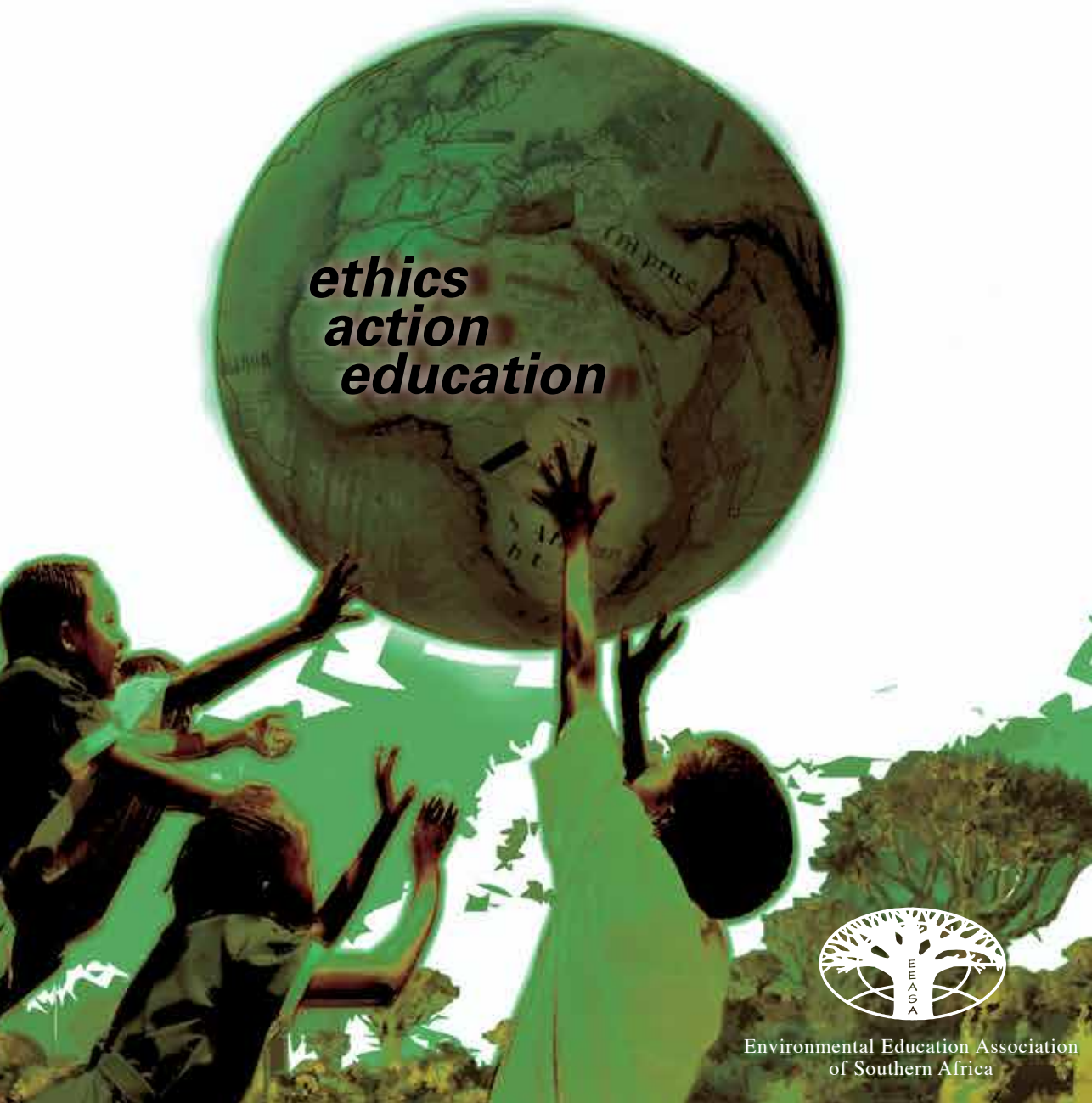
SOUTHERN AFRICAN JOURNAL of ENVIRONMENTAL EDUCATION

Vol. 30 (2014)



Environmental Education Association
of Southern Africa

Southern African Journal of Environmental Education
Volume 30 (2014)

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).

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Papers published in the Feature Article section of the journal are reviewed by two and at times three advisory editors. Keynote, Viewpoint and Think Piece papers are reviewed by one of the editors of the journal or an advisory editor.

The production of Volume 30 (2014) has been made possible through membership funding. 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
Design and lay-out by COMPRESS.dsl | www.compressdsl.com

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ISSN 1810–0333 ISBN 978-1-920677-54-1

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Editorial

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This year marks the end of the United Nations Decade of Education for Sustainable Development which was first proposed at the World Summit on Sustainable Development in 2002 in Johannesburg. At the end of 2014 UNESCO hosted the World Conference on Education for Sustainable Development in Nagoya, Japan. To mark this occasion Professor Rob O'Donoghue produced a reflective Think Piece that traces the emergence of education for sustainable development (ESD) from its educational roots in the Modernist project, to the diversity of practices that currently frame ESD as a transgressive process of cultural change. O'Donoghue interrogates tensions around knowledge and participation in the ESD terrain and proposes that knowledge-led and ethics-led learning in relation to valued purposes might create educational possibilities for expansive, transgressive and reflexive learning processes towards a more sustainable future. This Think Piece opens the Journal; many of the strengths, tensions and generative opportunities in environment and sustainability education referred to by O'Donoghue are reflected in this edition of the journal.

The first research article is by Ontong and Le Grange, who differentiate between 'sustainable development as a policy formulation' (around which education for sustainable development is orientated) and 'sustainability as a frame of mind'. They argue that the notion of 'sustainability as a frame of mind' rests on greater openness to, and concern for, nature and it shapes our attitudes and identities in relation to the environment. Ontong and Le Grange explore the potential contribution of place-based and place-conscious education (the pedagogy of place) in developing sustainability as a frame of mind. However, such changes in pedagogy require a metaphysical shift in which educators embrace more intimate, intuitive and non-technical educational encounters with the world. Such a shift, argue the authors, may be usefully framed by the African value of *ubuntu*.

The article by Le Grange and Ontong is followed by two differently focused papers that both reflect on conservation concerns. The paper by Lawhon and Grant addresses a major conservation concern in southern Africa, namely rhino poaching. They suggest that the media is instrumental in providing the public with environmental knowledge and increasing environmental awareness, and through their research, they investigate reporting on this issue in a national newspaper in South Africa, the *Mail & Guardian*. They note that most of the articles that they analysed were solution-oriented, with mitigation being the most frequently coded theme. They argue however, that coverage of issues such as rhino poaching is inadequate in that it does not include the relationship between the issues and the general public, potentially affecting how the public respond to such concerns.

The second paper that picks up a conservation theme is the paper by Mukute and Pesanayi. They focus on the development and implementation of a professional development course on climate change adaptation and Transfrontier Conservation Areas (TFCAs) in southern Africa. The paper traces the trajectory from initial contextual profiling, to course design and then course implementation by the SADC Regional Environmental Education Programme. Drawing on Bernstein's theory of curriculum translation, in particular the concept of recontextualisation, Mukute and Pesanayi draw attention to the value of curriculum design that is 'contextualised' and curriculum implementation that is 're-contextualised'.

The next two papers focus on the 'green economy' and its implications for environmental education and sustainability in southern Africa. Pullanikkatil, Mubako and Munthali explore the integration of green economy principles into poverty alleviation projects in Malawi concerned with the transfer of renewable energy technologies. They draw on case examples of solar energy kiosks and solar fish dryers to demonstrate that explicit knowledge-sharing practices in relation to these projects, especially those centred on local, traditional knowledge, can enhance environmental education efforts. In the second paper concerned with the green economy, Godwell Nhamo interrogates the readiness of higher education institutions in Africa to respond to the green economy, especially in the light of climate change challenges. Nhamo argues for a whole system approach that responds not only to how institutions of higher education develop their curricula, but also to how they institutionalise green economy concerns within policy and research structures.

Ingrid Schudel's paper marks a turn to environment-oriented learning in formal schooling in this edition of the journal. Schudel recognises that questions of knowledge are central to South Africa's curriculum crisis and, as such, questions of environmental knowledge are central to quality environmental learning. Schudel draws on social realist curriculum theory to argue for context-rich (but not context-bound) explorations of local and global environmental issues and for the importance of open-ended and futuristic thinking in the context of the dynamism of environmental knowledge.

Molapo, Stears and Dempster's paper is also concerned with environmental knowledge, this time in the context of Lesotho's senior secondary biology curriculum. The paper reveals that, despite the Lesotho national curriculum's intention of developing action competence in learners, biology learners' sound theoretical knowledge does not appear to inform their everyday practices or develop their sense of environmental responsibility or agency. Molapo, Stears and Dempster trace this mismatch to a de-contextualised curriculum in which environmental knowledge is not translated into action.

The final paper of this edition is by Carolina Dube who presents case study data of three South African Geography teachers' perceptions of environment and sustainability concepts in the Geography curriculum. The paper reveals that all three teachers struggle to understand and apply the concepts of 'environmental education', 'sustainable development' and 'education for sustainable development'. Dube posits that, unless pre-service and in-service teacher education programmes address these conceptual difficulties, South African Geography teachers will remain ill-equipped to re-orientate their teaching to environmental education and education for sustainable development.

Think Piece

Re-thinking Education for Sustainable Development as Transgressive Processes of Educational Engagement with Human Conduct, Emerging Matters of Concern and the Common Good

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> Human beings have developed within a world. Their cognitive functions evolved in continuous contact with objects to be recognised. The symbol emancipation, in the course of which socially acquired means of communication gained dominance over those which were genetically fixed, enabled humans to adjust their judgement and their actions to an almost infinite variety of situations.
> …
> Evidence shows that over the generations defects of knowledge can be mended.
>
> (Elias, 1991, p.121)

Abstract

The modernist expansion of Education is examined to explore how the concept of Education for Sustainable Development (ESD) has emerged, is being worked with, and is being assessed in imperatives intended to foster social-ecological change on a global scale. The opening review sketches how education developed as a mediating process in modernity, tracking some recent shifts that are shaping ESD in more and more diverse contexts of education practice. It scopes an ESD terrain where knowledge and ethics-led learning in relation to valued purposes might enable citizens to become engaged in change that secures a sustainable future for generations to come. Within these processes, competence specification is examined as a useful but under-theorised social imaginary for framing learning for future sustainability, primarily in teacher education and curriculum contexts. Here, ESD presents as an open process of situated social learning where emergent competences steer social innovation towards a more sustainable future (SD).

The paper attempts to navigate some of the current tensions in relation to knowledge and participation in these processes of learning-to-change. It probes ESD as praxiological processes of dialectical reflexivity that can become situated in contexts of risk and develop as transgressive[1] expansions within many conventional learning sequences in curriculum settings. The paper notes that current discourses on ESD and its assessment have often come to stand outside, and in contrast with, conventions of teaching and learning. These discourses also often conflate education and sustainable development in ways that ascribe change to ESD without adequately theorising the expansive and reflexive learning of citizens and how these processes might produce the desired change towards sustainable development (SD) in diverse contexts of learning in and about a changing world.

Overview

This paper opens with a review of the emerging concept of ESD and its development, to probe key dimensions of its expanding contours. In doing so, it scopes trends developing from prior to the Brundtland Commission's call for sustainable development in the 1980s to the formal advent of ESD within the United Nations Decade of Education for Sustainable Development. It also reaches beyond these into the UNESCO ESD Global Action Programme (GAP) and into an emerging focus on more sustainable planetary stewardship for a forthcoming focus on global citizenship education.

The approach taken is an examination of propositions that are framing ESD as a transgressive process in relation to an urgent cultural shift to future sustainability. It scopes how education emerged in modernity and is being worked with and assessed across widening initiatives into the UN-DESD. The enquiry is intentionally concerned with some of the broad contours of education and is developed as a scoping process that touches on key attributes of the expanding concept of ESD to inform our continuing work in southern Africa. The paper thus unfolds as a deepening conversation that seeks to navigate some of the open-ended origins of and developments in education and in so doing, to reconcile some apparent tensions in the widening contours of our ESD practices. It does not intentionally avoid any emerging contradictions but seeks briefly to point to and clarify some of these. The intention is also to probe for depth perspectives that might begin to resolve some tensions in relation to better-situated and knowledge-informed participation with higher order skills that bring some prospect of our becoming engaged in re-imagining our valued doings, knowings and beings in the sustaining company of others on a finite planet.

The enquiry reflected in the paper emerged when the Environmental Learning Research Centre in Rhodes University, South Africa was invited by UNESCO to co-convene a workshop with the National Institute for Education Policy Research, Japan to review the concept of ESD at the end-of-decade World Conference on Education for Sustainable Development held recently in Aichi-Nagoya, Japan (10-12 November, 2014). In examining the ways in which the concept was constituted and assessed, we traced expansive trajectories of ESD as quality education for all at the nexus of a 21st Century social reorientation in the face of rapid social-ecological change on a global scale.

