manageable parts. The selection of the criteria was done after observing two initial Grade 10 Life Sciences lessons at School A. It was important that the selected criteria were representative of a Grade 10 Life Sciences lesson at these schools, and that they were easy to identify and analyse in a lesson. The selection of lesson criteria was also guided by the pedagogical principles which underpin the national curriculum policy for Grade 10 Life Sciences (DoE, 2003). The five criteria which were selected to structure the analysis of the lessons are listed in Table 1.

Step 2: Selection of indicators of NRM integration

In the context of this study, the term indicator referred to a 'variable' which was used to show the status of a given lesson criterion with regard to the integration of NRM. Each identified lesson criterion was linked to one such indicator. The list of indicators that were used to analyse the lessons is shown in Table 1.

A table was compiled to distinguish between concepts which are specific to Life Sciences (for example, cell division and animal physiology), those which are general to both Life Sciences and NRM (for example, ecosystem structure and soil types), those which contained implicit reference to NRM (for example, climate change, water pollution) and those which explicitly refer to NRM (for example, biodiversity loss and game reserves). The assumption made was that the more explicit the references to NRM are during a Life Sciences lesson, the stronger the integration of NRM into that lesson.

Table 1. The criteria and indicators used to analyse the extent of NRM integration in the Grade 10 Life Sciences lessons

Criteria	Indicator
1. Lesson content	a. Nature of reference to NRM in the lesson topic
2. Oral questions	b. Nature of reference to NRM in the questions asked during the lesson
3. Educational resources	c. Types of educational resources used during the lesson
4. Written notes	d. Nature of reference to NRM in the notes written on the board during lesson
5. Assessment tasks	e. Nature of reference to NRM in the assessment tasks

Step 3: Generation of data on the extent of NRM integration

Classroom observations were conducted at each of the four schools. The class visits were made after making prior arrangement with the teachers concerned and involved only Grade 10 Life Sciences lessons. The lessons were spread across two school terms to help ensure that different areas of the Grade 10 Life Sciences curriculum were sampled, and observations were conducted with the aid of an observation schedule. All the observed lessons were audio-taped and field notes were taken. The second source of data was the pedagogic texts that were produced or used during the observed lessons. These included teachers' and learners' note books, teaching and learning materials and the notes written on the blackboard during the lessons. Semi-structured interviews with the Grade 10 Life Sciences teachers were also conducted mainly to obtain more clarity over issues which had arisen during the classroom observations.

Step 4: Grading the performance of each indicator with regard to the extent of NRM integration

This step was necessary in order to convert field data regarding the extent of NRM integration in the observed lessons to Bernstein's four classification levels of C+ +; C+; C- and C- -. The conversion of field data to classification levels was carried out with the help of scaling grids. A scaling grid is a research aid that was constructed during the study to ensure that the conversion was conducted in a systematic, rigorous, open and transparent manner. Each indicator had its own scaling grid, which showed which indicator descriptions from the field (in relation to the extent of NRM integration) corresponded with which classification level (see Table 2). An extra classification category (C°) was added to cater for those lessons in which the necessary data on the extent of NRM integration was either absent or insufficient.

Table 2. The scaling grids used to grade the performance of the indicators that were used to analyse the lessons

Indicator	C + + (very weak integration)	C+ (weak integration)	C- (strong integration)	C- - (very strong integration)	C° (necessary data absent/ insufficient
a. Nature of reference to NRM in the lesson topics	All specific to Life Sciences. No reference to NRM at all	Are general to both Life Sciences and NRM	Only implicit references made to NRM	Explicit references made to NRM	Lessons lacked focus, topic was unclear. Indicator performance could not be analysed.
b. Nature of reference to NRM in the questions asked during the lesson	Majority of questions specific to Life Sciences	Majority of questions general to both Life Sciences and NRM	Majority of questions made implicit reference to NRM	Majority of questions made explicit reference to NRM	No questions asked at all during lesson. Indicator performance could not be analysed.
c. Types of educational resources used during the lesson	All were specific to Life Sciences	Included those that are general to both Life Sciences and NRM	Included those that contain implicit reference to NRM	Included those that contain explicit reference to NRM	No teaching and learning materials used.
d. Nature of reference to NRM in the notes written during the lesson	Most notes are specific to Life Sciences	Contain numerous themes common to both Life Sciences and NRM	Contain numerous themes with implicit references to NRM	Contain numerous themes with explicit reference to NRM	No notes written down at all. Indicator performance could not be analysed.
e. Nature of reference to NRM in the assessment tasks	All assessment tasks set were specific to Life Sciences	Assessment tasks general to both Life Sciences and NRM	Assessment tasks with implicit reference to NRM	Assessment tasks with explicit reference to NRM	No/few assignment tasks given out. Indicator could not be analysed.

Results

A total of 15 Grade 10 Life Sciences lessons were analysed: four lessons each at School A, C and D, and three at School B. Since the lessons were observed after prior arrangement with the teachers, they were treated as representing the teachers' best classroom practices. The results are presented per indicator per school.

Indicator a: Nature of reference to NRM in the lesson topics

This indicator analysed the extent of NRM integration based on the teachers' inclusion of NRM concepts or themes into the lesson that was being taught. Of the four lessons which were observed at School A, one lesson (Lesson 1) contained explicit reference to NRM. This lesson involved listing the various natural resources and their uses by humans and other species. The rest of the observed lessons at School A consisted of topics which are specific to Life Sciences. At School B, all the observed lessons were based on topics which are specific to Life Sciences and contained no reference at all to NRM. At School C, Lesson 2, which was based on 'Biosphere Reserves', contained explicit reference to NRM, while Lesson 1 and 3 were based on topics which are general to both Life Sciences and NRM. Of the four lessons which were observed at School D, one contained topics which were general to both Life Sciences and NRM (Lesson 1), and the remaining three lessons were based exclusively on Life Sciences.

Based on the scaling grid of this indicator (see Table 2), the overall extent of NRM integration in the lesson topics that were taught to learners during the class visits at School A and School C was judged to be very strong and allocated a classification level of C- -. For School D the overall extent of integration in the topics that were taught during the observed lessons was judged to be weak and was given a classification score of C+. The extent of NRM integration at all the three observed lessons at School B was judged to be very weak, and allocated a score of C+ +.

Indicator b: Nature of reference to NRM in the questions asked during the lesson

This indicator analysed the extent of NRM integration in a lesson depending on the nature of questions that were asked during the lesson, the assumption being that the more the questions explicitly referred to NRM, the stronger the extent of NRM integration into the lesson.

The majority of the questions that were asked during all the observed lessons at all four schools were specific to Life Sciences. Based on the scaling grid of this indicator (see Table 2), the overall extent of NRM integration in the questions which were asked during the observed lessons at all the four schools was judged to be very weak, and given a classification score of C+ +.

Indicator c: Types of educational resources used during the lesson

This indicator analysed the extent of NRM integration in the lessons based on availability and use of different types of NRM-based educational resources during the lessons. The assumption made is that use by teachers or learners of various types of teaching and learning materials that specifically focus on NRM reflect very strong NRM integration, while the lack of use of such educational materials point to very weak NRM integration into the lesson.

The blackboard, teachers' notes and learners' notebooks were the most commonly used educational resources during the observed lessons at all four schools. In only one lesson (Lesson 1 of School C) did the teacher make use of a tool kit during the lesson. The tool kit was used to demonstrate the composition of soil, which is a topic that is common to both Life Sciences and NRM. Using the scaling grid of this indicator (see Table 2), the overall extent of NRM integration in the educational resources that were used during the observed Grade 10 Life Sciences at Schools A, B and D was judged to be very weak (C+ +). At School C, the overall extent of NRM integration in the learning materials that were used during the observed lessons was judged to be weak and allocated a score of C+.

Indicator d: Nature of reference to NRM in the notes written during the lesson

This indicator analysed the extent of the integration of NRM in the lessons depending on the nature of reference made to NRM in the notes that were written on the blackboard by the teacher. If most sets of notes contain themes with explicit references to NRM, it is interpreted as representing very strong NRM integration into the lesson, while the absence of themes that are specific to NRM in the notes points to very weak NRM integration.

The only notes that contained themes that are specific to NRM were written during Lesson 1 at School A (types of natural resources), and at School C during Lesson 2 (biosphere reserves). The rest of the notes that were written on the blackboard during the rest of the observed lessons at Schools A and C, and during all the observed lessons at Schools B and D were on themes that were specific to Life Sciences. Using the scaling grid for this indicator (see Table 2), the overall extent of NRM integration in the notes that were written on the blackboard during the observed lessons at all four schools was judged to be very weak (C + +).

Indicator e: Nature of reference to NRM in the assessment tasks

This indicator analysed the extent of NRM integration in the Grade 10 Life Sciences lessons depending on the themes of the assignment tasks that were assigned to the learners during the observed lessons. The assumption made is that explicit reference to NRM in the assignment tasks that were set during the observed lessons implies very strong NRM integration, while the absence of any reference to NRM counts as very weak NRM integration.

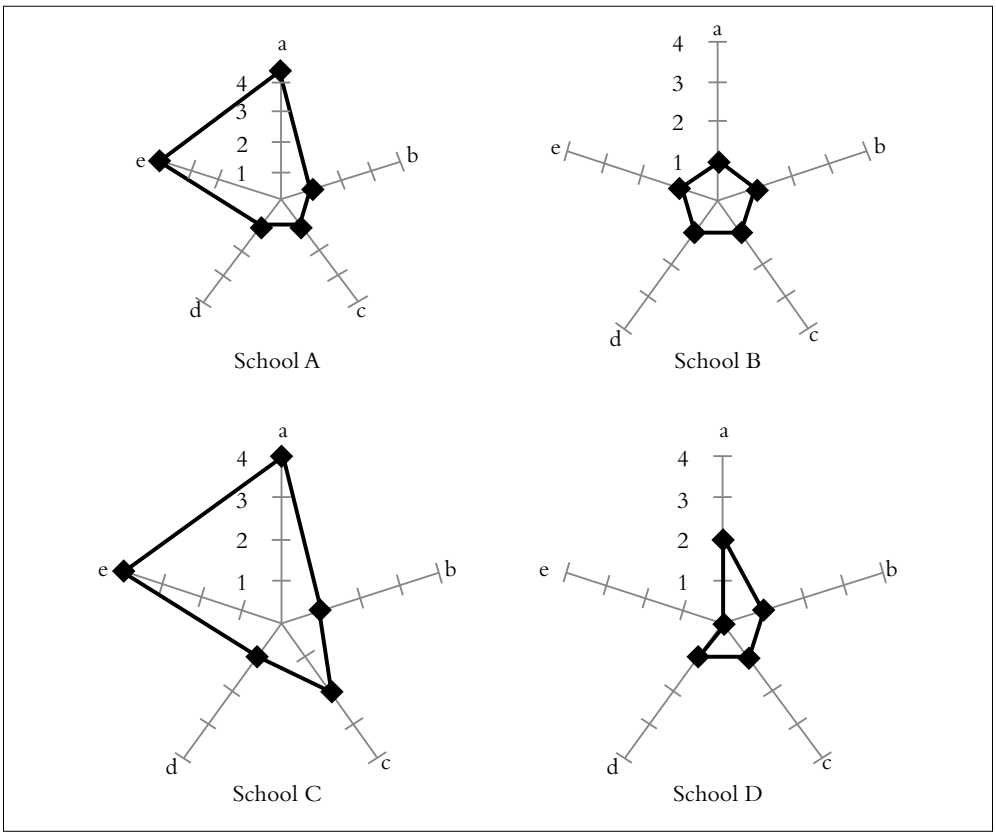
The only assessment tasks that contained explicit reference to NRM were in Lesson 1 of School A (although learners were merely required to list various natural resources and their uses) and Lesson 2 at School C (where learners were asked questions based on a diagram of biosphere reserves). The remaining assessment tasks at School A and School C, and all the assessment tasks which were set during the observed lessons at School B, were specific to Life Sciences.

Using the scaling grid of this indicator (see Table 2), the overall extent of NRM integration in the assessment tasks at Schools A and C was judged be very strong (C- -), while that at School B corresponded to a classification score of C+ +. At School D, no assessment tasks were set during the observed lessons, and this indictor was given a classification score of C^{o}.

Illustration of overall results

Overall, at all four schools, there was little or no integration of NRM into the Grade 10 Life Sciences lessons that were observed during the study. The overall extent of NRM integration into the observed lessons was strongest at Schools A and C, where two of the five indicators that were used to analyse the lessons showed very strong NRM integration. School B showed the least overall NRM integration, with all five indicators registering very weak NRM integration. There was no indicator that consistently showed very strong NRM integration across all the four different schools. The integration of NRM into the questions that were asked during the lessons was particularly weak at all the four schools. These results are illustrated in Figure 1 with the aid of radar diagrams.

Figure 1. The overall extent of NRM integration in the Grade 10 Life Sciences lessons at the four case study schools



Key to classification levels: 0: insufficient data for analysis; 1: C + + (very weak NRM integration); 2: C+ (weak NRM integration); 3: C- (strong NRM integration); 4: C- - (very strong NRM integration)

Key to indicators: a: Nature of reference to NRM in the lesson topics; b: Nature of reference to NRM in the questions asked during the lesson; c: Types of educational resources used during the lesson; d: Nature of reference to NRM in the notes written during the lesson; e: Nature of reference to NRM in the assessment tasks set during the lesson.

Discussion

One of the study's objectives was to design and to test the efficacy of a research tool for analysing and monitoring the extent to which NRM issues are integrated into lessons. The research tool that was piloted during the study proved to be very effective in analysing and describing the extent to which NRM issues were integrated into a sample of Grade 10 Life Sciences lessons. Bernstein's theory of classification, which formed the theoretical basis of the research tool, provided the 'lens' through which the relationship between NRM and Life Sciences knowledge was analysed, while his classification scale was used to differentiate between different extents of NRM integration. The use of qualitative indicators of NRM integration during the analysis resulted in a more comprehensive and interpretive analysis of the lessons. The radar diagrams that were used to illustrate the findings proved to be very strong and effective visual communicating tools of the overall extent to which NRM was integrated into the different lessons. In addition, the radar diagrams are relatively easy to draw and interpret as compared to linear or bar graphs. They also facilitated rapid comparisons of the extent of NRM integration between the different schools, different lessons in a given school and different criteria in a given lesson. Lastly, each of the five steps which constituted the analysis procedure has ample opportunity for the inclusion of teachers' and other stakeholders' input. This has the potential to democratise the lesson analysis process, which ensures that the decisions taken during the process are sensitive to the school and classroom contexts.

However, the piloted research tool also had a number of limitations. Firstly, with five different steps involved, the lesson analysis procedure became overly long before a final decision regarding the extent of NRM integration within each lesson criterion could be made. Secondly, the use of qualitative indicators of NRM integration to analyse the lessons could have resulted in researcher bias (hence the need to clearly show how major decisions during the lesson analysis were made). Thirdly, although the research tool made it possible to identify and describe different extents of NRM integration, it did not facilitate analysis of the quality of the NRM knowledge that was integrated into the lessons. This led to a situation where lessons were allocated the highest level of integration (C- -), although the quality of the NRM that was integrated was of questionable quality. This limitation on the part of Bernstein's theory of classification has been noted by Hugo *et al.* (2006), who recommend that it be used simultaneously with Bloom's Revised Taxonomy (for those studies where the quality of pedagogic [integrated] knowledge is also under investigation). Lastly, the conversion of data into classification levels (Step 4) led to the loss of rich descriptions of NRM integration that had been obtained from the field. Despite these limitations, the research tool proved to be an effective and robust alternative to the sole use of frequency counts of words when analysing the environmental content of teachers' lessons.

Although the study was mainly exploratory, it provided some insight into the extent to which NRM issues are integrated into Grade 10 Life Sciences lessons at a sample of rural under-resourced schools in the Eastern Cape. Overall, the study showed that at the four schools that took part in the study, there was little or no integration of NRM issues into the observed Grade 10 Life Sciences lessons. These results are in spite of the strong NRM discourse in the

official Grade 10 Life Sciences documents (Nsubuga, 2008). The results point to the possible existence of a disparity between official environmental education policy and its enactment at classroom level at the four schools. The existence of a wide gap between official curriculum policy and actual classroom practice at South Africa's rural under-resourced schools has been highlighted in numerous studies (Jansen, 2001; Cross *et al.*, 2002).

According to Bernstein (1996), the interpretation of official curriculum policy at school level is greatly influenced by a school's context, and the degree of autonomy that the school enjoys from external control. This view is supported by Neves and Morais (2001), who state that the implementation of official curriculum policy in schools depends on teachers' ideology and whether they understand what is stated in the curriculum documents. They further note that a lack of effective school monitoring mechanisms also creates opportunities for teachers to effect change to official discourse if they do not identify with the principles that underpin that discourse.

Working in a South African context, Maila (2004) identified numerous challenges to effective environmental learning in South Africa's schools, which included lack of teacher training in environmental education; poor curriculum support for teachers; lack of skills and experience with the development and use of teaching and learning materials that are relevant to environmental education; negative perceptions accorded environmental learning; unclear job descriptions for educators regarding their role in environmental learning and historical and structural factors. Which of the above named factors were at play at the four case study schools is an issue that demands further investigation.

Conclusions

Although there have been numerous changes made to the formal school curricula in South Africa since the end of apartheid, an integrated approach to environmental learning remains one of the country's cornerstone education policies. Effective implementation of this key environmental education principle in South Africa's rural under-resourced schools hinges inter alia on feedback information about teachers' environmental education practices at classroom level. The thousands of teachers in the Eastern Cape's rural under-resourced schools are a potential rich source of information on the status of environmental teaching and learning at these schools. Such research would be useful in two major ways. First, it would help create opportunities for teachers to reflect and improve on their classroom practice with regard to environmental learning. Secondly, it has the potential to inform future environmental education policies and implementation strategies that address the specific needs of the Eastern Cape's under-resourced rural schools. However, for these objectives to be realised, it is important that the teachers are supported in their capacity to integrate environmental issues into their lessons. A research tool for analysing the extent to which environmental issues are integrated into teachers' lessons represents one form of such teacher support.

Note on the Contributor

This article was written while the author was a post-doctoral student at Nelson Mandela Metropolitan University, Port Elizabeth. Dr Yvonne Nsubuga is currently a researcher in the Department of Education, Rhodes University. Email: ynsbga@yahoo.com

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Southern African Journal of Environmental Education, Vol. 28, 2011

Exploring Community Radio Programming Practices to Inform Environmental Education at Livingstone Museum in Zambia

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Abstract

This paper reports on a study (Muloongo, 2010) that investigated how participatory radio programming might be used to inform and extend museum-based community engagement in environment and sustainability concerns. Preliminary research on museum education practices established that these are primarily expert-led and centred on exhibitions and outreach, with limited participation by the community. The study was initiated after a brief experience of working on community radio that revealed a contrasting approach, including the community in discussing locally relevant content that was followed by the addition of the knowledge of a mediating expert.

A collective case study (multi-site) design was used to probe educational programming practices used in community radio. The paper explores how community radio station programming engages listeners in community-generated education programmes that are produced through collaborative work with radio listener clubs. Research on three cases of community radio programming concludes that community radio provides opportunities for community-led social learning which the Livingstone Museum could make use of to extend and localise its engagement with the community in environmental learning.

Introduction

This paper is based on a study that looked at how community radio stations in Malawi and Zambia are working with communities through radio listener clubs to bring about community participation in addressing community concerns. The study considered how the Livingstone Museum could work with the community through community radio to undertake outreach education activities.

The research on participatory radio programming practices was undertaken at three sites. They were the Dzimwe Community Radio Station based in Monkey Bay in Malawi, and in Zambia research was conducted with two community radio stations, namely Chikuni Community Radio in the Monze District of southern Zambia and Radio Musi-o-Tunya in Livingstone, Zambia. Dzimwe Community Radio was set up by UNESCO as a community-managed initiative to address environmental concerns within the Lake Malawi National Park. Chikuni Community Radio is managed by a Catholic church development ministry and Radio Musi-o-Tunya is a community radio station with more mixed programming. All three stations broadcast mainly to the rural community and have community structures called radio listener clubs. By researching these three cases I wanted to learn how community radio used these structures to engage the community in environmental education programming. By using

social learning as the guiding principle (Glasser, 2007), I studied how the programming for social learning through community radio takes place, and how the Livingstone Museum at which I worked could use radio to enhance community participation in learning processes.