Emergent Risk and Education Responses

The latter part of the 20th Century is characterised by education as a response to emerging risk within the modernist project. In southern Africa, early conservation education imperatives that developed into the 1960s were superseded by environmental education in the the 1980s (O'Donoghue, 2007). Perspectives then broadened further and were re-orientated within the United Nations Decade of Education for Sustainable Development (UN-DESD) that was implemented and assessed by many diverse groups around the world from 2005-2014. Here, further expansions developed as socio-economic and environmental issues escalated into a polycentric global crisis in the latter period of the UN-DESD, as reported in major

scientific reports coming out of the Stockholm Resilience Institute in Sweden and associated international researchers (Steffen , Crutzen & MacNeill, 2007), and amongst the Planet-Under-Pressure researchers (Planet Under Pressure conference 2012), including global change researchers in southern Africa (DST, 2010). These recent advances in knowledge and concern suggest the need for ESD and 'strong sustainability' (Neumayer, 2003) interventions for learning in a range of diverse contexts, levels and fora. It is from this focus that ESD takes its lead to foster corrective change in response to biodiversity loss, degradation of key ecosystem services, climate change, continuing poverty and the problems associated with sustainable production and consumption, for example, increasingly framed within the concept of a 'global change grand challenge' (DST/NRF, 2010).

The changes in the naming of successive educational practices and deliberation on associated guiding principles, processes and a changing scope of the education imperatives suggests differences and divergence. However, review of the processes involved reveals little more than subtle expansions and shifts in emphasis from earlier concerns with learning and change as outlined in Tbilisi Principles for Environmental Education in 1977 and subsequent international documents framing EE and ESD. These have entailed a broadening in the scope of education concepts and practices responding to wider and more complex risk emerging at a global level (Ahmedabhad Declaration, 2007). The expansions also reflect a concern with practices in relation to the wider social-ecological and economic domains of human activity as can be seen in an emerging emphasis on Green Economy in the recent UN Decade of Education for Sustainable Development report, 'Shaping the Future We Want' (UNESCO, 2014).

Tracing how education became a characterising feature of modernity in the 20th Century, Popkewitz (2008) describes the mediation of social life through responsive initiatives to educate citizens and to resolve emergent concerns. He notes how education as a modernist trajectory, initially included the massification of basic education to orientate citizens for life in a more complex cosmopolitan world. Latterly, there has been a proliferation of education imperatives in response to diverse risks and concerns that emerged within the modernist period of expansive socio-economic change. Here, education responses to risk becoming framed as interventions to resolve development-oriented problems. As will be discussed later in this paper, such framings have emerged in ways that have overlooked the nuance and contingency of teaching and learning processes and have commonly assumed a causal link between education and the production of sustainable development (structural functionalism).

The Instrumental Framing of Generalised Risk

Early education interventions to resolve social-ecological risk were institutionally framed within a structural functionalist disposition that sought to communicate information so as to create awareness and to foster changed behaviour (O'Donoghue, 2007). The scope of the *education, training and public awareness* interventions that preceded ESD initially assumed that, once successfully introduced into a curriculum, environmental education would create awareness and foster the necessary attitudes and behaviour change (Hungerford & Volk, 1990).[2] Developing environmental education initiatives successively became more centred on communicating

information on risk and enabling environmental problem solving, a process of environmental education that commonly included hands-on nature experience for problem solving and learning to foster pro-environmental behaviour. Here, awareness-centred and environmental problem solving pedagogy became more individualised amidst struggles to achieve and measure the desired pro-environmental behaviour (Courtenay-Hall & Rogers, 2002). The problem of education achieving the desired ends persisted in a globalising 'risk society' (Beck, 2009) and education to resolve risk began characterising cosmopolitan contexts with circulating risk generalisation in relation to concerns[3] to be taken up into expanding education practices (Popkewitz, 2008a).

It is notable that in these expanding education responses to escalating risk, not only was the measurement of pro-environmental behaviour a surprisingly elusive and contested process, but new environmental knowledge was generated around what Bruno Latour (2004) eloquently refers to as 'matters of concern'. Emerging concerns in relaton to biodiversity and climate change developed as circulating abstractions and generalisations that became emptied of historical and socio-cultural attributes and detail. For example, biodiversity loss became a circulating generalisation demanding attention. In many African contexts, engaging the concept of biodiversity loss is not a clear-cut matter. Here, as in many contexts, biodiversity loss developed as an outcome of colonial and modernist marginalisation of indigenous people who had their livelihood options reduced along with opportunities to adapt to changing circumstances that were accompanied by a natural resource base depletion that continues to impact on quality of life. In education practices related to these concerns the mapping and assessment of behaviour change can be surprisingly vague and contradictory where the generalisation of biodiversity loss as an emerging global issue brackets out historical, cultural and ontological attributes that are important for a grasp of the problem in context. Such generalisations can thus compromise learner engagement with questions of better stewardship and change in a troubled and intractable context of continuing marginalisation and escalating risk.

As briefly mentioned earlier, it is evident that the behaviourist foundations and the sequential rationale for effecting behaviour change that underlie ESD were derived from the structural functionalist theories on learning of the day and an institutional assumption that assessment of the desired change was possible with psychometric instruments to measure changing states of awareness, attitudes, values and behaviour (Courtenay-Hall & Rogers 2002). An underlying assumption was also that measures of observable patterns of change would provide evidence of how education was producing the desired change (behavioural structural functionalism) to resolve the matters of concern.

A Participatory Turn for a Problem-centred Engagement in Future Sustainability

As practices emerged and evolved, education researchers began to note how structural functionalism after Tyler was too linear and undifferentiated for describing and contouring the engagement of citizens in processes of learning and social change (O'Donoghue, 2007). This was particularly notable in development contexts and in relation to the poor since the

mid-1980s when the concept of sustainable development after Brundtland (UN, 1987) and the Rio Earth Summit gave rise to development education for fostering sustainable development. Into the turn of the 21st Century, socio-economic development narratives receded against ESD, a concept that gave more prominence to education for future sustainability. This change was accompanied by an expansion from early 'education, training and public awareness' perspectives to a wider and more participative concern for 'community, education, training and public awareness'. The subtle change was not a trivial expansion and engaging citizen groups and individuals as participants in learning-to-change became a key focus for ESD into the UN-DESD. The participatory turn gave rise to multi-stakeholder civic structures and learning processes in Regional Centres of Expertise (RCEs), for example (UNU-IAS, 2014).

Put simply and in summary, the participatory turn in education practices gathered momentum as a shift from a focus on '**getting information to people**' to create awareness, to '**getting people together**' with information so that they can deliberate problems and endeavour to bring about change to resolve the concerns at hand. In this way, the resolution of complex socio-economic, environment and sustainability issues were downloaded to community learning contexts of social learning in which the problems were becoming evident (O'Donoghue, 1999). Here, the target groups of the past became participants in co-engaged education processes (an emerging participatory methodology) towards social innovation to bring about behaviour change.

Measuring Change Entrenched as the Gold Standard in Programme Assessment

From early on in the expanding game, reliable measures of change had been the gold standard or the 'holy grail' (Moore, 2012) for assessing impact as behaviour change. Measuring values/attitudes and behaviour were combined in the concept of pro-environmental behaviour as a trustworthy approach for the assessment of change brought about by education as a process centred on the production of new environmental behaviour (Hungerford & Volk, 1990). The shift to more participatory approaches and a socially critical trajectory in the 1990s led to behavioural measures becoming less prominent. Courtenay-Hall and Rogers (2002) note fundamental tensions between a 'behavior modeling' commitment to measuring impact as evidence of behavioral change, and participatory approaches that commit to stakeholder engagement in learner-led change practices. Towards the close of the UN-DESD, the resolution of this contradiction in favour of the latter (participation) shaped a slow shift from behaviour to environmental literacy (Hollweg *et al.* 2011). Today there is a proliferation of measures ranging from institutions that survey behavioural patterns in their target communities (see, for example, Rathouse, 2008 and Moore, 2012), to rapidly expanding tests of environmental knowledge/literacy (Hollweg *et al.* 2011) along with diverse programmatic contexts where consultant groups produce measurement instruments for the assessment of impact. Here, education-induced behaviour change and enhanced environmental literacy are juxtaposed in efforts to track, steer and evaluate education programmes directed at enabling change (O'Donoghue, 2014).

The expansions and shifts in assessment practices, briefly sketched above, are particularly notable in the rapid growth of citizen science from participants simply gathering data for

scientific endeavours to a co-engagement in environmental monitoring and responding to risk (Wals *et al.*, 2014). Here, the science in citizen science is developing as a transdisciplinary, multi-stakeholder knowledge co-production process with an integral education/learning focus directed at the knowledge generated being used to resolve local environment and sustainability concerns. Ways of thinking about each citizen learning to bring about a necessary re-orientation in a changing world and the search for evidence-based assessment of change with improved literacy, has continued to be a challenge in an expanding field of multiple stakeholder engagement in the emergent risk of the day, and now the escalating global risk to future sustainability.

Here, measures of behaviour change and their proxy measures remain in many formal state and university programmes and at an international level, with a recent shift to an emphasis on testing environmental literacy as an amalgum of knowing about risk, having the disposition to do something about this and, in so doing, developing higher-order competences (Hollweg *et al.*, 2011). When these programme and evaluation processes are read with care, it is apparent that concepts and assessment have seldom meshed with sufficient coherence. There has thus always been a search for refinements of programmes and the assessment of change. In the latter part of the UN-DESD, where calls for evidence-based assessment became pressing, the production and measurement of change become centred on contouring the necessary attributes (competences) for change to a more sustainable world; literacy (knowledge) in relation to sustainability concerns; and social learning trajectories to bring about the desired change (sustainable development).

Competence Specifications Contour the Attributes for Producing a Sustainable Future

One of the key frameworks developed to signify and assess emerging education processes has been an expanding initiative to specify competences (De Haan, 2010) for educators to undertake ESD and for its enactment as a curriculum process. The inscriptive framing of these processes for teacher education in the United Nations Economic Commission for Europe (UNECE, 2011) developed as a mapping of the following categories of competence for ESD:

- Learning to know (knowledge);
- Learning to be (identity);
- Learning to live together (social); and
- Learning to do (actions).

The emergent framing of ESD as competences developed alongside a wider trajectory of change in education and training where the earlier conventions of specifying objectives and skills was displaced by a concern for competences. This is notable from the Delores Report (UNESCO, 1996) and into the United Nations Economic Comission for Europe (UNECE) framework (2011) for initiating and assessing ESD[4] as a process of learning to transform society through participation in collaborative social learning that is produced by and produces the competences necessary for a sustainable future.

In framing ESD in this way for teacher education, each arena of competence specifies attributes in relation to 'holistic integration', the 'envisaging of change' by individuals and groups who then come to 'achieve the transformation' that the acquisition of the competences makes possible (UNECE, 2011). The specified practices for teachers and teaching are a mirror into ESD pedagogy but what is not evident is a coherent theory of learning and reflexive change that holds these propositions together to inform social learning for transformation towards a sustainable future. Compelling as such ideal frameworks are for charting transformation, and beyond their application in assessment and evaluation, they can be relatively empty checklists that are not easily enacted into curriculum settings by teachers. These frameworks have primarily been initiated for teacher education and into formal education curriculum and assessment contexts but have also been taken up more widely as social imaginaries for wider sustainable futures pedagogy through ESD (NIER, 2010; and Kadoya & Goto, 2014).

In these emerging approaches to ESD, existing education conventions have commonly been used as a foil in an expert-led process that narrates the need for change, spelling out a new, more relevant logic of practice, as one finds in the recent call for a 'strong sustainability' approach (Neumayer, 2003). Constituting something new to displace the old has been a core cultural attribute in modernist educational reform. Imagining new possibilities in this way can be useful for framing a revised vision for education as ESD and getting support for this, but the successful implementation of something new is not an easy matter and often fails owing to an inadequate grasp of complexities in the existing system. It is now more common to use these framings as tools for engaging educators in the reflexive initiating of change projects to transform their classroom and institutional practices.

The co-engaged steering of ESD with specified attributes (competences) deemed necessary for participants to produce a sustainable future, emerged with a trend in curriculum development towards the specifying of outcomes as attributes and skills to be acquired in learning programmes. Competence approaches reflect a concern for participatory learning with what participants know, muting an earlier emphasis on creating awarness through communicating what is known. For example, a 'world café' method is commonly used for engaging the present but often without the environmental information necessary to clearly bring the matter of concern into the public domain for attention. Here the concepts and systems thinking necessary to grasp subtle complexity and to anticipate what needs to change does not easily emerge, particularly in African contexts where the information resources of the internet are not readily to hand. The subtle shift from received knowledge to knowledge experience of the concern (and a failure to note the need for both) is evident in climate change work where apriori experience of changing climate is now commonly assumed. Exploring climate change in an area of high climate variability like the Eastern Cape needs new environmental knowledge of the southern Pacific oscellation alongside experience of local seasonal cycle dynamics for mediating competence to emerge.[5]

I noted earlier how the circulating knowledge in modernity is commonly emptied of the situated and socio-cultural attributes for enabling reflexive learning in a complex social-ecological context. With knowledge increasingly being vested in individuals and primarily approached as a co-constitutive process, competence frameworks are not readily brought into use without an

unintended 'dumbing down' of the mediating knowledge project with an attendant loss of higher order analytical skills and systems thinking necessary for informed grasp of the concern and a reflexive steering of change. The competence frameworks are, however, useful referents as social imaginaries that point to the need for increased learner-led collaborative work but this needs to be mediated in knowledge-informed and real-world contexts for development to be possible (see further discussion on this below). It is telling that Vygotsky, elaborating on learning around his concept of a zone of proximal development noted how:

> … learning awakens a variety of developmental processes that are able to operate only when the child is interacting with people in his environment and with peers. Once these processes are internalised they become part of the child's independent developmental achievement. From this point of view, **learning is not development**; however, properly organized learning results in mental development and sets in motion a variety of developmental processes that would be impossible apart from learning
> (Vygotsky, 1978, p. 90, my bold).

Here, careful work is needed on the mediated provision of knowledge resources, including learning sequences with knowledge provision, particularly the mobilisation of knowledge that is socio-historically situated and related to real-world problems in developing contexts.

Mapping some of the Expansive Dimensions of ESD that are Emerging

In Table 1, I have juxtaposed key attributes from the expansive progression noted above. The progressions are mapped from early structural functionalism to more collaborative approaches that were reframed as attributes (competences) for educators and learners to participate in the production of future sustainability. The progressions are reflected as an expansion and a broadening from early foundations and into the reframing of ESD as co-engaged multi-stakeholder learning-to-change within the UN Decade of Education for Sustainable Development.

An Expanded Perspective on ESD as Knowledge, Ethics and Aesthetic Actions

The developing attributes and shifts reflected in Table 1 are useful for noting some of the open-ended contours for ESD as reflexive processes of situated learning and change. Here the four clusters of attributes frame dimensions for ESD as co-engaged learning and social change (Figure 1):

- Situated knowledge and systems thinking (Knowledge);
- An ethics-led process in emergent context (Ethics);
- A valuing and purposeful process of learning with and from others (Values and Purpose); and
- Developing agency and skills in stewardship practices that bring about change (Actions).

Table 1. Trajectories of expansion towards and within ESD

Targeted intervention 70s	**Participatory critical process of problem solving enquiry 80s – 90s**	**Competence for educator / learning practices to achieve sustainability. UN-DESD 2005-2014**	***A expanded framework for ESD as reflexive critical processes of change***
Create awareness	Collaborative / Constructivist	Learning to know	***New environmental systems knowledge***
Change attitudes	Deliberative	Learn to be (Identity)	***Ethics-led in cultural historical context***
Change values	Situated values and purpose	Learn to live together	***Valuing and purposeful learning with and from others***
Change behaviour	Collaborative change	Learning to do	***Agency and skills in stewardship actions***
Get-to / get the message across			***Situated and purposeful learning in relation to valued practices and earth stewardship for the common good***
	Get-together / get all to buy-in		
		Emergent competences mediating change	

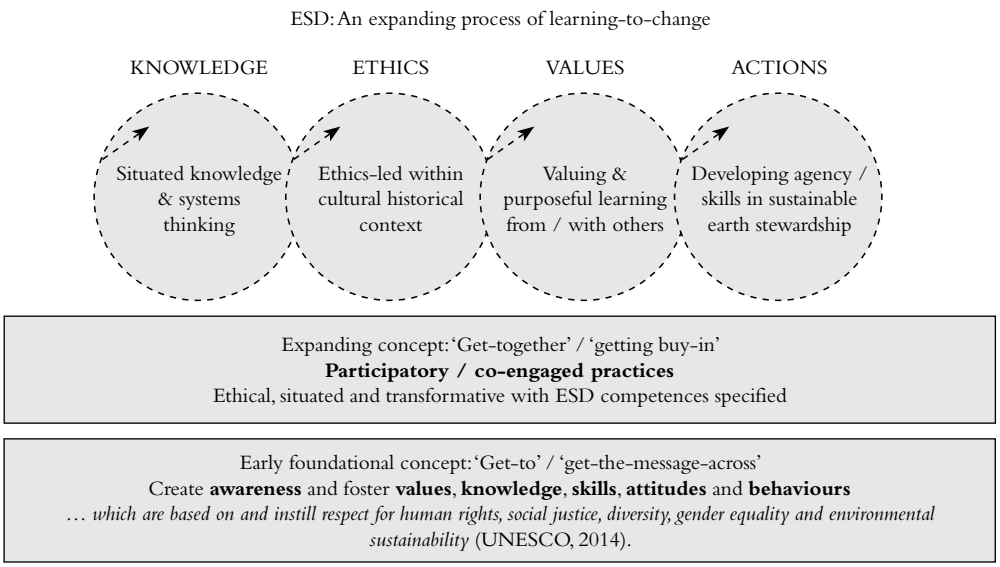
These intermeshed dimensions of an ESD concept reflect historisised reason and a rationalising narrative that developed within the political sociology of the time. Popkewitz (2008b), tracing some of the contours of 'a history of the present' in education quotes Rabinow to scope the changing contours of knowledge in modernity:

> Knowledge is conceptual because without **concepts** one would not know what to think about or where to look in the world. It is political because reflection is made possible by the **social conditions** that enable this practice (although it may be singular, it is not individual). It is ethical because the question of why and how to think are questions of what is good in life. Finally, all action is stylized, hence it is **aesthetic**, insofar as it is shaped and presented to others. (Rabinow, 2003:3)

Read in this knowledge-informed and situated way, ESD learning engagement in relation to a matters of concern might arise around what is known and develop around what is the right thing to do. These, in turn inform what is valued and can be done to bring about the necessary change for the common good. The framing of an education response that enables learning and change with reflexive dimensions that transgress existing dispositions and practices is not an easy matter. Education processes would appear to need to be both knowledge-informed and situated in the socio-historical context of risk, and be oriented to what is not yet known or done, but what is possible to bring about via new forms of agency (following the dialectical transformative praxis framework of Bhaskar 1998 in his *Dialectics: The Pulse of Freedom*). Where

grasp of how valued practices produce risk and are not in the interests of the common good, then a dialectical and reflexive process of learning and change can become possible in a given context and in relation to the matters of concern that need to be re-examined and changed.

Figure 1. Foundational and expansive trajectories in the concept of ESD



Contextualising ESD as Situated Matters of Concern and Transgressive Learning

Working with this expanded picture of ESD as reflexive learning to change, a series of questions can be used to engage a context and initiate education as a reflexive critical engagement in matters of concern towards change that transgresses the prevailing dispositions and practices currently producing risk. Here, framing questions to initiate situated critical engagement would appear to be:

- Knowledge-informed – What new environmental systems knowledge, emergent social-ecological detail and questions of social justice are informing the matters of concern?
- Ethics-led – How and why do these matters of concern need to be engaged and clarified?
- Valued purposes – Which practices are giving rise to matters of concern that need careful review and possible change?
- Actions – What concerns and change practices can be deliberated and explored as part of a transgressive process of learning-to-change?

The questions for opening up starting points towards reflexive learning processes that engage, clarify and resolve matters of concern, can often be developed as expansions of existing teaching and learning sequences so that what is known is engaged in a process of reflexive deliberation. For example, much of what is known (subject knowledge) is now being informed

by new environmental knowledge and systems thinking. This knowledge is reflected in subject disciplines as both foundational concepts and new environmental knowledge on social-ecological systems. These are taught in schools but often in fragmented ways. Alternative educational practices can emerge through questions in relation to knowledge, matters of concern, unsustainable practices and the need for change. These can situate and frame a reflexive learning programme (ESD) as a transgressive space within and around better situated and integrative work with the knowledge and skills of conventional school subjects. Contextualising and questioning processes that situate learning in this way can frame a sense of 'knowing what we don't yet know' and the need to find out or work out better ways of doing things together. Situated approaches such as this can establish the reflexive foundations of critical, co-engaged and action-orientated learning (ESD) that goes beyond the *status quo* (transgression).

How Situated, Participatory and Action-orientated Learning has been Emerging

Action research emerged in the participatory turn and a softening of institutional structural functionalism during the socially critical period of the 1990s. At the time, the focus on emancipatory change was accompanied by an individualising trajectory so that one had a constructivist pedagogy that involved collaborative learning where individuals in groups became involved in learner-led problem solving. This shaped a logic for educational practice that involved participants in planning an intervention, acting to try it out and then critically reflecting in/on the experience to assess the extent to which the matter of concern was being resolved.

Kurt Lewin is attributed with the advent of the idea of action research (Adelman, 1993) but readers of his work overlooked an important start-up step before the 'plan - act - reflect' process that came to characterise the participatory intervention methodologies for stake-holder engagement in ESD learning and change as an emancipatory process. Adelman (1993) notes how a populist framing of action research overlooked mediated depth engagement. For Lewin, action research was enabled through 'reconnaissance' of a context to get to '*connaissance*', a supported, grasp of matters of concern to achieve new understanding for reflexive intervention. This is important for noting how many matters of social-ecological concern are commonly beyond our immediate grasp without mediated depth enquiry that can open the way to a critical grasp for reflexive learning. Action research and community problem solving in environmental education and now social learning (Wals, 2011), have emerged as frameworks for collaborative processes of ESD, but key attributes for situated learning have not always been enabled for a co-engaged grasp that can purposefully drive reflexive learning and change.

The participatory action research and social learning expansions of ESD allows us to see how 'reflexive modernisation' after Ulrich Beck (2009) is emerging as diverse education processes that give rise to and enable ESD as *praxiological processes of dialectical reflexivity*. Here education beyond prevailing knowledge practices cannot be engaged in a vacuum but must develop out of the prevailing logic of practice as a transgressive process. Here also dialectical reflexivity has come to characterise the critical contours of the modern day where prevailing patterns of human conduct are producing risk.

Unfortunately, key aspects of these situated and action-centred processes of critical engagement and reflexive change have remained under-theorised in most ESD perspectives for competence-producing multi-stakeholder social learning. Recent work with Cultural-Historical Activity Theory (CHAT) is further expanding our grasp of ESD as reflexive learning borne of engagement with knowledge and the contradictions of the day within a co-mediated and expansive learning process to realise more sustainable alternatives (Mukute & Lotz-Sisitka, 2012). Here, new environmental systems knowledge can enable participants to transgress what is known and taken for granted and initiate local interventions to foster change. Situated and co-engaged intervention approaches such as this (for example Mukute, 2010; Masara, 2011; Lindley, 2014; and Kachilonda, 2014 - synthesised and reviewed in Lotz-Sisitka 2014) have been derived, understood and narrated in diverse ways across differing contexts where participants struggle with existing and emerging cultural historical tools in learning to grasp matters of concern and how these are being produced and reproduced as risk. These research projects are all pointing to the importance of *reframing* an expansive social learning that is *transgressive* and change oriented (Lotz-Sisitka, 2014). The research projects also show that this requires the introduction of new knowledge *juxtaposed with and/or brought into dialectical reflexive engagement* with existing knowledge and an experience of socio-historically situated risk. Through this, articulation of possibilities for social transformation and change can emerge (ibid.). The research shows too (ibid.) that this becomes possible via situated, formative and expansive learning processes as theorised by Engeström and his colleagues[6] working with cultural-historical activity theory and the expansion of human learning and activity. Stetsenko (2008) also working in the cultural historical activity theory tradition, but with a strong commitment to transformative agency and action, probes cultural, historical and relational processes that might enable us to mediate a situated, critical disposition for approaching learning to change as a reflexive process of working with existing and new environmental knowledge to engage emerging contradictions so that we can learn and change things together.

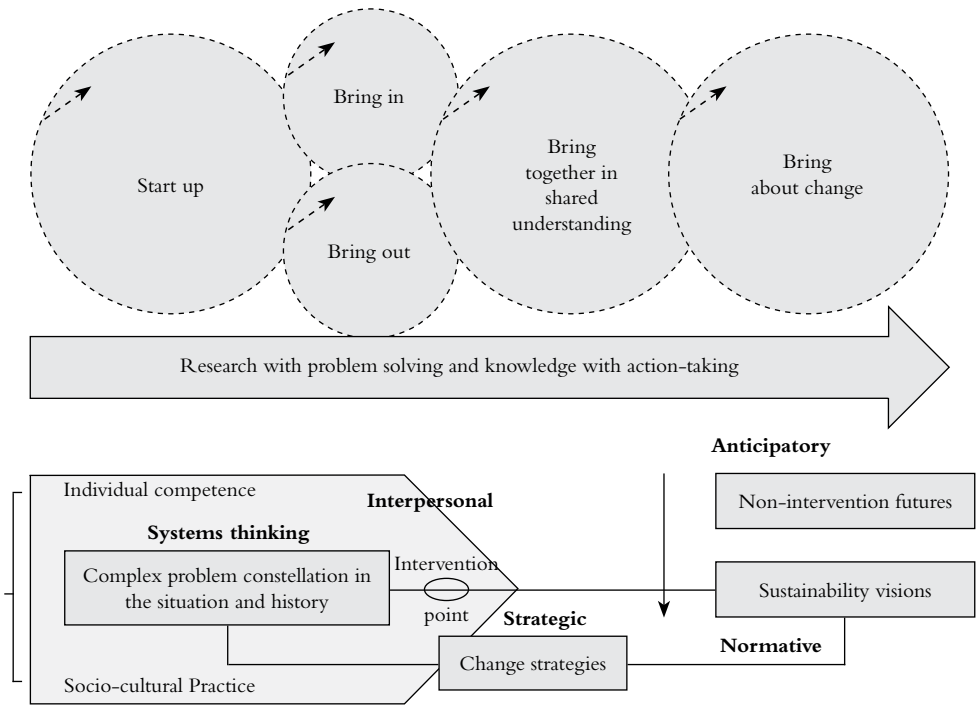
New Environmental Knowledge and Competence

Working with new environmental knowledge has not been an easy matter, particularly within individualising, constructivist dispositions that exemplify participation in its own right and on its own terms. Also, new environmental knowledge is not always accessible in the schooling system, particularly in many African contexts where new environmental knowledge is not widely available.[7] As noted above, discourses framing competence approaches to ESD have emerged as social imaginaries for producing a sustainable future. Within these discourses, conventional education practices have often been contrasted as inappropriate and failing against the new ideals. Competence frameworks have also been difficult to translate into the schooling system, commonly manifesting as somewhat arbitrary criteria that do not always produce coherent progressions in teaching and learning processes. Early competence frameworks did not have the coherence that one might have hoped for framing pedagogy to mediate social change in response to the social-ecological systems producing risk.