Research Methodology

The study of participatory programming at the radio stations was conducted as a qualitative case study within the interpretive tradition (Yin, 1993; Gillham, 2000; Gerring, 2007). It employed what Stake (2000) referred to as 'collective case study design' (multi-site qualitative research) where a researcher may study a phenomenon in diverse case contexts. In looking at the three community radio stations, I drew on Yin (2009:20), who states 'case studies can cover multiple cases and then draw a single set of "cross-case" conclusions'. In other words, lessons are drawn about a particular phenomenon from research across several cases.

The study focused on three questions:

1. How do current museum outreach practices engage the Livingstone community in environment and sustainability learning?
2. How does community radio currently engage listeners in social learning?
3. How can museum outreach and community radio programming be partnered in environment and sustainability learning?

To address these questions I worked with listener groups associated with community radio stations in order to understand how learning through radio takes place at group level. I also worked with managers of community radio stations and the Livingstone Museum to understand the community learning activities and approaches used by these institutions.

The first phase of data generation involved mainly face-to-face, semi-structured interviews and document analysis. The interviews were meant to obtain information about the experiences of education practitioners in both the museum and the radio stations. The recorded interviews were transcribed for easy analysis and to ensure that the interviewee expressions were correctly captured. The data was analysed thematically. The second phase involved a strategy workshop where participants from Radio Musi-o-Tunya and the Livingstone Museum were presented with the initial findings on education practices in the museum and community radio stations. The strategy workshop was meant to provide a participatory learning environment that empowers people through active sharing of knowledge, skills and experiences (Fleming, 1997). It was through the workshop that possible strategies were identified which would facilitate the Livingstone Museum's working together with community radio stations to produce educational programmes.

Research Findings and Discussion

Deliberation and networking through radio programming to engage communities

The community radio programming examined covered diverse issues. The practices were centred on engaging the local community to elicit stories and issues that are authentic and generated from within communities. Evidence from the environmental conservation radio

programme aired on Dzimwe Community Radio showed that the programme involved stories, poems and drama generated by the local community. The materials used to engage the community in deliberative learning were focused on local environmental concerns. Some of the topics discussed include concerns about reductions in fish stocks on Lake Malawi, and the need to promote tree planting to reduce the pressure on the high demand for firewood. The environmental issues opened up in materials from the radio listener clubs were then broadcast to engage the wider listeners with call-in discussions and expert commentary.

Similarly, radio listener clubs at Chikuni Community Radio (Zambia) identify community issues and record these for radio broadcasting. One of the issues that was discussed was the community concern about the proliferation of an invasive plant called *lantana camara* that some members of the community had been planting as a fencing hedge. The focus on how issues are being identified by the community allowed for the inclusion of local knowledge and experiences. This approach is supported by Dyball *et al.,* (2007), who argue for locally designed solutions to environmental problems. They remind us that 'attempting to solve local problems by "importing" solutions which have worked in a different context has met recurrent failure in terms of sustainability' (2007:182). Here, extending expert-generated exhibition practices into more direct work with locally generated environmental materials to address locally identified environmental problems may be much more likely to succeed. Working with the local community in environment and sustainability issues is also in line with the observations made by Janse van Rensburg (1996) which claim that to solve environmental issues we need to make changes to our social systems and actions. Once we work with communities to identify and address environmental concerns, the community will always address what is really important to them.

In the case of Radio Musi-o-Tunya in Livingstone (Zambia), the drama in the *Our Family* programme is not generated by the communities. However, the drama is designed in such a way that materials on social issues that are prevalent in the community are used to depict true-life situations which the community can relate to. The drama is scripted so that it does not prescribe any solutions, but raises questions and controversy to encourage debate among the listeners in the community. The scriptwriters noted that it is through debate that people have an opportunity to learn in ways that open up possible change practices. Wals (2007b:19) argues, '[i]n social learning, the learning goals are, at least in part, internally determined by the community of learners itself'. He further comments that social learning 'tends to refer to learning that takes place when divergent interests, norms, values and constructions of reality meet in an environment that is conducive to meaningful interaction' (2007a:39). In this case the locally informed scripting of the drama becomes a way of engaging a community of learners. This approach is significant for creating a platform conducive for engaging listeners in locally relevant environmental concerns.

Deliberation across ages and issues

Working with local stories engages both adults and the young, providing opportunities for learning interactions across a wide age range and associated topics of interest. In all the radio stations studied, my research interest was programming with a focus and discussion of issues

raised by the community. The programming involved deliberation at two stages. Firstly, at the stage of programme preparation when radio listener clubs discuss issues and secondly, by way of phone interactions during live radio programme presentations. One of the limitations of the community discussion approach is that established community perspectives can simply circulate without fostering change. This trend towards the prevailing conventional wisdom being sustained is addressed in community radio stations' programming where the station uses a 'magazine format' of programming by bringing in expert commentary that invites critical engagement.

In situations where one community listener club generated a subject for radio broadcast, the rest of the listeners in the radio's coverage area are also engaged and enter the discussion. Programming with one part of a listening community can thus open environmental challenges that are more widely engaged. This evidence led me to note that this mode of radio programming begins to create and operate across a network of learning communities (Wals, 2007b; Glasser, 2007; Wals & van der Leij, 2007). Here, since environment and sustainability issues require participation of the wider community to address them, working with a network of communities through radio provides opportunities for wider deliberation and participation in decision-making and action-taking, and increases the chances of suggested solutions to challenges being taken up in critical conversation by the community. It was evident that discussions bring about learning interactions as people share opinions and experiences about the issue at hand. According to Wals and Heymann (2004:9), 'in social learning the interactions between people [both in listener clubs and across the network] are viewed as possibilities or opportunities for meaningful learning'. In deliberation both within and following radio programmes, the social learning taking place appears to involve both dialogue on a topic and a meaning-making exchange of ideas and feelings, such that participants benefit by being part of a deliberative critical community engaging with local environmental concerns. The case evidence pointed to how community radio station programming practices can facilitate social learning, through work with the establishment of community structures (radio listener clubs) and wider deliberation and expert commentary both during and flowing from the radio programmes.

This case evidence agrees with Alumuku (2006:40), who observes that through community radio, 'specific problems can be analysed, remedies discussed, and those most affected – or who can help with the solution – mobilised to collective action'. The community-generated environmental issues are specific, and the process of deliberation allows for the identification of possible partners towards collective action.

Challenges and opportunities for extending and changing existing museum practices

The study of radio station programming and learning interactions revealed that the museum as a knowledge-rich institution is operating in a narrow 'delivery of the conservation message' perspective with declining community visitors coming in to learn from its exhibitions and with declining funds for outreach activities. School outings continue with a slight decline but the topics relate to the content and concepts of the school syllabus. The evidence suggests that the museum has been operating in a manner that sets it apart as a place of knowledge to which

the public must be attracted. To this effect Walsh (1992:60) challenges museum practitioners by stating that 'a "new museology" must concern itself with involving the public, not just during the visit to the museum through interactive displays, but also in the production of their own past'. Similarly, Hooper-Greenhill (1994) calls for an integration of the functions of the museum so that knowledge of collections is related to, and generated by, the knowledge of the audience. This, therefore, implies that in addressing environment and sustainability concerns, the approach to museum education and specifically to outreach activities needs to be reviewed to enable community participation and learning. The research allowed me to conclude that a museum must become both an encounter and an outreach space where audiences can participate in and co-define what is represented for them in relation to their environment and sustainability concerns.

Learning and change through participation with expert commentary

There are two main ways in which expert knowledge is used in community radio educational programming. Some programmes simply focus on the expert explaining issues for the listeners, usually through interviews with radio personnel, while other programming allows for more co-defining interaction between the community and the experts on specific subjects.

In programming that engaged the local communities, it was interesting to note that the bringing in of expert opinion was a significant part of the radio programmes, and that this stimulated further community responses and action-taking possibilities. This evidence allowed me to conclude that working with local issues identified by the community can be enriched with the addition of expert knowledge to mediate the prevailing perspectives on environmental issues in the community. This was evident in cases where the issues were directly generated by the community as in the case of environmental conservation programmes at Dzimwe Community Radio, as well as in the *Our Family* programme at Radio Musi-o-Tunya, where drama was used to set the context, followed by community discussion, then comments from specialised experts through the feedback programme.

During the recording of radio programmes, the community discusses the topic, identifying the challenge at hand, and suggests other concerned individuals and institutions to be involved in finding solutions. Sometimes, after hearing the community's concerns, the radio producers are able to identify other concerned individuals and institutions. The radio station producers invite experts to comment on or challenge or explain the phenomenon under discussion. This allows both the community and the expert to reflect upon the issues raised in the discussion. According to Dyball *et al.* (2007), the reflection on the value of what one knows and how one gets to know it leads to new understandings, and thus learning takes place.

The idea of working with the community to identify environment and sustainability issues within the community accords with the observation by Gough (1997) that in environmental education there is a growing recognition of the socially constructed nature of knowledge and support for situated learning. This approach to learning takes on board the learners' prior knowledge. Challenging established community perspectives allows further deliberation that can lead to community-led practice-change, a significant factor in addressing environment and sustainability concerns.

Museum and community radio can complement each other for education

Radio and the museum could work together in education programming to engage the community in environmental learning. Currently, the Livingstone Museum waits for people to visit the exhibitions within the museum building. On the other hand, community radio stations operate through community structures such as radio listener clubs. Working with the community in their locality encourages social learning processes as people interact with one another in addressing environmental issues. As Wals and Heymann (2004) observed, through social interactions, possibilities and opportunities for meaningful learning are created. The interactions are beneficial to education activities because they facilitate dialogue and exchange of experiences and ideas that may eventually influence practice-change.

The museum has professional staff that have access to technical knowledge on environmental issues, but they are unable to reach out to the community due to limitations of facilities and funds. Radio, however, has the facility (air-time) to reach out to the community, but may lack the technical knowledge in environment and sustainability issues. Therefore, the museum and radio stations could plan the basic environmental education programme layout so that it allows the community to raise issues, and then the technical staff at the museum would provide commentary to address the issues raised. The role of the radio staff would then be to transform the environmental education content into participatory radio programmes. This approach would ensure that the community becomes part of the process of constructing the environment and conservation messages to be broadcast to the wider community, a process that will create a 'sense of ownership' of the programme, and may add to the likelihood of the success of the implementation of that programme. This follows from O'Donoghue's (1993) suggestion that rather than continuing concentrating efforts on awareness through external messages and wildlife experiences, we need to support the structures and 'tools' for environmental problem-solving among participants at a local level. It also agrees with the UN's Food and Agriculture Organisation's (FAO) observation that 'sharing knowledge, linking different viewpoints, fostering dialogue and mutual understanding are essential for encouraging participation among stakeholders, and communication is central to this task' (FAO).

Both radio and museum education approaches are characterised by some form of social learning. In these approaches, social learning is important because it promotes 'situatedness' and community participation in learning activities to foster relevance towards addressing environment and sustainability concerns. As Glasser (2007) observed, social learning provides the opportunity to directly engage both a broad range of perspectives and the whole human being. It has the potential to promote effective environmental learning processes.

Community radio provides the mass communication tool which by design opens up a community-situated method of addressing issues (social learning) in a local situation. Patterns of participatory programming appear to increase the prospect of local engagement and responsiveness to community needs. The museum can use this to advance its mandate of fostering environmental learning in the community.

Conclusion

The research analysed how education programming in a museum (the Livingstone Museum) and community radio stations (Chikuni, Dzimwe and Musi-o-Tunya) unfolded to engage community audiences in environmental learning. The differences are stark but mutually beneficial compatibilities are apparent.

Historically and in simple terms, the Livingstone Museum education approach has been to represent environmental knowledge and to attract visitors to interact with exhibits so that they might think over the information to become aware of local environmental change and conservation concerns. Curators and education staff have been questioning this approach for some time and this has shaped outreach programmes that have had appeal but have been difficult to sustain. As I have worked on the education programming challenges in a museum, this study has led me to begin to redefine the museum environmental project by proposing that its knowledge strengths be more aligned with the co-engaged processes of community learning programming that are used in community radio. Community radio is characterised by active community participation both at the level of members of radio listener clubs and in engaging learning interactions between listeners and experts.

However, to effectively employ radio for environmental learning, one needs to carefully select programming and broadcasting approaches that are interactive and open to community contributions. In probing interactive programming and the mediating role of the expert, this study has opened up community radio programming as an exciting extension of current museum education practices. A strategy workshop followed the study and a working partnership between museums and community radio stations has been opened up. Further research will have to be done to probe how programming practices play out in local engagement in social learning around the pressing environmental issues of our times. At this stage all that the study can report is useful insights and the beginnings of an environment and sustainability education collaboration between a museum and its local community radio station.

Note on the Contributor

Henry Muloongo is a Curator of Ecology at The Copperbelt Museum in Zambia. His research draws attention to the many ways in which education can take place, and the significance of educational partnership building. His interest is the promotion of community participation in environment and sustainability learning through community radio. Email:: muloongoah@yahoo.com

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Southern African Journal of Environmental Education, Vol. 28, 2011

Simulating Collective Agency: Joint Purpose, Presence and Power as Constraints to Learning in a Social Context

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Abstract

This paper reflects on the practice of social learning by using my experiences as a social development practitioner in two projects. The first, the Arkwork Collective, is an art-junk process that engages marginalised youth in Grahamstown, South Africa in a process that uses creative sculpture and drama to explore personal and social issues that exist in their immediate context. The second, Jonga Phambili Sinethemba looks into the impact of climate change and HIV/AIDS (amongst other issues) in the rural and peri-urban communities of Willowvale and Lesseyton in the Eastern Cape, South Africa. It seeks to provide a platform where members of each community can define the vulnerabilities, capabilities, social networks in their areas with the aim of bolstering the adaptive capacity of these communities. Snippets of my experiences in these projects are shared with the intention of demonstrating constraints to learning in a social context. Key ideas that the paper explores include honouring the lived experiences of participants as part of the process, prioritising the participation of each individual present as part of the ongoing conversation, the challenge of surfacing the vital independent links of a collective, drawing on the reflective capacity of a diverse group, assessing the quality of participation, building capabilities for 'response-ability' and rethinking facilitation. Each section sets out challenges and questions for practitioners in this field to reflect on. The paper suggests that in order to achieve the laudable aims of social learning, we need to peel back the common rhetoric of its participatory aims and acknowledge the complexity, flexibility and dedication that it requires.

Defining Social Learning

Social learning is an idea of civic engagement that presents a collective of diverse actors from different backgrounds pooling together to deliberate, understand and respond to a pertinent issue that they all identify with. The emphasis on learning within this approach believes that:

> Through communicative learning a person constructs an inter-subjective understanding of a situation with others, which becomes especially relevant in the context of wicked problems where there is no clear knowledge, or perhaps there is conflicting knowledge about the situation or the best solution. (Muro & Jeffrey, 2008:329)

The understanding here is that by involving people from different vantage points and backgrounds, a process of deliberation and action will be informed by diverse points of view. These ranging vantage points are thought to strengthen responses to complex problems by surfacing multiple dimensions of an issue as seen by hosts of affected contributors. This process implies that there is a level of interdependence between participants in the way that they are bound (perhaps in different ways) to the issue of common interest. This vital interdependence binds the process of dialogue and deliberation because each perspective tells a story without which a solution cannot be collectively forged. Self-reflexivity in this perspective is about 'finding strategies for looking at our own thought processes, values, prejudices and habitual actions as if we were onlookers' (Bolton, 2005:7). This practice embraces the collaboration of people from different genders, age groups, livelihood practices, academic communities, related institutions and the practitioner communities such as NGOs and/or governmental bodies. The focus on collective agency in social learning sees 'the working collective' as the 'pre-requisite for acquiring more knowledge, understanding and skills' in the support of transformation and change (Sarpong, 2008:24).

It is important to note that the understanding of social learning presents in a fairly formal manner something that we all do to some extent in our daily lives. When I sit down and have a critical conversation about a burning issue with friends who are members of my community, each of us unconsciously presents varying viewpoints informed by our backgrounds and interests. This provides a rich conversation that challenges each person present to reflect on and explain their understanding of the present situation whilst putting their perspective in dialogue with others. Through this process, we are challenged to think through a collective response. We might not always agree but by the end of it, diverging viewpoints are boiled down to their central arguments and our collective focus is drawn to trying to address the issue. Perhaps the extent to which we all work actively to address this issue after our conversation is limited in this example, but the foundations of the concept of social learning draws on the natural ability of affected groups to reflect on and act upon the complex issues of their time.

Keeping in mind the way that we organically perform social learning in our daily lives, its formalisation and performance as a methodology in the field of environmental education brings up interesting issues. Using insight gained from work that I have been doing in Grahamstown as part of the Arkwork Collective and in Willowvale and Lesseyton in the Jonga Phambili Sinethemba project, I will unpack some issues that are pertinent when thinking about the practice of social learning in different contexts. The following section provides brief snippets of my experience in the field. Following this, a reflection on the implications of this experience and how it relates to the idea of social learning is shared, highlighting challenges pertinent to practitioners.

Constraints to Learning in a Social Context

At the onset of the project, I arrived as part of a team that came to introduce the project to the whole community. The focus on climate change and HIV/AIDS was shared and the community was asked to share their experiences of the way that these issues affect their lives. Their reflections provided useful information. However, even at this point in the project other issues – apart from what we were specifically focusing on – started to creep into the conversation.

Later on, as we began working with the smaller 'social learning' group, we decided it was best to begin again and to start the conversation in a different way. Instead of speaking specifically about climate change and HIV/AIDS, we asked the group how they would define vulnerability in the context that they live in. They did so, and when invited to tell stories about the way in which these vulnerabilities play out in their communities, poignant examples were given. These stories described many devastatingly important issues that might have been overlooked. Also, the telling of these stories seemed to unite the group in their shared experiences. These stories, because of their relevance to the group, gave us a good place to start and made the project real in the sense that we now had an important sense of the pulse of the group and a relevant place to move on from.

The sense of collaboration highlighted in the literature of social learning presents a coalition in which participants have shared authority and purpose. The reality of this work in practice is that despite holding the concerns of the collective as a whole, some parties wield more power than others. They do so simply by having access to funding and resources that create the space for such deliberations to take place. This elevated standing in the group can be used to nurture collective responsibility or it can inadvertently undercut it.

In this instance, the impact that our group of researchers and facilitators had on the nature of the collective conversation was significant. Without the insight to open up the conversation in earnest, the focus and ethical practice of the whole project could have been compromised. The simple lesson learnt here was that the focus and content of the conversation needs to be debated and acknowledged as a burning issue to explore. The precondition of a shared interest cannot be underestimated. It has a binding influence on the quality of the conversations. It reinforces the motivation and determination of a community to engage with an issue. The results of our initial engagement clearly illustrated that what one perceives as an important issue in a community may not be as important for someone with a different profile. The focus on climate change within related fields of environmental education and development is a warranted one if one takes into account the predicted outcomes of these phenomena in sub-Saharan Africa (Wiggins & Levy, 2008). Despite this reality, work towards addressing the complex issues that are the result of changing climates needs to engage communities in a way that allows their priority experiences to come to the fore. Only by encouraging and sharing these experiences can the ongoing conversation be of vital importance to those taking part. The quality of the conversation and the ability to see the complex puzzle of experiences that comes from different vantage points is compromised when attention to lived experiences and the concerns of individuals is not given More is said on this:

> Imposing a problem definition and restricting possible solutions, can be seen as a strategy to reduce complexity and achieve order in complexity. (Van Bommel *et al.*, 2009:409)

The result of such predestined conversations can very likely lead to a strained conversation in which participants have varying levels of interest or *real commitment* to the issue being discussed. This could create an atmosphere where people are simply going through the motions and participating in a tokenistic fashion.

Challenge for practitioners

Looking at the roles that we play in initiatives, how is the problem defined? How can this be done in a way that keeps a firm grasp on the lived concerns in a particular context, even if they are not part of your predetermined focus or agenda? The element of consensus highlighted in the literature is relevant here and underscores the need to acknowledge the necessity of continuing conversations already relevant to the context. It gives a clear purpose to the exercise of social learning. This way of working simply acknowledges that what I think is important from a specific standpoint may be of mild concern for somebody else.

Balancing Power in the Face of an Essential Diversity

> At some point in the discussion, a prominent member of a local political party came into the room. There was a discernable shift in the atmosphere. The casual way in which people were relating to each other earlier became more tense. It seemed like some members of the group became slightly more cautious about their participation in his presence.
>
> One of the group members had just returned from his initiation into manhood. Whereas before he might have been on equal standing with the rest of the group, now there was a clear hierarchy. There was a different formula to the way that conversations could be had now, and a new understanding of whose opinion was legitimate and whose wasn't.