A useful refinement in competence modelling emerged through the work of Wiek, Withycombe and Redman (2011). Their contributions resolved some of the tensions and contradictions, providing insights on the importance of new environmental knowledge for *systems thinking* and other competences necessary (and emergent) in processes of learner-led research to inform and initiate action for change.

Figure 2 reflects how, according to Wiek *et al*. (2011), in complex problem constellations, new environmental knowledge and systems thinking can enable anticipatory competence and normative adjustment for sustainability visions. However this needs to be accompanied by the strategic and interpersonal competence to bring about the necessary change for a reflexive vision to be realised.

Figure 2. Translation of the Wiek *et al.* curriculum framework into a learning progression



This approach to competence framing in curriculum contexts has been useful for contemplating a new environmental systems knowledge start-up and a learning engagement that brings out heritage as well as bringing in what is now known so that participants can bring their ideas together into collaborative, strategic initiatives to bring about change. This open process is reflected in the interlocking progression of circles reflecting ESD as a process of research with problem solving and knowledge with action-taking.

Framing a Curriculum of Concepts and Competences for ESD in Japan

The expansive framing of competence as a developing process involving systems thinking and collaborative learning to change, and its clarification as social-ecological attributes that relate human actions with surrounding environments is useful for contemplating learning progressions for ESD. The National Institute for Education Policy Research in Japan (2010), for example, has framed an ESD curriculum where six key concepts are used to scope social-ecological attributes for building a sustainable society (Table 2). The curriculum process is centred on six core concepts and seven abilities and attitudes related to these social-ecological concepts being used to engage in developing a sustainable society.

Table 2. Six concepts and seven abilities and attitudes for building a sustainable society

Aim of the learning instruction from ESD viewpoints

Discovering issues on sustainable society-building and acquiring abilities and attitudes *necessary to solve the issues*

SIX CONCEPTS	SEVEN ABILITIES & ATTITUDES
1 Diversity	1 Critical thinking ability
2 Interdependence	2 Ability to predict future image for making plan
3 Limitation	3 Ability to think in multifaceted and comprehensive ways
4 Fairness	4 Ability to communicate
5 Cooperation	5 Attitude to cooperate with other people
6 Responsibility	6 Attitude to respect for connections
	7 Attitude to participate willingly

Source: NIER (2010), cited in Kadoya & Goto (2014).

The six concepts can be worked with in diverse ways to frame and mediate learning interactions and lesson sequences (NIER, 2010). This framing of an ESD curriculum process can be undertaken in ways that develop as an expansion of existing curriculum processes. The learning progressions can be developed around new environmental knowledge and systems thinking that are extended to questions of social justice and the importance for citizens to work together to find solutions to the intractable problems of our times.

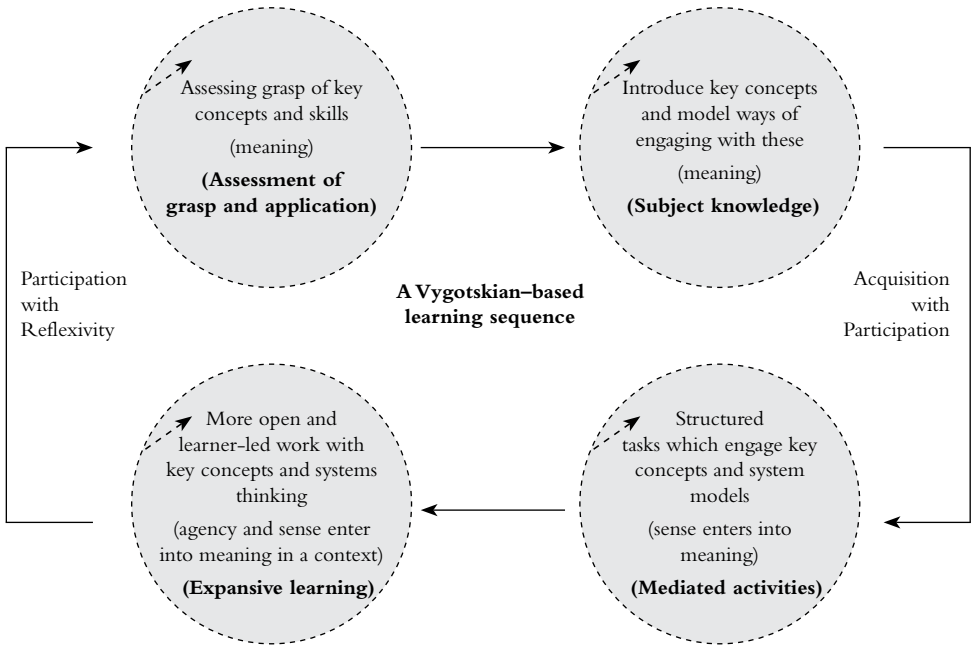
ESD as the Mediated Expansion of Knowledge-informed Learning Sequences

ESD perspectives are commonly set up in contrast to how teaching and learning is currently happening in many educational institutions. This is particularly notable in a vilifying of knowledge transmission approaches and authoritative perspectives over participatory and transformative ideals of citizens producing a sustainable future. Jickling and Wals (2008) for example, usefully criticise a deterministic framing of sustainable development in the early concept of ESD. Here the underlying propositions were primarily authoritative and transmissive and in contrast to emerging participative approaches that are thought to better enable transformative learning. This key point should not be confused with curriculum contexts where concepts and knowledge are communicated to enable learners to develop a grasp of complex ideas for learning. The critique was directed at getting beyond inscriptions in the concept of sustainable development and a failure to note that sustainability can be an unknown that might require a transgressive reframing of how we see and do things in a changing world. Jickling and Wals' (2008: 6) concern is thus: 'Enabling thought and action - Beyond sustainable development'. A superficial reading of their work has suggested that the transmission of knowledge and authoritative methodologies in schooling should be displaced by participative and socio-constructivist approaches. This matter is not easily resolved without reference to the work on curriculum and schooling by Anna Sfard (1998). She explored similar tensions and contradictions in schooling and has proposed that one needs an educative authority for acquisition of concepts for meaningful participation to be possible, and alongside this, one needs participation in order for acquisition to have relevance.

Anne Edwards (2014), working with a Vygotskian learning sequence (Figure 3), illustrates how good teaching appears to emerge through situated teaching for concept acquisition with a transition to more learner-led participation. Here, processes of reflexive critical deliberation (higher-order skills) are made possible by the acquisition of knowledge and attendant cognitive skills acquired through careful work with concepts and ways of working with these that shape meaningful learning.

Seen in critical relief, it is possible to illustrate how an emphasis on the individual and circulating knowledge (abstract generalisations) in ESD has led to a loss of cultural context and history necessary for learning with relevance. Here, also, a decline in the engagement with new environmental knowledge could be muting the emergence of the necessary systems thinking for reflexive social learning to steer change. The Vygotskian learning sequence after Edwards (2014) should be read with the Wals and Jickling (2008) critique of inscriptive approaches to sustainable development (structural functionalism). Sfard (1998) resolves the problem of a need for both acquisition for participation and participation for relevance in social learning as a process of cultural change towards future sustainability.

Figure 3. A lesson sequence with acquisition for participation with reflexivity (adapted from Edwards, 2014)



Concluding Synthesis for an Expanded ESD Framework and its Assessment

This review has briefly examined the expanding concept of ESD and a possible resolution of many of the contradictions it currently contains.

Tracing the modernist constitution of conservation, environment and sustainability education allows one to contemplate ESD as a process of *praxiological dialectical reflexivity and social change*[8] emerging in an expansive array of reflexive critical processes in a changing world. Clarifying how ESD comes to be situated and enacted as practices-centred and co-engaged social processes of learning-to-change has been beset with competing tensions and modes of assessment that have produced plural and often conflicting models of process that are not easily reconciled. The review has attempted to track and to navigate some of the contours of change as well as some of the dimensions of these that might be used to develop better framing tools for our continuing ESD work.

The narrative points to the need for more careful work with competence frameworks and for a review of many assumptions that have emerged where ESD has been posed as a participatory alternative to current practice. The review navigates an alternative route that approaches ESD as a situated process of co-engaged reflexive change within a transgressive expansion of existing education and social practices. The paper notes the importance of knowledge-informed learning sequences to enable better-situated knowledge acquisition that

enables higher-order critical and systems thinking in the contexts of both schooling and wider multi-stakeholder reflexive learning in a changing world.

Looking back at the journey thus far to contemplate the learning processes that appear to be needed for global citizens in an Anthrophocene of radical cultural adjustment, it is clear to me that there are no silver bullets nor a gold standard for the assessment of our work. Important remaining challenges include developing better understandings of **ESD as an assessment process.** Alongside this, one needs to give attention to enabling assessment in ESD processes as well as the assessment of ESD as a reflexive process of change (O'Donoghue & Fadeeva, 2014). It is thus noted that perspectives on learning and assessment need to be developed in context and be clarified to steer reflexive learning and change.

These realisations have steered the emerging narrative towards clarifying tools for better-situated and knowledge-informed learning sequences where competence might best emerge in and as multi-stakeholder processes of learning and change. Some of the framing tools for an expanded and a better-situated grasp of ESD as a transgressive process are becoming more clearly apparent out of the Nagoya review of the concept as outlined in this paper. This reflection should therefore be read as an orientating narrative for continued work in southern African where our education work is developing as open processes of situated co-engagement in knowledge-mediated learning and social innovation. Here, our ESD practices are emerging as transgressive processes of assessment and change, the value-producing dimensions of which will need clarification and reporting into and out of the diverse contexts of learning-to-change involved. With these framing tools to steer our continuing education work, I am optimistic that we might be able to maintain and reproduce more just and sustainable social-ecological systems for all that share in, contribute to and benefit as global communities of interdependent living things.

Expressions of optimism such as this are all very well but it remains to be seen if transgressive forms of education can gain sufficient traction for cultural processes of praxiological dialectical reflexivity (human conduct enquiry with deliberative re-imagining) to produce the reorientation necessary into the Anthropocene. Our continuing work on environment and sustainability matters of concern is probably to continue to ask the question, 'What co-engaged modes of educative engagement in relation to human conduct are producing the necessary transgressive change for the common good?'

Note on the Contributor

Rob O'Donoghue is an associate professor at the Environmental Education Research Centre, Rhodes University. He wrote this 'Think Piece' as a positioning paper on the emerging concept of ESD after co-convening a global workshop with the National Institute for Education Policy Research (NIER), Japan.

Endnotes

1. I use this term in preference to 'transformation', following a conversation with my colleague Heila Sisitka who noted that the change required is often a transgressive move of re-imagining departure from conventional wisdom (Lotz-Sisitka, 2014).
2. In 1990 UNESCO, UNDP, UNICEF and the World Bank were present at a round table to address, 'Environmental Education: A component of sustainable development.' Here Hungerford and Volk, in the conventions of the time, argued for an issue-based approach where, 'The ultimate aim of education is shaping human behavior' (Hungerford & Volk, 1990: 257).
3. Notable here is how circulating knowledge in relation to biodiversity, climate change, obesity and social justice, for example, has proliferated with the advent of electronic media.
4. Although framed for teacher education, the competences reflect ESD as a collaborative pedagogical process, noting, '*Transformative pedagogy'* draws on the experience of learners and creates opportunities for participation and for the development of creativity, innovation and the capacity to imagine alternative ways of living. (UNECE, 2011: 7)
5. The *gelesha* of the pre-colonial Xhosa is a good example of adaptive competence to optimize water infiltration for summer cropping in anticipation of an extended winter drought as is currently becoming apparent with climate change.
6. See Engeström and Sannino (2010) for a recent synthesis of this work.
7. This is due mainly to research systems that are inadequately set up and prepared for the scale, scope and type of knowledge production necessary (see www.sarua.org for an analysis of this in the climate change context in southern Africa).
8. This proposition is useful for analytical traction on how education emerged as a process of reflexive modernisation in recent times of rapid change and escalating risk.