Power relations are a normal and integral part of any endeavour to bring together a diverse group of interconnected persons. Any collective represents more than a group of people with a shared interest. It also represents a group of people with a set of different intentions and objectives, sometimes overlapping, sometimes dissonant. This we cannot do anything about. However, the way in which we reflect on power – our own, and that of others in the group – is important in such processes.

Gibson states that, 'there can be no sustained "movement", no collective action, where there is no participatory democracy and the explicit right to articulate differences' (2011:22). Despite this laudable principle, the articulation of differences in a collective does not always present itself through dialogue. It can often be masked behind what seems to be compliance, silence, resistance or a lack of participation. A depth of understanding of the way power plays itself out within a group needs to be continually discerned. Normally, caution is provided against neglecting power dynamics because when these issues 'do not surface directly and remain unaddressed, they constitute a hidden conflict which is likely to resurface sooner or

later, possibly with increased intensity' (Morgan in Van Bommel *et al.*, 2009:410). Conflict from this perspective is presented as a negative occurrence that compromises the exercise of social learning. Despite this, my experience in these two projects has challenged me to question whether conflict is necessarily a negative occurrence. With regard to the second vignette presented above, the tension that was evident in that instance evolved in interesting ways. The new dominance of the recent initiate resulted in his abusing his colleagues. As this ensued, the insulted participants very subtly stood in solidarity. They grew confident and made it very clear that whilst society might elevate him to a higher standing, their humanity was not going to be compromised by his sense of entitlement. New boundaries were set that restored the dignity and value of everyone present. This experience shaped an understanding that simply acknowledging the presence of conflict or skewed power relations in a group is not adequate. Instead, investigating whether conflict is surmountable is of key importance. This is especially relevant when we consider the conducive climate that can be created from the emergence of organic dissent and its resolution. These are the experiences that help create the atmosphere of respect, deliberation and participation that we seek.

Challenge for practitioners

What effect does the involvement of certain parties in the conversation have? How does their perceived power affect the ability of the collective to feel that they can contribute to the conversation? As a practitioner, how can my role be used to sensitively allow these issues to emerge in a way that appropriately thrashes out and validates the experiences of all those involved? How can the experience of conflict be used to rebuild group solidarity and renewed collective focus? Is there enough will and motivation to respond to and resolve these issues? This last question is a gentle reminder that 'people's personal emotional daily life matter a great deal' in any collective processes and also affects the ability of the collective to respond (Buchy & Ahmed, 2007:372).

Cultivating Participation and Surfacing Interdependent Links

In an attempt to bring to the surface the interdependent links in the group, each person was asked to provide a map of the daily work that they do which helps to build their community. This information was shared collectively. Participants were encouraged to add information to peoples profiles that they might have left out.

This exercise not only revealed the immense capabilities of the group, it also demonstrated the way in which the group works in different or similar ways to address the vulnerabilities they face as a community. Everyone was acknowledged as part of a vital collective, including us, as our roles as researchers and facilitators were recognised as the catalyst that helped this important conversation to happen.

Stripping down the commonalities of those present creates an atmosphere conducive to collective learning. This communal self-reflexivity creates the foundation from which those present can begin in earnest to engage in a conversation that has implications for all involved. The interdependence that is the common ground for social learning is not something that can be taken for granted. It is something that needs to be explicitly explored as a critical part of the conversation. This conversation requires a level of capability on the part of the participants that cannot be assumed to be present in every diverse group. In line with this concern, Glasser comments that social learning depends on:

> the preparedness, competence, openness, and maturity of the individuals engaging in it as on the rules that guide particular organisational learning, public participation, or decision making processes. (2007:53)

The level of participation required to sustain such a conversation needs to be assessed and gently built upon by engaging participants in activities that can develop levels of trust, communion and understanding. Ultimately, we need to work towards an atmosphere where one can feel responsible for oneself and feel confident enough to allow one's voice to emerge as a part of a group. This is essentially a commitment to go beyond the tokenism of social learning that might be satisfied with having a diverse group of stakeholders represented at a gathering. More is said on the pitfalls of this practice:

> To define our own praxis on the basis of a stakeholder analysis would be to inevitably inscribe our praxis as part of the existing order – precisely the dead-end that we needed to break with. (Butler & Ntseng, 2008:39)

The mere presence of participants cannot be assumed to be useful criteria for social learning. It is rather the *quality* of participation of those present that provides the foundation from which learning can happen. As a part of this, we need to rethink the criterion of voluntary participation as an adequate motivation for participation. All those present need to know why they are part of the process, and whether their agenda is in line with the purpose of the gathering. This is a critical issue that impacts upon the ownership of the process. The possible effects of lack of ownership are demonstrated:

> The key question has been whether participants of a deliberative processes stop learning when the facilitator and information providers walk out of the door, or whether, a more complicated process is set in motion that has the capacity to change hearts and minds resulting in a greater sense of environmental citizenship. (Bull *et al.*, 2008:703)

Participation in itself is not the purpose of social learning. Building momentum for social change is the ultimate intention of this activity.

Challenge for practitioners

If social learning processes are to form a vital learning opportunity that speaks to some of the complex problems that communities face, it needs to be a practice that understands and is ready to build on the levels of capability in a group. This needs to be done in ways that value and encourage the participation of each person present. It is a commitment to understanding presence (really being there) as a part of participation. Additionally, the quality of participation needs to be choreographed with the intention of bringing about active citizenry and change. How do we work with the opportunities and risks inherent in a context in order to build momentum for change?

Rethinking Facilitation

> I stood there asking a question that I thought was relevant and suddenly I felt that the group actually wasn't really that interested in what I was asking. Eyes glazed over and I wasn't sure what their silence meant. I suddenly became aware of how weird I might seem to some members of the collective – a small young woman trying to unpack aspects of their daily experiences.

As someone who has been a part of catalysing conversations around particular issues in different contexts, I am often really anxious about my presence as a 'facilitator' in one process or another. Whilst in front of a community that knows more about itself than I ever will, I often feel as though my presence presents a formality around issues that might be obvious to them. This lack of familiarity can sometimes be an energising presence that can help bring up issues that are perhaps difficult to explore without a catalyst. Despite this, I often wonder about what remains unsaid in the balance. The issue here is a genuine concern about the purpose and effect of my presence as a facilitator. One has to ask genuinely: what is our motivation? Is this way of working really going to achieve what we have set out to do? Van Bommel adds to this line of thought by stating that social learning is wishful thinking unless we can 'rethink the criterion of interdependence' (Van Bommel *et al.*, 2009:410). Through this he raises the issue of power again by challenging us to see beyond our own 'problem frames' (2009:410). The question that remains for practitioners in this field is: how are the community and I interdependent? Gibson highlights concerns that an 'outsider' in this sort of work ought:

> To be sure 'politics' does not depend on 'outsiders'; 'victims' can themselves be faithful to these events. And it certainly would be a mistake to assert that thinking and reflecting is not 'organically' carried out in poor communities. The issue is: what can and should the radical who is committed to praxis do? For Fanon, the great challenge to those who want to engage in a liberatory praxis is to find new ways to listen to those who continue to be silenced and de-humanised but who are now gaining their voices, and become 'faithful' to those events of self-determination when they occur. (Gibson, 2011:40)

Looking at the legacy that development initiatives have had in many contexts, a discomfort with being an outsider is warranted. It is important for practitioners to find ways to step out of important conversations and let the group steer itself into the heart of its own dilemma. We need to find ways to be able to concurrently do this work with the perspective of an outsider whilst being able to contribute (but not dominate) as a participant. This negotiation of being an outsider and an insider is complex. It entails the dexterity to be an invisible part of the ongoing process and also emerge when necessary, as a guide, reflecting back to the group their concerns. The idea of acting as a 'responsible participant' rather than a facilitator highlighted in the work of Dylan McGarry[1] opens up interesting possibilities towards this practice.

Challenge for practitioners

What is our 'empathic solidarity' and how does it serve the needs of those marginalised? How can we find more ways to be faithful to the groups' own self-determination? How can we act more as 'responsible participants' rather than facilitators of a process? How do we balance the scope of our influence in a way that we can consider ourselves participants just like the rest of those present? Is this possible at all in our situation? We need to be clear about overstepping our mandate as facilitators and creating a rapport that masks domination.

Conclusion: On Interpendence, Presence and Collective Action

The relevance of the practice of social learning lies in its enthusiasm to do the complex work of engaging with diverse participants. The collective self-reflexivity that it demands has implications for all those involved. This process needs to be dedicated to maintaining awareness on the lived experiences that provide meaning for participants. Only through this can the purpose of such a venture inspire the motivation needed. The challenge is not simply having spaces for participation, but whether this participation is enough to catalyse collective agency. It requires a level of ownership and capability on the part of those involved that might need to be encouraged as an ongoing part of the process. Practitioners need to reflect on their roles and ask how they can mould their practice in a way that prioritises the experiences and agency of local communities.

Endnote

1. Dylan McGarry is currently completing a trans-disciplinary, split-site PhD, entitled 'Empathy in the time of climate change', in environmental education at the Environmental Learning Research Centre (ELRC) at Rhodes University and in social sculpture at the Social Sculpture Research Unit at Oxford Brookes University (UK). He is developing a new methodological approach to social learning (learning outside of educational institutions in everyday life), which aims to encourage and enable ecological citizenship and reflexive justice in South Africa. To read more about his work go to www.earthfora.org.

Note on Contributor

Injairu Kulundu is a lyricist, singer, researcher, and community development practitioner. Her research interests began with a focus in African politics and a desire to not only grapple with the complexities that are presented but also to do work that constructively and creatively engages with alternative possibilities that can be engendered. She obtained a BA, in politics and drama (2006), Honours in applied theatre (2006), and a Post Graduate Diploma (PDIS) in African diplomacy and peacekeeping (2007) from Rhodes University. She went on to complete an MA in political studies (2009) from Rhodes University that focused on the work of a local organisation that worked creatively to bring about historically conscious participatory human development strategies as part of a youth empowerment process. Since then her work has focused on using creative methodologies as part of social learning processes amongst youth at risk and diverse and interdependent members of rural communities in the Eastern Cape. Email: injairu.kulundu@gmail.com

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Heritage – A Conceptually Evolving and Dissonant Phenomenon: Implications for Heritage Management and Education Practices in Post-colonial Southern Africa

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Abstract

This conceptual paper is based on experiences and insights which have emerged from my quest to develop a conceptual framework for working with the term 'heritage' within an education for sustainable development study that I am currently conducting. Of specific interest to me, and having potential to improve the relevance and quality of heritage education in southern Africa, given the region's inherent cultural diversity and colonial history, is the need for 'heritage construct inclusivity' within the processes constituting heritage education practices. Working around this broad research goal, I therefore needed to be clear about what I mean or refer to as heritage. I realised, however, how elusive and conceptually problematic the term 'heritage' is. I therefore, drawing from literature and experiences gained during field observations and focus group interviews, came up with the idea of working with three viewpoints of heritage. Drawing on real life cases I argue that current heritage management and education practices' failure to recognise and respect the evolving, interconnectedness and multi-layered nature of heritage, partly explain the same practices' lack of relevance and agency to enhance the sustainable management of local heritage resources. I also suggest a few ideas which heritage educators in the context of post-colonial southern Africa may need to consider in their everyday heritage education practices. I also introduce the notion of conceptualising heritage as 'cultural landscapes', within which the evolving, dissonant and interconnected nature of heritage, and associated heritage constructs, may be reconciled.

Introduction

> There is really no such thing as heritage. I say this advisedly, and it is a statement that I will qualify, but it needs to be said to highlight the common sense assumption that 'heritage' can unproblematically be identified as 'old', grand, monumental and aesthetically pleasing sites, buildings, places and artefacts, ... what I argue, ... is rather a hegemonic discourse about heritage, which acts to constitute the way we think, talk, and write about heritage. (Smith, 2006:1)

Heritage, despite its fast becoming an increasingly used term within contemporary environment and development discourses, has largely remained conceptually problematic. According to Graham *et al.* (2000) and Smith (2006), defining heritage has always been a daunting and elusive task. This may partly be because heritage, with its hybridity and discursive nature, cannot easily be defined with any meaningful degree of universality. For this reason, scholars

like Smith (2006:11) making reference to the problematic conception of heritage, as noted in the quotation above, have even concluded that 'there is really no such thing as heritage'. Smith (2006:11) preferred to work with the notion of 'hegemonic discourse about heritage', which he went on to argue acts to constitute the way we think, talk and write about heritage.

Other scholars like Lowenthal (1990; 1996; 2005:81) have claimed that 'heritage denotes everything we suppose has been handed down to us from the past'. He (2005:81) further pointed out that what comprises heritage (what it is) differs greatly among people and over time. The word 'heritage' is therefore a slippery term that incorporates a vast range of contradictory meanings. The value that we attach to that which we call heritage is similarly contested, when viewed from a different cultural perspective.

Given the difficulties associated with conceptualising the term 'heritage', other scholars have often chosen to leave the concept undefined, choosing to work with either the notion of 'cultural heritage' or that of 'natural heritage'. At times many have opted to work with dichotomies of heritages, such as tangible or intangible. Realising the above, I therefore decided, within my study, to work with what I call the three viewpoints or frameworks for understanding heritage as a concept. These viewpoints or frameworks are: 'heritage as evolving and dissonant'; 'heritage as natural and cultural'; and 'heritage as tangible or intangible'. Using a few examples I make an attempt to make explicit the interconnected nature of heritage, and the implications that this has on heritage management and education practices in southern Africa.

Heritage as an 'Evolving and Dissonant' Concept

Until recently the word 'heritage' was commonly used to refer to the inheritance that an individual receives from a deceased ancestor or what a person bequeaths to descendants (Lowenthal, 2005). Such a conceptualisation of heritage is still widespread, and explains why even today a lot of us treasure the old spoon or picture frame that we got from our forebears as heritage items. However, according to Graham *et al.* (2000:1): 'the term "heritage" has recently undergone a quantum of expansion to include almost any sort of inter-generational exchange or relationship, welcome or not, between societies as well as individuals'. In concurrence with Graham *et al.* (2000), Jimenez Perez argued that:

> the concept of heritage has gone from referring to artistic works, buildings and archaeological remains (so-called historical–artistic heritage) to encompass objects, environments and phenomena (tangible and intangible) which are the result of both human activity and their interaction with nature. (Perez *et al.*, 2010:1320)

Important to note and closely linked to this evolving nature of heritage is that heritage as claimed by Graham *et al.* (2000:23) and Smith (2006) 'fulfils several inherently opposing uses and often carries conflicting meanings simultaneously'. Consequently, heritage is, as already pointed out, valued for different reasons and at different levels and between cultures, time and places (Jokiletho, 1999; Graham *et al.*, 2000; de la Torre, 2002; Smith, 2006). For instance, at an individual level, heritage is widely considered a precious and irreplaceable resource essential for

personal identity and necessary for self-respect. However, at a national level, heritage is often perceived as a resource for promoting national sovereignty, unified identity and economic development (Lowenthal, 1996; Head, 2000; Ndoro, 2005). A good example is the case of Great Zimbabwe, where national and local communities' interests were at one time in conflict (Fontein, 2006). In his doctoral thesis, Fontein (2006) claimed that people who currently live around Great Zimbabwe are excluded from the monument. To local communities, the Great Zimbabwe monument is a place of cultural significance, where they are supposed to conduct their rituals and ceremonies, and at national level the monument is being used to reconstruct a patriotic national history for the country.

Drawing from the above discussion, one may conclude that heritage is therefore an evolving and dissonant concept, which takes on different meanings at different places and times. The evolving and dissonant nature of heritage does help one to understand some of the challenges associated with ownership, value systems and access and use of heritage resources in the southern African region (Graham *et al.*, 2000; de la Torre, 2002; Smith, 2006). Examples of how the evolving and dissonant character of heritage impacts on sustainable management of heritage resources are many. In southern Africa, another notable example is the tension between the Ramunangi clan in Limpopo province and a tourism development project reflecting conflicting values and use regarding a local heritage site – the Phiphidi Falls. For the Ramunangi clan, the falls are, as in the Great Zimbabwe case, a place of cultural significance, while for the tourism developer the falls are a potential site for the construction of a holiday resort. Underlying the tensions and conflicts playing out in the two examples given above are conflicting 'constructs' or conceptions of what constitutes heritage, what it is valued for and how it should be managed and used. Management approaches and heritage education practices that address such tensions are urgently needed if we are to reduce the risks and vulnerability facing our heritage resources.

Heritage as Natural and/or Cultural

Lowenthal (2005:81), other than conceptualising heritage as a constantly evolving and dissonant concept, went on to claim that heritage comes from both 'nature' and 'culture'. From Lowenthal's (2005) point of view, heritage can therefore be conceived of as either natural or cultural, and from this school of thought emerged the widely used conception of cultural and natural heritages. Accordingly, we now talk of natural heritage, as denoting natural places such as forests, mountains, grasslands, deserts, rivers and wildlife (UNESCO, 2002). Put together, this range of naturally occurring resources constitutes our natural heritage. On the other hand, we also have our cultural heritage, consisting of tangible objects such as museum collections and intangible social practices such as songs, dance, folklore, legends, rituals and ceremonies (UNESCO, 2003; 2006). It is important to note that cultural heritage entails a people's way of life and their relationship to the natural (rivers, water, soil, forests and air) and the built (urban spaces, industries, etc.) environment. From this one can argue that cultural and natural heritages are, therefore, interconnected. Lowenthal (2005) called this interconnection the nature–culture dualism.

The interconnectedness of heritages of nature and culture has important implications for both the sustainable management of heritage resources and associated heritage education practices. In emphasising the nature–culture dualism of heritage, Lowenthal argued that:

> Increasingly the heritages of culture and nature came to be viewed as interconnected, and indeed indivisible. If they are twins, they are Siamese twins, separated only at high risk of demise of both. (Lowenthal, 2005:85)

Hughes (2009:30) in his recent book called *An Environmental History of the World*, challenged the idea of dichotomising natural and cultural heritage in conservation and development processes, arguing that 'cities are not separate from the natural world on which they depend'. He alerted us to the risks of treating culture as divorced from nature by narrating how such conceptions have presented challenges for the sustainable management of both natural and cultural heritage resources. He claimed that treating nature as divorced from culture could have contributed to the abandonment of cities during ancient times, examples in the southern African region being Mapungubwe and Great Zimbabwe. Drawing on Prats (1997) and Mattozi (2001), Jimenez Perez *et al.* (2010) also pointed out that the term 'heritage' itself does not distinguish between cultural and natural manifestations. Hence all heritages are either natural or cultural but, importantly, can also be both.

The conception of heritage as intertwined or interconnected and consisting of both natural and cultural dimensions requires that we re-think the manner in which current heritage management and education practices are constituted. As mentioned earlier, underlying some of the challenges for the sustainable management of heritage resources in southern Africa is the current management approaches' failure to perceive heritage as both natural and cultural. Or, to borrow Hughes' (2009) words, our 'treating nature as divorced from culture' has contributed to fragmented and exclusive heritage policies, management and education practices, often leaving out local people's cultural perspectives. In the case of Great Zimbabwe, as noted by Chirikure and Pwiti 'heritage managers and archaeologists understandably became alarmed to discover that the alienation of local indigenous groups was also depriving them of valuable allies in the protection of the site' (Chirikure & Pwiti, 2008:467). And so, by and large, unless current heritage management and education practices are also re-oriented to allow for recognition of the nature–culture dualism aspect of heritage, they will continue to do little to support the sustainable management of heritage resources (UNESCO, 2010).

A close look at the recent conflict between the National Parks and Wildlife Authority and the National Museums and Monuments in Zimbabwe over control and ownership of Victoria Falls – declared a national monument in *1932*, a national park in *1957* and finally a World Heritage Site in *1989* (own emphasis) – illustrates, other than the evolving nature of heritage, the challenges caused by a fragmented view of what heritage resources are (Guvamombe & Chitumba, 2010). The Victoria Falls case begs the question: Are the falls a cultural or natural heritage resource? How one answers this question will influence how the same person may approach the management and interpretation of the falls.

Educationally, it is sad to note that the current representation of Victoria Falls to learners continues to be exclusive of the cultural histories associated with indigenous people who lived and interacted with the falls since time immemorial and arguably well before David Livingstone claimed to have discovered the falls. Tour guides continue to narrowly interpret the falls as a natural wonder historically discovered by David Livingstone. The challenge is how to reconstitute heritage education practices to help learners to construct the Victoria Falls and other heritage sites or monuments as being both natural and cultural. I suggest that such a heritage education will be broader, inclusive and more relevant in enhancing the management of heritage resources than the education practices currently taking place in most Zimbabwean museums, heritage sites and school classrooms.