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Southern African Journal of Environmental Education, Vol. 30, 2014

The Role of Place-based Education in Developing Sustainability as a Frame of Mind

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Abstract

As the Decade of Education for Sustainable Development (2005-2014) draws to an end, one could pose the question: what might education's response be to a deepening environmental crisis as we move beyond the decade? Sustainability as a frame of mind presents a different perspective to that of sustainable development as a policy (the focus of the Decade of Education for Sustainable Development) and therefore cultivating it through education might be a response that could take us forward. In this article we argue for an expanded notion of sustainability as a frame of mind, viewed through the lens of place-based/place-conscious education and also informed by the metaphysics of ubuntu. The aim of the article is to introduce place-based education and sustainability as a frame of mind as conceptual avenues for challenging educators to rethink environmental education as we enter an era beyond the Decade of Education for Sustainable Development. We do this by conceptually exploring the concepts of place-based and place-conscious education and how these fairly new educational notions might assist in developing sustainability as a frame of mind. We also discuss the educational implications of practising a pedagogy of place with specific reference to sustainability.

Introduction

Even though the concept of place is generating increasing interest in all disciplines, the connections and feelings that people have towards the place(s) which they inhabit is an area of study that has been underemphasised in environmental education. According to Gruenewald (2003a), contemporary school reform pays little attention to the notion of place. The increased emphasis on state-mandated standards for teachers and students is aimed at achieving uniform, segregated skills and outcomes in the expectation that schools will promote them. The discourse of 'accountability' and the publication of standardised test scores in the media reinforce the assumption that student, teacher and school achievement can be measured by classroom routines alone and that the only kind of achievements that really matter are those which are individualistic, quantifiable and statistically comparable (Gruenewald, 2003a). According to Apple (2001), assumptions like these are misleading, because they distract attention from the larger cultural contexts of living, of which formal education is just a part. Such assumptions are therefore antithetical to environmental education which is concerned with making students aware of the complex nature of global and local environmental problems and the actions that could be taken to ameliorate or address them.

Many scholars in environmental education such as Bonnett (2002a, 2002b, 2003, 2007), Stables (2002), Scott (2002), (Stables & Scott, 2002) and Gruenewald (2003a, 2003b), among others, argue that scientific and technical solutions to the environmental crisis lack crucial elements and are therefore inadequate responses to the crisis. These scholars take a more philosophical approach to the environmental crisis and argue for a return to the inner self through connecting with nature. By connecting with our deepest emotions and feelings, we move to a higher level of consciousness, which enables us not only to appreciate nature more, but also to develop an ethic of care. Stables (2002:6) reminds us 'that many of our most fulfilling experiences are encounters with the non-human – often when we are alone.' He elaborates: 'We remember such things because they either disrupt, question or make us somehow aware of our frames and remind us that there is always life beyond the narrow limits of our reason: life to which we are related in some way, though we cannot understand it' (Stables, 2002:6). The most well-intentioned environmental education efforts may not resonate with such authentic experiences and understandings of ecologically and culturally appropriate knowledge, values, and ways of living in local places. Therefore we shall argue that place-based/place-conscious education and sustainability as a frame of mind could serve as potential conceptual lenses through which environmental education could enhance such experiences. The purpose of this paper is to elaborate on these frameworks so as to contribute to a more expansive environmental education theory that engages students in critical learning about how to (re) connect with nature and better care for themselves, each other and the places in which they live, work and play. In what follows we will discuss place-based and place-conscious education; sustainability as a frame of mind; and the implications of the nexus of place consciousness and sustainability as a frame of mind for environmental education. We do so to explore how the nexus of placed-based/conscious education and sustainability as a frame of mind might enable us to (re)think environmental education.

Place-conscious Education and Place-based Education (PBE)

According to Greenwood (2013), the socioecological construct 'place' is not only helpful in overcoming the dualism between culture and environment, but also informs education from a grounded philosophical and theoretical perspective. Gruenewald (2003a, 2003b) claims that the current educational concern with local space is overshadowed by both the discourse of accountability and by the discourse of economic competitiveness to which it is linked. Scholars such as Berry (1992), Haas and Nachtigal (1998), Orr (1992) and Theobald (1997) assert that place becomes a critical construct not because it is in opposition to economic wellbeing, but because it focuses attention on analysing how economic and political decisions impact on particular places.

The term place-conscious education originates from Theobold (1997), but its intellectual heritage can be traced back to the ancient Greeks as well as to more contemporary critics of culture and agriculture (Berry, 1987; Critchfield, 1991; Gruchow, 1995; Jackson, 1987). Greenwood (2013) distinguishes between place-based education as a movement and methodology, and place-conscious education as a philosophical and political orientation to the field. Greenwood (2013:99) defines the aim of place-conscious education as follows:

'Place-conscious education aims to activate and integrate social and ecological awareness so that learning, ethics and politics are well grounded in the enfleshed world of social and ecological experiences'. Whereas place-conscious thinking can assist in developing a conceptual framework that explicitly articulates educational purposes and possibilities, place-based education can be seen as a pedagogy that can transform schooling for all involved by offering authentic experiences in local communities and environments. According to Knapp (2005), PBE has gained increasing prominence over the last ten years in educational literature and is aimed at (re)connecting humans with the land. Gruenewald and Smith (2008) agree that the purpose of place-based education is to increase student engagement and achievement and to promote democratic participation in local community processes.

Place-consciousness depends equally on knowledge of, and experience with, ecological and cultural systems as well as the interactions between them. It also takes into account that places themselves are not predetermined but are social products, cultural products with intended and unintended consequences (Greenwood, 2013). Place-consciousness further involves reflecting on the multicultural traditions that shape places and it advocates the idea of not only learning about places but also from them directly. Greenwood (2013) asserts that place-conscious education aims to discover/recover/reconstruct self in relation to place. This implies that in coming to know a place humans should keep in mind that places themselves have something to say. It is therefore our task as humans to learn to listen attentively to places, which entails learning the diverse stories which are told about them. Although each place has a dominant story to tell, Greenwood (2013:98) cautions that we need to devote attention not only to the latter narratives, but to 'all the stories at risk of being silenced or erased, including the voice of the land itself'. He further argues that it is not just places that can be renewed, but also the minds of people. The processes of restoration, maintenance, transformation or re-membering involve the discovery of the self as much as the discovery of place.

Using place as a starting point in environmental education programmes will enable students to understand the localness of environmental problems, even those that transcend national boundaries and that solutions to environmental problems often require local action. Moreover, in rural areas where people live close to the land, place-based environmental education might help students to better understand how their livelihoods depend on the land and could also serve as a basis for integrating indigenous cultural practices and philosophies such as *ubuntu* (humanness) into environmental education processes. Through connecting with places, students in urban areas could develop greater awareness of how the local and global are intertwined and how global-local connections are evident in environmental problems.

In this article we use the notions of place-based education and the pedagogy of place interchangeably. Woodhouse and Knapp (2000) describe various characteristics of a pedagogy of place: it originates from the specific attributes of a place; it is inherently multidisciplinary; it is inherently experiential; it reflects an educational philosophy which transcends 'learning to earn'; and it connects place with the self and the community. According to Gruenewald (2003b), place-based pedagogies are needed so that the education of citizens might have some direct influence on the wellbeing of the social and ecological places that people inhabit. Regarding the connection of self to place, we argue that a pedagogy of place shares some mutual ground

with sustainability as a frame of mind. We will return to a discussion of this later, but will first discuss the idea of sustainability as a frame of mind.

Defining Sustainability as a Frame of Mind

The constructs sustainability and sustainable development have received much attention in environmental education discourses of the past two decades. The association between sustainability discourses and environmental education is a contested terrain. There is no place for a detailed discussion on sustainability's association with environmental education here. For a more detailed discussion on this see Le Grange (2013). Suffice to say, much of the discussion on sustainability both outside and inside the field of environmental education has focused on sustainability as a policy. This might have deepened in the Decade of Education for Sustainable Development (2005-2014).

Bonnett (2002a) avers that sustainable development (SD) as a policy is highly problematic, heavily contested and subject to internal contradictions. Sustainable development as a policy refers to the invocation of SD in guidelines on environment produced by inter-governmental conventions over the past three decades. The United Nations Decade of Education for Sustainable Development also focuses on sustainable development as a policy. The most popular definition of sustainable development circulating in policy discourses is that of the Brundtland Commission report, which reads as follows: 'Development which meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987:43). Although this definition is highly attractive in promising an improved standard of living if the need for conservation is satisfied, it is also highly problematic, open to a wide range of interpretations and raises severe epistemological difficulties (Bonnett, 2002b). Definitions such as that of the Brundtland Commission generate further questions such as: What constitutes needs? What should be sustained, at what level and for how long?

Le Grange (2013) avers that reference to needs in the Brundtland Commission's definition should be understood in the context of the emergence of needs discourses in late capitalist societies more generally. With respect to the latter, Fraser (1993:162) raises several questions, of which we mention two. Firstly, does the emergence of the needs idiom presage an extension of the political sphere or, rather, a colonisation of that sphere by newer modes of power and social control? Secondly, what are the varieties of needs talk and how do they interact polemically with one another? In responding to these questions, Fraser does not offer definitive answers, but rather outlines an approach to thinking about such questions. We shall not explore sustainable development as a policy any further here, but turn our attention to the notion of sustainability as a frame of mind. (For more detailed discussions on sustainability as a policy see Bonnett, 2002a, 2002b, 2003, 2007; Scott 2002; Stables, 2002; Le Grange, 2013). The reason for exploring sustainability as a frame of mind as an alternative approach to sustainability as policy is that the latter has done little to improve environmental risk positions. In fact, the past decade has witnessed the environmental crisis deepening, leaving the planet on the brink of ecological disaster (see Le Grange, 2012a).

The notion of 'sustainability as a frame of mind' posits a right relationship with nature which conditions both our attitudes towards the environment and a sense of our own identity (Bonnett, 2002b). If, however, the right relationship with nature is central to developing sustainability as a frame of mind, what should our underlying attitude towards nature then be? In order to answer this question, it is important to first clarify the concept of 'nature'. Bonnett (2002a:1-2) explains that nature should be viewed in its most general sense as the 'non-human, self-originary and self-arising aspects of the world.' Conceptualising nature in this specific way raises the idea of nature being understood as a dimension of human awareness, yet independent of the human will but not unaffected by it. Nature should not be viewed as only one thing and this in turn implies that our attitude towards it will depend on the specific aspect we have in mind. Sustainability as a frame of mind is thus an integral element of authentic human awareness (Bonnett, 2002a).

Although there are no fixed prescribed steps in developing sustainability as a frame of mind, there are some key features which are central to this idea. Firstly, it requires a radical re-evaluation and re-positioning of dominant Western motives, understandings and consciousness. In fact, Bonnett (2002a) claims that this will require taking on a different metaphysics. This can be achieved by developing a receptive-responsive openness to, and concern for, nature. Bonnett (2002a) continues by stating that we appropriate nature in the intimate details of our daily transactions with our environment. By conceiving of nature as 'the great order of things' and acknowledging that all things, human and non-human, have intrinsic value, we develop a frame of mind that is neither anthropocentric nor bio-centric. This in itself could result in an environmental ethic which differs from other ethics on a metaphysical basis. Such an ethic which might be cultivated among students would deal with open, many-faceted, mysterious things instead of pre-defined, thoroughly knowable objects (Bonnett, 2002a). In the light of this understanding of sustainability as a frame of mind, we discuss how place-based education can assist in developing sustainability as a frame of mind.

PBE as Transformative Pedagogy in Developing Sustainable Development as a Frame of Mind

Bonnett (2013) claims that in experience nothing occurs unplaced. Casey (1997:9) corroborates this when he mentions that, 'We are surrounded by places. We walk over and through them. Nothing we do is unplaced. How could it be otherwise? How could we fail to recognize this primal fact?' Bonnett (2003) further mentions that we experience ourselves as always already beings in a world not characterised by universal laws and spatio-temporal space, but by distinct neighbourhoods, local events and communities, to mention a few. He adds that we are always to some degree claimed by the neighbourhoods in which we live. And the relationship we have with these neighbourhoods raises certain feelings, perceptions, attitudes and moods. Bonnett (2013:88) describes this as the self being locally 'emplaced'. According to Freire (1995), human beings are because they are in a situation. Reflecting on one's situation corresponds to reflecting on the space(s) one inhabits; acting on one's situation often corresponds to changing one's relationship to a place.