Heritage as Tangible or Intangible

UNESCO (2006) in its publication 'Cultural Heritage and Local Development', argued that heritage can be divided into two main categories: notably, a heritage that presents itself in a material, tangible form, such as archaeology, art, movable objects, architecture and landscape, and a heritage that is intangible but manifest in the form of knowledge and practices as well as values, norms and belief systems. Accordingly, tangible heritage resources are deemed to include all the heritages that are material in form, such as historic buildings, art and artefacts, relics, archaeological sites and monuments (Government of South Africa, 1999). Tangible heritages encompass natural resources such as the rivers, seas, soil, mountains, forests and animals (Lowenthal, 2005; Smith, 2006).

Intangible heritage, on the other hand, is perceived as incorporating a wide range of non-material aspects. These, as UNESCO (2003; 2006) puts it, include oral traditions and expressions, social practices and rituals, knowledge and practices concerning nature, as well as traditional craftsmanship. According to Munjeri (2004), intangible culture entails the wider frame within which societies function. The conservation of these intangible cultural heritages, Munjeri (2004) further argued, can be done best within the social processes that generate them.

The idea of conceiving heritage as tangible or intangible has been popularised by UNESCO, and is now widely used in heritage resources management and development, but significant for this paper is that UNESCO (2002, 2003 & 2006) also acknowledged the interconnectedness of tangible and intangible heritages. UNESCO argued that:

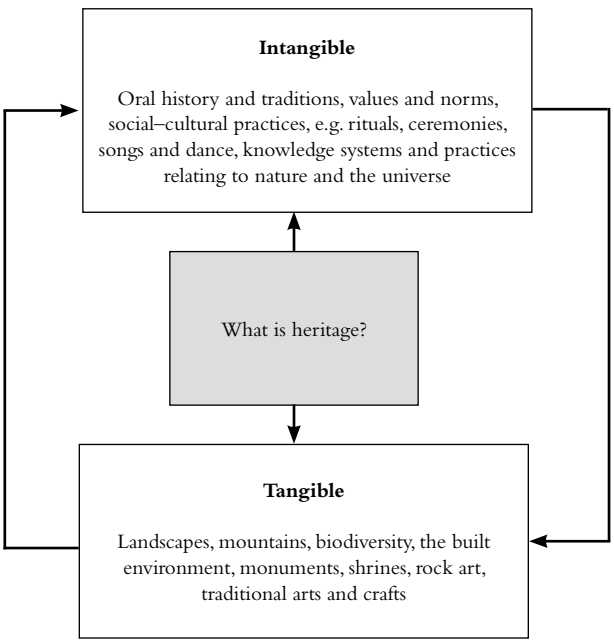
> All intangible aspects such as knowledge systems, the principles of action or the values and beliefs of man, cannot be considered as heritage if they cannot be shared, and given a sensible form – words, objects, gestures, representations and even behaviours. (2006:9)

Similarly, attempting to draw our attention to the interconnectedness of tangible and intangible heritages, Ndoro (2005) pointed out that the meaning and importance imbued in monuments, like the Great Zimbabwe ruins and the Great Pyramids in Egypt, lay not only in the physical appearance but also in the reason behind their construction and existence. In concurrence, Smith (2006) argued that monument sites and rock art are not inherently valuable, but derive

value and meaning from the present day cultural processes and activities that are undertaken around them. As already highlighted, the additional value of the Phiphidi Falls in the Limpopo Province stems from the cultural practices that the Ramunangi clan conduct at the falls much more than it simply being a natural resource. Thus, the tension between the Ramunangi clan and the tourism developer may be due to both parties' failure to acknowledge the relationship between tangible and intangible aspects of heritage resources and how this determines the value and desired use of the Phiphidi Falls. This may also lie in the tendency of current heritage legislation and management practices to emphasise the material nature of heritage over its intangible aspects (Ndoro, 2005; UNESCO, 2006). Again, education practices that acknowledge the link between tangible and intangible aspects of heritage resources, as well as the evolving and dissonant nature of heritage, could go a long way in mediating challenges such as those of the Ramunangi and Phiphidi Falls.

In the diagram below, I attempt to represent the interaction between tangible and intangible heritages and how these influence people's construction of what heritage is. Important to note is that our heritage constructs are influenced and shaped by both tangible and intangible aspects tied to that which we perceive as heritage. As I argued earlier, over-emphasising one aspect over the other could be problematic and have varying implications for heritage management and education practices.

Figure 1. The interaction between tangible and intangible heritages and its influence on heritage construction



Implications for Educational Practices

Central in my study was the desire to generate ideas that could be used to re-orient current heritage education practices towards being able to incorporate and work with a broader conception of heritage. A conception that allows heritage constructs inclusivity and acknowledges and respects the diversity of cultures in southern Africa.

Educationally, this requires that heritage educators need to:

- Carefully reflect on how heritage is being constructed within the educational processes that they engage in. Given the diverse cultures inherent in southern Africa, and the region's history of colonisation, educators may need to tread with caution and avoid the pitfalls of pushing forward one aspect of heritage, be it a historical perspective, cultural value, or related to a heritage site or object.
- Continue reflecting on their own conceptions of heritage and ensure that these are not imposed on the learners. Learners must create their own heritages rather than being passive receivers. In this way increasing the meaning and relevance of the learning opportunity is possible.
- Accept and respect that there is more than one history of a heritage site or object, and giving the learner access to all of these histories enriches the learning experience. For instance, what learners are exposed to at Victoria Falls can certainly be expanded to give a broader and inclusive view of the falls as a cultural landscape. Working with a concept of the Victoria Falls as a cultural landscape, within which the nature–culture dualism and discursive nature of heritage is accommodated, is a good idea.
- Continuously ask themselves about the heritage constructs being promoted or marginalised within the teaching and learning support materials that they are currently using. Doing so can help the educator to avoid perpetrating the exclusivity that is characteristic of current heritage education practices.

What I therefore advocate is a heritage education practice that is socio-culturally situated and inclusive of diverse constructs of what heritage is. One of the challenges that comes to mind is the question of how to achieve this type of heritage education, given that the education systems within which we work are often shaped and influenced by policy discourses that are beyond our control. Hence, maybe what we need initially is a change in heritage policies. Another challenge that also needs attention is how, in practice, to achieve an inclusive heritage education practice without becoming too relativist and falling into the trap of conceiving heritage as meaning everything and nothing.

Conclusion

In this conceptual paper I have discussed the three viewpoints of heritage and how these could be influencing heritage management and education practices in southern Africa, particularly Zimbabwe. I have used a few examples to illustrate how our varying and evolving conceptions of heritage can help us to appreciate and understand some of the challenges associated with

heritage management and education in the region. Further to this I have also tried to offer a few ideas that heritage educators can start to consider in their quest to make current heritage education practices more inclusive, relevant and supportive of the management and protection of the region's diverse heritage resources. In this paper I have hopefully opened up space for heritage practitioners to continue engaging critically with the notion of heritage and how their conceptions influence practice. I have also, even though not fully, interrogated the idea of working with the notion of cultural landscapes, hoping that readers might be interested in following it up.

Note on the Contributor

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Think Piece
Christian and African Perspectives on Stewardship of Creation

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Introduction

Genesis 1: 24 & 25 read thus:

> Then God said, let the earth bring forth living creatures after their kind: cattle and creeping things and beasts of the earth after their kind; and it was so. God made the beasts of the earth after their kind, and the cattle after their kind, and everything that creeps on the ground after its kind; and God saw that it was good.

According to Christianity and African religious systems and cultures, God created everything: heaven and earth, and all living and innate creatures. As the aforementioned verses from the bible say, 'God saw that it was good'. Thereafter, God created human beings to be the chief stewards of the entire creation. Then:

> ... the LORD God took the human being and put him/her into the Garden of Eden to cultivate it and keep it. (Genesis 2: 15)

So, the two main issues that will be in my mind as I explore the Christian principles as well as the African perspectives on the stewardship of creation are:

- The entire beautiful (or good) creation belongs to God;
- Human beings are the stewards of creation – their duty is to 'cultivate and to keep it'.

Christians and Environmental Justice

Christians have often been blamed for the neglect of the environment. For example, according to Lynn White Jr:

> Christianity, in absolute contrast to ancient paganism and Asia's religions (except, perhaps, Zoroastrianism), not only established dualism of man and nature but also insisted that it is God's will that man exploit nature for his proper ends ... By destroying pagan animism, Christianity made it possible to exploit nature in a mood of indifference to the feelings

> of natural objects ... Hence we shall continue to have a worsening ecological crisis until we reject the Christian axiom that nature has no reason for existence save to serve man. (White, 1967)

White's (1967) criticism is based on interpretation of Genesis 1: 28, where God is by and large understood as saying that human beings are the only important species on earth, so they must have 'dominion' or should exploit everything else on earth. Indeed many critiques, such as White (1967) are not entirely false. For example, the Umthatha Mission Congress of the Methodist Church of Southern Africa (MCSA) in 2004 did not do justice to the issues pertaining to the environment. As a result, the MCSA's 'fifth' pillar of mission (Environmental Justice) was an afterthought – and many people in the MCSA still know and preach only about four mission pillars (imperatives). Generally, very few preachers say anything (preach) on the importance of the environment to Christians.

However, there are many Christian (and non-Christian) men and women who have dedicated their lives to ensure that the earth we have inherited is passed on to the next generations as beautiful to the eyes of God as it was when he created it many, many years ago. Certainly, all of us have a role to play – no matter how small.

Ethical Issues and Creation (Environment)

There are many ethical issues pertaining to the environment if we are to somehow balance the needs of human beings and environmental conservation. Indeed, by harming the earth today, we will exert pressure on future generations. Herman Daley (cited by Conradie & Field, 2001: 5) correctly pointed out that future generations will inherit the earth with 'less arable land, more people, fewer species of living things, a legacy of poisonous waste, and much beauty irrevocably lost'. So, for the well-being of our planet and all its residents, present and future, we all have to find a balance.