As mentioned earlier, the development of sustainable development as a frame of mind requires the right relationship with nature, a responsive-openness to and concern for nature. If place-based education is based on the premise of re-membering and emotionally reconnecting students to the land, it is potentially an educational approach (tool) for developing the right relationship with nature. Our relationship with nature is a reflection of our own identity and self-knowledge. The way we regard and treat nature – the whole which sustains us and of which we are a part – reveals a lot about the type of beings we are and the kind of beings we regard everything else to be. In this vein, Heidegger (1962) argues that the notion of nature which we hold defines our understanding of, and attitude towards, both the world and ourselves. According to Taylor (1998:2), our understanding of the order of things is bound up with our understanding of ourselves, and we cannot understand the order of things and our place in it without loving it, without seeing its goodness – which Taylor refers to as our attunement with it. Based on this, one can infer that alienation from nature and alienation from oneself are interrelated and the key to our ability to despoil the environment. What it comes down to is this: if we love ourselves, we will love what we believe supports us (Bonnett, 2007; Taylor, 1998). In line with this, Guattari (2001) avers that self, society and nature are three interlocking dimensions of environment. Destruction in one dimension will manifest in the other two dimensions, just as healing in one dimension will witness healing in the other two dimensions. Caring for self by implication means caring for others and nature. In an African context, Le Grange (2012a, 2012b) argues that *ubuntu* encapsulates Guattari's three ecologies.

Following from the above discussion, one could infer that education for sustainability as a frame of mind would involve the reconnection of people with their origins and what sustains them as well as developing a love of themselves (Bonnett, 2003b). Bonnett's idea relates to that of PBE in the sense that both (PBE and sustainability as a frame of mind) strongly advocate for an emotional reconnection with nature, the environment, the land and the self. Given that place-based education seeks to engage learners actively in exploring local environmental phenomena, we argue that a pedagogy of place could serve as the underlying concept for a reconnection and a positive orientation towards nature, the environment, the land and the self. Haas and Nachtigal (1998) affirm that part of living well involves developing a sustainable relationship with the natural world in which one's community is located.

Educational Implications

So what are the implications of the above for education? By considering PBE and place-conscious education as pedagogical avenues for developing sustainability as a frame of mind, we argue that it is fundamentally a matter of possibility which is associated with opportunity, risk and openings. First of all, educators should make a gradual change in how they apprehend the world and explore the possibility of developing a different metaphysical basis for education. Although we are not in a position to regenerate from scratch the education system, which includes the expertise and attitudes of teachers, we do have the capacity to build on existing strengths. Environmental education should therefore be aimed at helping students to flourish in an authentic poetic relationship with nature. This implies that education should help learners

to properly learn to love their innate (self-arising) nature and not sell themselves cheaply to a global economism and consumerism (Bonnett, 2007). According to Reid (2002), education for sustainable development is neither fixed, isolated nor pure, and we will never be able to arrive at, or indeed present, an incontestably 'correct' version of it.

Bonnett (2007:719) furthermore suggests that environmental education should have two agendas: a short-term pragmatic agenda of damage limitation, which entails focused attention to the imaginative use of science and technology to help mitigate and monitor the undesirable outcomes of the impact of human behaviour on nature; and a long-term agenda of developing a sense of a right relationship with nature as a self-arising entity. Bonnett (2007) reminds educators that they should keep in mind that environmental education is much richer and more profound in its aspirations than the idea of aspiration that sustainable development encourages.

Returning to the notions of PBE and place-conscious education, it is important to recognise the cultural and ecological traditions which Gruenewald/Greenwood[1] (2003b, 2013) draws on when he introduces a critical pedagogy of place. Although we do not discuss the latter in detail, we do wish to emphasise two context-dependent goals which Gruenewald/Greenwood (2003b, 2013) views as essential for cultural and ecological renewal, namely decolonisation and reinhabitation. Whilst decolonisation involves reflecting on the places one inhabits, reinhabitation entails looking at the role that power plays in these places, among others, and is concerned with the necessary actions to change or reverse the current situation in places (Gruenewald, 2003b). As Greenwood (2013) later explains, decolonisation is primarily involved with culture and in transforming or resisting oppressive relationships that limit people's ability to control their own life circumstances. It's about learning to recognise disruption and injury in person-places relationships, and learning to address their causes (Greenwood, 2013:96). On the other hand, reinhabitation corresponds to the maintenance and creation of ways to live within the ecological constraints of a place. It has to do with learning to live socially and ecologically well in a place and not to harm other people and places. As Greenwood (2013:96) states: 'reinhabitation is a term that suggests the need to reimagine and recover an ecologically conscious relationship between people and place.' At this point we would argue, based on the concepts of decolonisation and reinhabitation, that in order for students to reflect and act on the places which they inhabit, it is in fact necessary that they experience nature first hand on a regular basis. This implies that in order for reflection and action to take place, students must be clear about why they should care for the places in which they live and in effect care for themselves. This relates to Bonnett's (2002a, 2002b, 2007) argument that we can only love and care for that which sustains us if we love and care enough for ourselves. Students can arrive at answers as to why they should care through regular authentic experiences with nature and the environment as a whole. As Gruenewald (2003a:621) succinctly puts it: 'places themselves are pedagogical'.

With respect to the classroom, it is important to note that the purpose of this article is not to provide detailed pre-specifiable content, because this would militate against the self-arising nature of learners and mystery associated with authentic learning. However, there are a few educational considerations which require attention. The theoretical perspectives discussed in this article imply that environmental education would need to include a critical investigation into current social, economic, political and biophysical related practices – to identify and

evaluate the motives that energise them and the ways in which we are to some extent implicated in them – how they impact the self and are activities of the self. Yet educators should be careful not to always approach environmental education as some totalising cross-curriculum alternative to the different disciplines. By doing this, they could overlook the concern with the self-arising nature of learners and mystery associated with learning. As mentioned earlier, it is in fact impossible to regenerate the current educational system. We therefore argue that the value of practising a pedagogy of place in order to cultivate sustainability as a frame of mind lies in the re-orientation of, and new approach towards, environmental education. Educators need a shift in consciousness from adopting a rigorous (in a technical sense) approach towards acknowledging the value of a more intimate, intuitive and non-logical style of encounter with the world.

Stables and Scott (2002) caution against conceiving environmental education as some holistic cross-disciplinary element. Doing this would suggest that environmental education is a single grand narrative which needs to be conveyed. Bonnett (2007) suggests that environmental education should be developed from within the differing perspectives that exist in school disciplines. Bonnett (2003b) claims that students should be engaged in enquiries which enable them to address the issues raised by sustainable development instead of preoccupying themselves with symptoms and causes, which includes the measuring of pollution levels, for example. This implies that educational spaces should be created for students to actively enquire into that which reveals the underlying dominant motives not just in society, but also the motives that are inherent in their own most fundamental ways of thinking about themselves and the world. School subjects such as Language and History are, for example, as important as Biology and Geography in cultivating a self that is place-conscious and emplaced.

At this stage one could say that the issue of developing sustainability as a frame of mind is not one primarily of formal education as it is of the general culture of the school (and society). Although the striving for a strong economy, social well-being and a flourishing environment remains a challenging task, educators still have the ability and capacity to change their existing dominant frames of mind. Sterling (2001:14-15) asserts that sustainable development can mean almost anything, including the scope for fundamental contradiction. He adds that it is best to regard sustainable development as a constant process of transformation of society. Therefore, developing sustainability as a frame of mind by means of a pedagogy of place is a matter of the ethos and practices of the school as a community and how it connects with life 'outside'. In fact, one could say it's about realising the interconnectedness of all human and non-human nature. Adopting this kind of ethos would inform the spirit in which the curriculum is taught and received. The gradual change to a different metaphysics could give rise to a space for intimate experience of the presence of nature in which the power and subtlety of otherness are felt. In South Africa, *ubuntu* (which means humanness) as a value could serve as the basis for a different metaphysics that connects self, society and nature. As Le Grange (2012:334) writes:

> Humanness is … inextricably bound up in the human being's connectedness with other human beings and with an ever-changing and complex (biophysical) world. In other words, *ubuntu* involves 'coming into presence' … of self in a changing social and

> biophysical world. The sense of wholeness and interconnectedness of self with the social and natural by implication means that caring for others also involves a duty to care for nature. *Ubuntu*, therefore is not by definition speciesist …, but is rather an ecosophy that connects Guattari's (2001) three ecologies: self, social and nature – self, social and nature are inextricably bound up with one another. Cultivating *ubuntu* by definition therefore involves healing of self, social and nature.

Cultivating sustainability as a frame of mind (with a metaphysics based on *ubuntu*) might require a rethinking of education – a rethinking of curriculum and school organisation. A national curriculum framework such as the current Curriculum Assessment and Policy Statement (CAPS),[2] which prescribes that all teachers in the country should teach the same subject content at the same time, disconnects the school and its learners from local places, places which in many instances have been the sources of local communities' livelihoods. It furthermore erodes values such as *ubuntu* through disconnecting learners from their communities and in promoting individualism through a largely test- and examination-driven system. Furthermore, the hierarchical organisation of schools and the strictures of time-tables are not conducive to enacting place-based education, even when an environment in which the school is located is conducive to doing so (Ontong, 2013).

Conclusion

In this article we have attempted to present an expanded view of sustainability as a frame of mind by arguing that place-based and place-conscious education can be useful avenues for developing such a frame of mind, especially as we move beyond the Decade of Education for Sustainable Development. We have done this by emphasising the common ground which these educational traditions share, such as the (re)connection of the self with nature, the land and the environment. Greenwood (2013) states that learning to devote attention to the land and its inhabitants and to perceiving place is not merely an intellectual exercise, but depends on a way of being in the world that itself needs to be created, recovered and continually renewed.

This article explored the educational challenge that educators face to create spaces which enable students to learn how to listen to the complex relationship of self and other, human and non-human. Therefore educators might need to gradually change the basis of their metaphysical values and adopt a more intuitive, open and poetic response to nature as a self-arising entity and the environment as a whole. This change in metaphysics would also inform the spirit in which the curriculum is taught. We have noted that *ubuntu* could serve as a basis for a different metaphysics that views sustainability not as a policy but as a frame of mind.

The challenge of cultivating and nurturing sustainability as a frame of mind through education might require teachers to teach against the grain. It would require teachers to identify ruptures within existing curriculum frameworks and school arrangements to invigorate lines of escape along which sustainability as a frame of mind can be developed through placed-based education. This challenge might not be easy and require personal risk and intellectual daring – but is a worthy challenge to take up.

Acknowledgement

Stellenbosch University and in particular the Vice-Rector (Research & Innovation) Prof. Eugene Cloete and is thanked for funding the postdoctoral fellowship that made this research possible.Views expressed in the article are those of the authors.

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Endnotes

1. David Gruenewald recently changed his surname to Greenwood.
2. CAPS is the most recent version of South Africa's national curriculum and was first implemented in 2012.

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Reporting on Rhinos
Analysis of the Newspaper Coverage of Rhino Paoching

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Abstract

The media is instrumental in providing the public with environmental knowledge and increasing environmental awareness, and is a useful indicator of established public perceptions. Analysis of media representations of environmental issues can thus contribute to our understanding of public attitudes, behaviours and perceptions and the role of the media in environmental education more generally. It can also enhance support for effective environmental management. This research, based on a qualitative design, provides an analysis of a specific environmental issue- rhino poaching – as represented in The Mail & Guardian*, a prominent weekly English newspaper known for its environmental content. Fifty issues of* The Mail & Guardian*, published between January and December 2012 were reviewed to establish the types of articles, their size, placement and use of graphics; the actors in the articles; and the thematic framing. The majority of the articles categorised were solution-orientated, with mitigation being the most frequently coded theme. The study also indicated some limitations in the reporting of rhino poaching, both in terms of coverage of relevant issues and integrity of the content.*

Introduction

Environmental information is disseminated in a variety of ways form different sources including formal schooling, government programmes and NGOs. However, extrapolating from studies done elsewhere, much of the information which South Africans get about the environment comes through the news (Lawhon & Fincham, 2004). Despite the relevance of environmental stories in the media to environmental education and awareness, there is a limited understanding of the kinds of environmental stories that are in the news, and the framings used to communicate these stories in South Africa.

Even though readers do not believe everything in the news, the media can be seen both as shaping public opinion and as representing common framings of problems and solutions. Analysis of media information thus provides critical insights into the dominant frames in the public discourse as well as the kind of information being accessed by the public. An understanding of how the public learns about the environment can therefore be enhanced through analysis of environmental media. This article uses the case of rhino poaching to contribute to an understanding of the role of media in raising awareness about environmental issues in South Africa.

This study has practical implications in terms of understanding public action. Public awareness is imperative in addressing conservation issues such as rhino poaching mainly because public response is often necessary to prompt action by other stakeholders (Prasad, 1999; Schoenfield *et al.*, 1979; Slovic, 1986). As the media plays an important role in increasing public awareness, it is important to assess how specific issues are represented to the public to better understand public action. Thus far, no studies have explored the role of media in representing rhino poaching. A study of this nature will be beneficial both for making sense of rhino poaching specifically, as well as in contributing to the assessment of the broader connection between the media and environmental education in South Africa.

In this paper, we analyse how rhino poaching is represented in a South African newspaper known for its environmental reporting: *The Mail & Guardian*. In the next section, we provide a brief overview of rhino poaching in South Africa. This is followed by an explanation of the link between the media and environmental education. In the next section, we describe the methods used in our research. This includes documenting the type of articles, and the extent to which they focus on describing a news event, contextualising the problem, identifying key actors and solutions and mobilising public support against rhino poaching. The final section presents the key findings, and is followed by conclusions.