It is indeed difficult to find a balance on environmental affairs. Barbara Ward and Rene Dubos have pointed out that:

> There exists a SINGLE unified system from one end of the cosmos to the other. Yet, this unified stuff of existence only twists itself into the incredible variety of material things; it can also produce living patterns of ever-greater complexity. Remove the green cover from the soil of Central Africa and it becomes a brick-hard, everlasting laterites. Cut down the forests; overgraze the grass, and productive land turns to desert. Overload the waters with sewage or nutrients and algae consume its oxygen, fish die and produce stinking gas as they decompose. If (hu)man (beings) continue to let their behaviour be dominated by separation, antagonism and greed; they will destroy the delicate balance of their planetary environment. And there would be no more life (for everyone). (Ward & Dubos, 1972: 83–87)

Arri Santas concurs with Ward and Dubos (1972):

> There is always a flow of material in and out of the membranes of the organism as it reconstructs and replenishes itself with the stuff of the outside world. In so doing they recreate themselves and their environment. Secondly, the organism is part of what constitutes its environment – it is a member of the ecosystem. Thirdly, an organism is part of its own environment in so far as its activities determine future states of those surroundings in which it acts, so that its present environment is a function of its past activities and its future is function of the present. (Santas, 1996: 77)

So, the primary role of human beings, I strongly believe, is to maintain the 'delicate balance' which existed for millions of years in the ecosystem. Without a doubt, as Meister Eckhardt (cited by Conradie & Field, 2001: 73) said, 'one creature sustains one another, one enriches the other and that is why all creatures are interdependent'. This delicate balance should also, I believe, be maintained between stewardship of creation and social justice issues, as Cora Tucker (1987) alludes:

> People don't get all the connections. They say the environment is over here, the civil rights group is over there, the women's group is over there, and the other groups are here. Actually, all of them are one group, and the issues we fight become null and void if we have no clean water to drink, no clean air to breathe, and nothing to eat.

Wenz discusses how differently environmental justice issues may affect the wealthy and the poor (2007: 57–84). However, judging by the number of plant and animal species which have become extinct – all of us, rich or poor, are not doing well. Among other things, the ever expanding human population is not doing us any favours (Kirk, 1999: 165). Thus, for us to find the balance – 'something (somebody) has to give; family size, standard of living or the biosphere's survival. Of these alternatives, stable family size with modest affluence seems the most humane solution' (Ward & Dubos, 1972: 177). Talks have been going on for far too long – now, practical steps hinged on Christian and African perspectives have to be taken.

Biblical and Theological Principles and Creation

God's creation is good. However, it is true that the 'people have devalued the earth' (Warmback, 2001: 80). When it comes to economic development, we have been neglecting the impact of human activities on the environment. Indeed, our behaviour is in contrast with what we read in Psalm 148: 1–13. A picture of vibrant ecosystem praising the Lord comes to my mind every time when I read this Psalm. Having said that, the understanding of the passage in Genesis 1 (about dominion) and the idea that our time on earth is transitory, are often used to implicate Christian perspectives in the environmental degradation of our times. Thus, I agree with White when he said we need to 'rethink our axioms' (White, 1967: 1204).

The Bible has many passages which clearly show that God wants human beings to live in harmony with the environment. In Deuteronomy 20: 19–20, humans are restricted from cutting down fruit trees. In Leviticus 25, we read about the preservation of land. And in Deuteronomy 25: 4, we read about the law which forbids the killing of birds. In the New Testament, we also get a picture of how Jesus loved the environment. For example, in Matthew 6: 28–30, he says God will clothe his beloved like he 'clothes the grass in the fields'.

This harmonious relationship between the environment and humans beings was also explored by many early church fathers (and mothers). For example, Irenaeus (185 to 254 CE), taught that 'the creation as a whole is part of the divine plan of renewal. God tends and nourishes his creation' (Kinsley, 1995: 119). Although Irenaeus tended to emphasise the centrality of human beings in the creation, he taught that 'the majority of creatures after the Fall continue to remain obedient to God's will – nature then, retains its goodness' (ibid.) And, Augustine (354–430 CE) believed that 'every creature has an 'existence fitting it', and although we, from our limited perspective, may not understand the place of a given being, or may even be repelled by it – in its way that being glorifies the Creator' (ibid.: 120). However, Augustine never considered creation (environment) as 'divine in itself', but he thought (and taught) that 'it testifies to the divine in its every facet and is suffused with the divine in its daily expressions'. More importantly, Saint Francis of Assisi (1182–1226) and his work, remain the most powerful testimony of how the early Church loved nature. In one of his poems (songs) he says:

(Lord) be praised...
Especially for Sir Brother Sun.
How handsome he is!
(Lord) be praised...
For Sister Moon and the Stars,
(Lord) be praised...
For our Sister, Mother Earth...
Who nourishes and governs us!'
And who produces various fruits,
with many-coloured flowers and herbs.

More recently, in 1991, the heads of many religious denominations (mainly from North America) at the 'Summit on Environment' pledged to:

- 'Take initiatives in interpreting and communicating theological foundations for the leadership of creation in which we find the principles for environmental actions';
- 'Encourage and exemplify habits of sound and sustainable house-holding – in land use, investment decisions, energy conservation, purchasing of products and waste disposal';
- 'Witness firsthand and call public attention to the effect of environmental degradation on vulnerable peoples and ecosystems'; and
- 'Prepare educational materials for congregations; provide technical support for religious publishers already producing such materials, and share *sermonical* and liturgical materials about ecology'.

More importantly, they pledged 'to the children of the world, to take full measure of what this moment in history requires of us' (Gottlieb, 1996: 636–630). However, about 20 years later, very few church leaders (in the world and particularly in southern Africa) as well as faith-based organisations, have lived up to the aforementioned New York Declaration. Among these few faith-based organisations, the work of the Western Cape Provincial Council of Churches (WCPCC) and Diakonia Council of Churches (DCC), which is based in Durban, South Africa, needs to be commended. In 2005 and 2007, the DCC conducted successfully the 'Environmental Justice' and 'Economic Justice' seasons, respectively. These programmes made many faith-based organisations and churches aware of issues such as: the Basic Income Grant; the *Oikos* Journey (inclusive economy and shared prosperity); genetically modified foods; vegetable gardens; and climate change, among others. These issues, which the church is called upon to respond, continue to affect many poor people of God, especially those who live in Africa and depend mainly on their indigenous belief systems and solely on what Mother Earth has to give. Therefore, the Christian response is not likely to have meaning for many of our people until it is 'cooked in African Pots' (Abrahams, 2007:7).

An African Perspective of Creation

According to Basotho folklore, (human) life began from a damp place (something like a wetland), with many reeds, called *Ntsoanatsatsi* (the place where the sun was born). That is why Basotho refer to the hospital maternity ward as *kalehlakeng* (in the, or the place of, reeds). And in the olden days many Africans used to consider (river) water, especially where there were reeds, to be sacred. These days many African traditions (especially those which have something to do with the environment) such as the *umkhosi wokweshwama* (the ritual of killing of a bull with bare hands) are still rightly interpreted as cruelty to animals. Hence, as many believe, these rituals need to be transformed.

Africans honour nature in many other ways. For example, some often adopt certain animals and use them as clans' totems. The clan/tribe which uses the *kgomo/nare* (cow/buffalo) as its *seboko* (totem) neither eats beef nor kill cows/buffalos. For example, the same goes for *Bakwena/oNgwenya* (those who venerate crocodiles), *Batshweneng* (those who venerate apes/monkeys), *Bakubung/oMvubu* (those who venerate hippos) and *Batloung/oNdlovu* (those who venerate the elephants, such as myself).

Some clans venerate non-living things such as the sun (*abakwaLanga*) and plants such as wheat (*bahaSelemakoro*) and acacia trees (*bahaLeoka*) trees. This African belief system is also similar to the 'ordination of trees' often done in Thailand by Buddhist Monks. In Thai culture, an ordained priest can't be killed, so the trees are protected (www.sulak-sivaraksa.org). As people intermarry, many tribes become related to each other – resulting in many people not killing the animals venerated by their relatives. As a result, killing elephants and rhinos for their horns (which happen so often these days) hurts many people because is an insult and is foreign to African culture and traditions. So, killing animals as part of hunting (or competing for a 'trophy'), which some people 'play' as sport, is also un-African.

Undeniably, Gabriel Setiloane and John Mbiti contributed significantly in the narration, recording and interpretating African religions. In as far as creation and the environment is concerned, Mbiti said:

> The earth is full of created things. Some Africans regard it as a living being, and call it 'mother earth, the goddess earth, or the divinity of the earth'. On the earth itself many things are held in greatest esteem for religious reasons, such as mountains, waterfalls, rocks, some forests and trees, birds, animals and insects. But in African myths of creation, (hu) man (beings) put themselves at the centre of the universe. It is as if the whole world exists for (hu)man (beings') sake. This means both what the world can do for (hu)man (beings), and how (hu)man (beings) can use the world for their own sake.... and endeavour to live in harmony with it. (Mbiti, 1996:172)

It is clear that Mbiti (1992) supported the original, and still widely held, understanding among many Christians that human beings have 'dominion' over the entire creation.

However recent empirical research 'suggests that traditional culture', especially among the Zulus, still 'regard naturally occurring indigenous plant species as more valuable' than invaders (Nemudzudzanyi *et al.*, 2010). Therefore, it is encouraging that some African people still honour God's creation. Many continue to implement the teachings, which were handed to them by their ancestors in dealing with contemporary environmental adversities.

Children should be encouraged to practice the Biblical, theological, ethical and African principles of stewardship of the environment, and to make these principles their lifestyles (or fashion) from a tender age. In fact, 'all of us have a role to play – no matter how small' (Botha *et al.*, 2006). The author of Psalms reminds us :

> O Lord, you have always been our home. Before you created the hills or brought the world into being, you were eternally God, and will be God forever you tell us to return to what we were; you change us back to dust. A thousand years to you are like one day; they are like yesterday, already gone, like a short hour in the night. You carry us away like a flood; we last no longer than a dream. We are like weeds that sprout in the morning that grow and burst into bloom, then dry up and die in the evening. (Psalm 90: 1-6 ,Good News Bible)

Conclusion

In conclusion, both the Christian and African perspectives on creation, as argued in this think piece, affirm that human beings and the entire God's creation are interconnected. We belong to each other. So, it is our prime responsibility to take good care of the environment; to recycle and re reuse waste; and more importantly, to discourage companies from manufacturing and supplying non-biodegradable waste such as plastic, which causes so much harm to the earth, which *Modimo le Badimo* love so much.

Editorial note

The text was shortened for publication as a think piece as it opens a conversation on perspectives that Lehlohonolo has explored out of his reading and personal experiences. The publication of think pieces has emerged as a way of bringing emerging and interesting concerns and perspective into scholarly deliberation.

Note on the Contributor

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ISBN 978-1-920489-47-2

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ISSN: 1810-0333