A Brief Overview of Rhino Poaching in South Africa

At the end of 2010, South Africa's rhino population represented approximately 93% and 35% of the total worldwide white rhino (*Ceratotherium simum simum*) and black rhino (*Diceros bicornis*) populations respectively (South African Government Online). According to Amin *et al.* (2006), these figures were achieved through good management practices in South Africa over the last thirty years. Sufficient protection coupled with enforcement measures undertaken by government-run national parks and privately owned reserves have resulted in a rebound of the rhino population. However, both species remain on the IUCN Red List Category as critically endangered and the conservation status remains uncertain (Emslie, 2011).

Poaching is the main threat to rhino population in South Africa. Rhinos are poached for their horn, which is sold on the black market and used for traditional medicines, particularly in Asian countries such a Vietnam. The horn is believed to cure a number of health problems, including fever, rheumatism, gout, hallucinations, food poisoning and vomiting. It is thought to have the power to cure 'devil possession' and is often prescribed as an aphrodisiac (Ellis, 2005).

Rhino poaching levels remained relatively low prior to 2008. Since then, the demand for rhino horns has increased drastically, with a total of 1 654 rhino poached between 2008 and 2012 in South Africa, and rates are expected to continue to increase. The count of poached rhinos for 2013 exceeded one thousand. Rhino poaching was elevated to a 'priority crime' by the National Joint Operations Centre, which resulted in concern and 'attracted international attention, including media coverage worldwide' (National Strategy for the Safety and Security of Rhinoceros Populations in South Africa, 2010:2). If poaching continues at this rate, the ongoing conservation efforts will have been futile (Lockwood, 2010). Both the number of poached rhinos as well as the level of sophistication used by the poachers is unprecedented

(Lockwood, 2010). Concern has been expressed by conservationists, land owners as well as politicians, and has resulted in numerous summits being hosted and strategies being developed aimed at combating rhino poaching.

The Relationship between the Media and Public Opinion

There are many different theories of the relationship between media information and public opinion. However, there is general consensus that the media shapes public opinion and can also be viewed as partially representative of public opinion. Schoenbach & Becker (1995) note that the media does not 'mirror' public opinion, but 'mold[s]' it by 'emphasising certain voices, highlighting particular views and generating discourse about certain issues' (cited in Zhou & Moy, 2007:4). Another metaphor often used is that of a window (Tuchman, 1978), which suggests that the media is not just a reflection, but shapes what we see and do not see. According to Callaghan (2001:5), the media's presentation can 'define and give meaning to issues', as well as connect them to a larger political environment. The media can influence the type and nature of information, as well as the amount of information accessible to the public (Waitt, 1995; Hessing, 2003).

Zucker (1978) proposed that not all issues are equally dependent on the media and that the impact of the media depends on the obtrusiveness of the issue. An issue is obtrusive based on the degree of direct experience people have with the issue. The less direct experience people have, the greater their reliance on the media to provide information and interpretation regarding the issue. This point is particularly relevant for rhino poaching and many other environmental issues that the public has little direct experience of. It can therefore be assumed that the public is significantly reliant on the media for information about rhino poaching.

Newspapers have been a dominant medium through which the public gather information about current events and issues for over a century (Korn & Efrat, 2004; Roshco, 1975; Benedict, 1992). Issues covered in newspapers need to be newsworthy; the phrase 'it's not news unless it's new' bears much truth in the selection of topics. Many different scholars have researched what makes an article newsworthy, and this differs across newspapers and contexts (Yang, 2004; Jamieson & Campbell, 1992). However, some of the key findings suggest that:

- Most news cover a specific event or occurrence (rather than be a chronic problem);
- Issues gain attention when an elite nation, group of people or prominent individual is involved;
- Photogenic, negative stories are most common; and
- Readers want stories which have relevance to their lives (Lester, 2010).

Some researchers argue that newspapers need to be accountable in their reporting and to take responsibility for educating the public (Ditton & Duffy, 1983), however, the role of the media in education generally, and environmental education specifically, is somewhat controversial. Certainly the media plays a role in raising public awareness of environmental issues and can provide social and educational opportunities (Prasad, 1999; Schoenfield *et al.*, 1979; Slovic,

1986); it may also provide technical information regarding environmental problems and possibilities, and potential improvements (Singhal & Rogers, 1989). However, newspapers often reinforce conventional traditions and the dominant thinking (Korn & Efrat, 2004). Newspaper content is primarily presented as factual representations, and articles are often considered by journalists and readers to be objective and true (Lamb & Koen, 1995; Markowitz, 2006). While newspapers are considered a credible media source, they often highlight one or two individuals' perceptions, rather than being representative of the population (Gregory & Williams, 1981). We return to this point further below.

Environmental issues and the media

Environmental issues, risks and crises are extensively reported in the media, particularly natural disasters (Adam *et al.*, 2003), making mass media significant players in the identification and interpretation of environmental issues (Schoenfield *et al.*, 1979) and putting environmental issues on the public agenda (Anderson, 1997). Numerous studies documenting media coverage of environmental issues and public reaction, including historical studies, which suggest that the media slowly responded to public interest in environmental issues (not that the media led the way in increasing awareness) during the 1960s and 1970s in the US and UK. Since then, however, the media has arguably had a greater agenda-setting role (Lester, 2010).

Brosius & Kepplinger (1990) found that coverage of environmental issues in the media stimulates attention to reported environmental problems. Public concern is reportedly proportional to the coverage of the environmental issue (Mazur & Lee, 1993). Due to the transience of the media, public concern about an environmental issue is expected to decline when the media attention shifts to a different issue (Stamm *et al.*, 2000). Persistent and growing environmental problems often do not make it into news coverage because it is focused on events, not chronic problems (Stocking & Leonard, 1990). Dunlap (2002:13) suggests that environment-related issues remain popular in media and high on the public agenda due to 'an endless variety of new problems'. Despite this extensive variety, continuous bombardment of news carrying similar messages will eventually lead to saturation (Hilgartner & Bosk, 1988). This could result in boredom with certain environmental issues and subsequently, the loss of public interest.

As with other kinds of news, expert perspectives are often sought in environmental news. Guedes' (2000) study on environmental issues in the Brazilian press suggests that issues become newsworthy when articulated by or through institutions which are regarded as legitimate sources, and are already present in the media. Hornmoen (2009) found that the presence of the public and other non-experts is 'as an implied audience' (cited in Jönsson, 2011:128); while Jönsson (2011:128) found that the citizens' voices were more or less 'invisible in the news'.

There are several limitations of the existing research. First, most of these studies of environmentalism in the media focus on cases in the global North. As Lawhon & Fincham asserted in this journal in 2006 (p.108), which remains true today, 'Despite these findings which indicate a general understanding of how environmental news rose in the global North, there remains a notable deficit of studies both on the details of current coverage and the history and current coverage of environmental issues in the media of the South.' Lawhon & Fincham (2006)

and Barnett (2002) are the only sources we were able to identify for such analysis in South Africa. Second, much of the research focuses on the text itself, leaving unclear how articles are produced and what their impact is on readers (Lester, 2010). A limitation of media analysis is that little can be told about how audiences interpret and understand media texts (Burgess, 1990). The ways in which the audience interpret and decipher messages disseminated by the media are poorly understood. Third, and a point we do not address here, the media is in a state of significant change, as social media, digital media and other non-traditional sources become prominent. The impact these have on shaping environmental awareness and education is certainly an area for future research.

The role of the media in environmental advocacy and education

The power of the news media in influencing public debate and shaping policy agendas has been acknowledged extensively in media studies (McGraw & Ling, 2003; Hurlimann & Dolnicar, 2012) and specifically in South Africa (McDonald & Jacobs, 2005; Gibbs, 2010). As discussed above, the media influences which environmental issues garner attention – and which do not. Media often cast environmental issues in a negative light, focusing primarily on stories of catastrophes and political shortcomings rather than solutions. Nevertheless, the media has been found to contribute positively to the understanding of environmental problems (Stamm *et al.*, 2000).

Explicit calls for advocacy or adoption of particular solutions are, arguably, controversial roles for the media to play. Environmental journalists often present different positions on their role. Following Barak (1999:97–98), the media may see themselves as 'carrying [an] educative role to the public'. Some suggest the need to remain neutral and objective, while others see their role as increasing awareness (Neuzil, 2008; Lester, 2010). The media is thus not merely a channel of information to the public, but also holds the power to inform and educate the public, and play a crucial role in environmental management. However, the normative position on what its role should be (information or advocacy) remains contentious.

Methodology

Our research analyses articles and editorials published from January 2012 to December 2012 in *The Mail & Guardian*. The one year period was selected to avoid seasonal bias. *The Mail & Guardian* had an average weekly circulation of 187 839 and a readership of 459 000 for the period January 2012 to December 2012 (SAARF, 2012), and most of the articles are available on its website (www.mg.co.za). Articles were identified by scanning hard copies of the newspaper. We included only articles that were complete stories, not advertisements or promotional references for a full story contained elsewhere.

The data collection focused on three keys aspects. First, we sought to establish the primacy of the articles through an evaluation of article size, placement and the use of graphics. A point score system was used to code each article, similar to that of McManus (2000).[1] Second, we sought to establish the types of actors in the articles. To do so, we considered 'quoted' and 'other' sources/actors by role, parties responsible for proposed solutions and source/sources of statistics (see Einsiedel & Coughlan, 1993; Guedes 2000; Liu *et al.*, 2008). 'Quoted' sources/actors refer

to those actually quoted while 'other' sources/actors refer to those merely mentioned in the article. Government sources were divided to distinguish between conservation officials working for the government (such as employees of national parks) and other government officials. We also documented the statistical and scientific information sources in the coding process, using the following categories: academic, government, environmental group, industry or other.

Finally, we sought to understand the broad framing of the articles. The categories determined were based on a literature review, and a pilot study of three articles from the same newspaper in 2011. This included the following theme categories: effects, economics, policy, opportunities, behaviours, science, mitigation, adaptation, management, fundraising or other. Mitigation refers to strategies which will decrease poaching, such as increasing patrolling at game reserves; and adaptation refers to measures which could be put in place in order to deal with the current rate of rhino poaching, such as increasing breeding.

Certainly other approaches could have been taken into consideration, for example, website content including online comments, examination of public response to the articles, or consideration of other forms of media such as television or social media. However, any study must delimit its boundaries and we see this as but one contribution towards a broader effort to understand the complex relationship between media and environmental education.

Results

In this section, we provide the results of our analysis based on the methodology described above. In total, there were fifty issues during the period covered, which contained 21 relevant articles and editorials.

Primacy of rhino poaching

The primary type of article was news, with two articles coded as editorial/opinion. The majority of articles covered 1–20% of the page. Almost half of the articles and editorials had a colour photograph accompanying it; one contained a graphic. No news article on rhino poaching appeared on the front page. The fact that news articles were by far the most common type of article which featured rhino poaching suggests that rhino poaching had become a recognised and established item in *The Mail & Guardian*.

The total number of articles suggests that the issue has some prominence in *The Mail & Guardian*, even though the absence of such articles on the front page could suggest that rhino poaching is not deemed a very important issue or front page news or, alternatively, that it's not very newsworthy given the repeated incidents. The press coverage of rhino poaching is heavily dependent on visual effects, as evidenced by the large number of colour photographs included with the articles. The lack of letters to the editor could be attributed to the fact that, the editors do not consider the issue of rhino poaching to be of interest to the readers (if there were letters received by the editors but which were not published), or to the lack of letters being submitted altogether.

Key terms in article titles

The use of keywords in headings draws attention to the different ways of approaching the topic. As expected, rhino/rhinos were the most popular keyword in the headings (see Table 1). The data shows that emphasis was placed on rhino horn, and terms that referred to rhino deaths. Terms which implicitly label the activity as illegal including poaching/poacher, arrested/arrest/charged/caught and smuggling/black market/illegal were used infrequently although more so than trade/trading and hunt/hunting. Other provocative words were occasionally used in the titles, including reference to 'rhino lovers' (13 January 2012), 'slaughter' (2 March 2012; 30 March 2012; 3 August 2012), and the 'war on rhinos' (9 November 2012).

Table 1. Frequency of keywords

Key term	Frequency
Rhino death	5
Smuggling/black market/illegal	4
Rhino horn	3
Arrest/arrested/charged/caught	2
Poaching/poacher	1
Trade/trading	1
Hunt/hunting	1

Sources and actors by role

The analysis of the sources and actors in *The Mail & Guardian* gives an indication of who articulates the narratives about rhino poaching (see Table 2). Environment/conservation spokespersons were the main quoted actors, particularly representatives of national parks or conservation agencies. Scientists or experts were the least frequently quoted source (although there may be some overlap between environment/conservation practitioners and scientists, we coded the actors based on the identity emphasised in the articles). Six articles did not contain any direct information from a source. Eight articles contained no indirect sources or actors. Other government or government spokespersons was the most indirectly mentioned source in the rhino poaching articles, having been mentioned in seven articles.

Table 2. Summary of the sources/actors by role

Sources/actors by role	Quoted (Frequency)	Other (Frequency)
Government/government spokesperson	5	7
Scientist/expert	1	0
Public	4	4
Environment/conservation spokesperson	9	4
Other	6	3
None	6	8

Findings concerning the frequency of government or government spokespersons support Guedes's (2000:546) views where the government is seen as a key source of information, however, in the South African case it is possible that others are seen as more legitimate sources of information given the prominence of environment/conservation spokespersons on this issue. The absence of the public as a source of information in the news supports the idea that this is a topic that the public has limited direct engagement with; there is therefore a high likelihood that the media is their primary source of information. News media portrayed the government and non-government organisations as the main stakeholders responsible for developing and implementing strategies and solutions. This is indicative that both government and non-government are perceived as being the most responsible for rhino poaching solutions.

Those responsible for rhino deaths were never interviewed in the articles, despite their regular presence. The tone and description of these actors varied significantly across the articles. One highly sympathetic quote was given by the 'the head of the Kruger's anti-poaching special operations team' (3 August 2012). 'Leslie has a great deal of respect for his adversaries. "These poachers have grown up in this type of terrain and they have spent their lives hunting and trapping smaller animals for subsistence. So when their crops fail and a syndicate offers them money to shoot an animal, they are going to take that. This is about them looking after their families, so it's an economic issue," he said.'

This contrasts significantly with another description of rhino hunting, in which two white male hunters are described as 'repeatedly shooting a rhino in what appears to have been an illegal "pseudo hunt", carried out at the behest of an international wildlife-trafficking syndicate' (9 November 2012). The word 'poaching' is not used here, but the tone is clearly critical of these actors. Other parties drawn into the narratives include veterinarians who supply materials used in hunting and poaching. According to an anti-poaching NGO employee, 'Poachers and Asian nationals involved in the illegal rhino trade are starting to get meaty court sentences ... Only when we see the high-profile white guys in the game industry end up with similar penalties will they realise it's not worthwhile getting involved' (2 March 2012). These quotes show very different interpretations of who is responsible for the growing death of rhinos, who they are connected to – small scale local poachers, or wealthy conglomerates – and how to respond to the growing problem.

Parties responsible for proposed solutions

Parties considered responsible for rhino poaching solutions were coded as: government, non-government, government and joint effort. Government parties and non-government parties (industry and individuals) are almost equally considered to be the main holders of solution strategies (coded six and four times each respectively). A joint effort between the government parties and non-government parties was also mentioned four times. The use of the courts emerged as a key theme, as was cooperation between various government actors. For example, in an article on the conviction of a Thai national: 'The investigation had required the Hawks, SARS customs officials, the Department of Environmental Affairs, Sanparks and the National Prosecuting Authority to work together closely to find and present credible evidence

before the courts, he said, paving the way for future collaborations' (9 November 2012). Rarely were the impacts on the public, or the possibilities for public engagement, discussed.

Source(s) of statistics

The vast majority of the articles contained some kind of statistic, most commonly regarding the number of deaths. The most cited source for statistics was unknown. Many articles quoted the number of rhinos killed thus far in the year without citing where this information came from. This could potentially result in readers being suspicious about the statistics, and questioning the authenticity and legitimacy of the sources.

Environmental groups, including various national parks and conservation organisations, were the second most cited actor in the rhino poaching debate. This is possibly because journalists and readers deem these sources the most accurate. The government was rarely cited as a reference for statistics. It is possible that government sources are used less frequently as they are not as abundant as environmental group sources, or because numbers from the government are provided by other actors who do not specify their source. Supporting the findings of Jönsson (2011), industry sources were invisible, with no statistical or scientific information being provided by this source.

Interestingly, one article noted a controversy over statistics provided by the government (13 January 2012). 'International Animal Rescue Foundation … questions the government statistics that there are about 22 000 rhinos in South Africa and says 'reputable wildlife conservationists' estimate the number to be between 9 500 and 11 000'. Such contestation indicates the level of uncertainty regarding statistics, although this uncertainty is rarely mentioned in other articles.

Theme category

From the data, we see that the proportions for the mitigation and adaptation strategies are vastly dissimilar. Mitigation articles made the biggest contribution in terms of theme categories. Mitigation was coded 13 times, in comparison to adaptation which was coded once. These findings correspond to Liu *et al.*'s (2008) study, where newspapers had a strong tendency to focus on mitigation as opposed to adaptation. This could be indicative of news media not acknowledging the current levels of rhino poaching, with the belief that more needs to be done to curtail the present rhino poaching levels. However, there may be a need for news media to focus more on adaptation strategies. While mitigation is indeed necessary to reduce further depletion of the rhino population in South Africa, the population has significantly depleted, which may warrant current and future adaptation strategies. Similar to Ahchong and Dodds' (2012) findings regarding climate change, a combination of the two types of strategies is necessary and should be reflected in media representation of rhino poaching solution strategies.

The policy theme was almost equally as common as the economics theme, with policy referring to specific policy proposals, rhino poaching laws, trade and the penalties poachers face when caught (coded a total of nine times). The articles often suggested that better law enforcement and stricter penalties for offenders is a step in the right direction. For example, a global Rhino Ultimatum has threatened both agricultural and tourism boycotts if the government does not meet the demands to 'halt the imminent extinction of the rhino species'

(13 January 2012). One of the demands of the Ultimatum is for the 'immediate destruction of all stockpiles of horn'. The Ultimatum states that the government 'is seen to be contradicting the proven fact that rhino horn has no medicine value to human beings by stockpiling horns. It directly and knowingly reinforces the value that criminal syndicates place on it'. Opportunities and behaviours were coded five times each. Opportunities were concerned with possible breaks and optimistic future prospects in the fight against rhino poaching, while behaviours represented changes the public could make in terms of their attitudes and their actions.

Economics was also a common theme category (coded seven times), with articles often referring to the financial implications of rhino poaching. A provocative quote was given by a rhino horn farmer, who claimed that 'my financial advisers tell me not to sell my rhino horn because its value is increasing more than any other investment' (30 March 2012). This and other articles include commentaries on the benefits of legalising the trade of rhino horn on the economy. For example, one researcher argues that 'A controlled legal trade in the private sector would bring the market out into the open so that it could be monitored and managed' (30 March 2012).

Conclusion

There has been a limited analysis of environmental media in South Africa despite its importance to environmental education, public awareness and environmental management. This study is a first effort in understanding the role of the media in covering and framing the issue of rhino poaching, and is meant to both demonstrate the importance of such research as well as provide some important insights into the specific issue of rhino poaching.

This study certainly has methodological limitations, including a focus on the text only, leaving out the production process by journalists and editors and the reception by readers, and the fact that it focuses on only the printed version of a single newspaper, a traditional form of media which may be declining in its significance. Certainly there is more work to be done, particularly regarding the relationships between text and readers as well as actors and journalists, and explorations of the content and impact of new media. Nonetheless, we believe that it is a much needed first step into broadening this under-researched area of study.

A number of important points raised above suggest the need for follow-up studies. There is a low number of articles covering the effects of rhino poaching, particularly the effects on the lives of the public. This could result in the public feeling disconnected from, and impervious to, the issue. This raises important questions regarding responsibility; fewer associations made about rhino poaching to the lives of citizens may consequently result in inaction and feelings of disconnection and apathy. In addition, this could lead to the public believing that they are not responsible for rhino poaching solutions. More generally, this raises questions regarding who is represented in media accounts of environmental issues, who are the 'good guys' (in this case, conservationists) and 'bad guys' (in this case, poachers), and how well this accords with public perceptions (poachers of all types are not necessarily always considered bad in public opinion; impoverished people hunting for food may garner more sympathy). The presentation of statistics with limited sources and contested information makes it necessary to trace these

sources. Following up with individual journalists to explain where the information came from would provide better insights into the production and circulation of such 'facts'.

Most importantly, our research indicates that there are a number of different framings regarding rhino poaching in particular, and most likely other environmental issues. There is a clear need for studies such as this one, which document the different framings, to be followed up with studies that firstly explore in detail the production of such frames by journalists and editors and secondly examine the public response to particular articles and frames. This is important because the frames are likely to influence the way people respond to public awareness and education on environmental issues. Environmental educators would benefit from better understanding what the public already thinks about environmental issues in order to better direct their messages. Further, a better understanding of the media could encourage environmental educators to use news outlets to reach a broad audience. It is hoped that this paper has provided some motivation and direction for these and other future research efforts.

Notes on the Contributors

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Endnotes

1. Article headline size relative to the article will be given 15 points for a large heading, 10 points for a medium heading and 5 points for a small heading. Measuring headlines in centimetres as done by Waitt (1995) would not necessarily provide an accurate measure of significance, as text font and size may differ between the two newspapers. A score of 25 points will be given for an article length that covers between 81–100% of the page, 20 points for between 61–80% of the page, 15 points for between 41–60% of the page, 10 points for between 21–40% of the page and 5 points for between 1–20% of the page. To score the primacy of the article within the newspaper, five points will be given for articles that appear exclusively on the front page. Four points will be given for articles that begin on the first page, but continue on another page. Articles appearing in pages 2 and 3 will be given three points, while articles appearing on page 4 onwards will be given two points. 15 points will be given for each photograph or graphic included with an article. In addition, 5 points will be given if the photographs or graphics are in printed in colour.

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Appendix. List of articles analysed

Date of publication	Author	Article title	Page no.
13/01/2012	Fiona Macleod	Rhino lovers issue ultimatum ahead of poaching hearings	9
13/01/2012	Fiona Macleod	Illegal hunts 'the worst'	9
13/01/2012	Fiona Macleod	Experts split over rhino horn sales	6
13/01/2012	Fiona Macleod	Calls to monitor 'leakages' from stockpiles	6
27/01/2012	Caroline Southey	Human deaths are not fair game	12
10/02/2012	Fiona Macleod	Arrest of wildlife butchers boosts anti-trafficking efforts	23
17/02/2012	Sipho Kings	Rhinos killed as rangers strike	12
02/03/2012	Fiona Macleod	Vets charged for illegal use of tranquillisers	18
02/03/2012	Fiona Macleod	Slaughter despite assurances	18
09/03/2012	Mary Rice	Legalised trade is a cover for laundering wildlife	33
30/03/2012	Fiona Macleod	The horn ultimatum: 'Lift the ban on trade or slaughter continues'	26–27
30/03/2012	Fiona Macleod	Legalising market 'like pulling at tail of a snake'	26
30/03/2012	Fiona Macleod	Orphan gets a second chance	27
30/03/2012	Fiona Macleod	Medical claims amount to fraud	27
03/08/2012	Sipho Kings	Kruger races to end the slaughter	16
03/08/2012	Sipho Kings	Rangers make major busts	16
03/08/2012	Sipho Kings	Rhino facts	16
28/09/2012	Fiona Macleod	Tiger man'Varty issues rhino horn challenge	13
02/11/2012	Fiona Macleod	Rhino deal on the cards	45
09/11/2012	Julian Rademeyer	Rhino butchers caught on film	3
09/11/2012	Julian Rademeyer	Deep in the trenches of the war on rhinos	14–15

Contextualising Curriculum Design and Recontextualising Its Implementation

The Case of Climate Change Education for Southern African Transfrontier Conservation Area Practitioners

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Abstract

This paper discusses how the climate change education needs of park managers, ecologists, and community development officers in Southern African Development Community (SADC) Transfrontier Conservation Areas (TFCAs) were established through contextual profiling. It subsequently analyses how a curriculum that was designed in response to a contextual profiling process was recontextualised during implementation by the SADC Regional Environmental Education Programme (REEP), with support from German Federal Enterprise for International Cooperation (GIZ). The paper's purpose is to trace the trajectory of contextualised curriculum development and implementation with a view to identifying how the twin concepts of contextual profiling and recontextualisation were utilised and lessons were learnt. The paper has potential value for educators/trainers interested in increasing the relevance of protected area workplace learning and its congruence to learners' realities.

Introduction

The authors were involved in developing the contextual profile, designing the course and training the course participants, who were organised in two groups of about 20 each. The participants comprised ecologists, park managers and community development officers from SADC TFCAs. A TFCA is a component of a large ecological region that straddles the boundaries of two or more countries encompassing one or more protected areas, as well as multiple resource-use areas, for example, the Great Limpopo Transfrontier Conservation Area that covers adjacent parts of Mozambique, South Africa and Zimbabwe. SADC TFCAs are underpinned by two philosophies that are based on ecological and socio-economic integrative perspectives respectively (Mombeshora, 2005). The ecosystem philosophy seeks to enhance ecosystem integrity and natural ecological processes across political boundaries. The integrative perspective intends to enhance partnerships among the state, civil society, communities and the private sector to conserve and benefit from wildlife and related natural resources, and enhance inter-state collaboration for regional peace and security.

Conceptual Framing

The three main concepts that shape this paper are: contextual profiling; learning needs identification; and curriculum recontextualisation. *Contextual profiling* is a process by which contextual factors and complexities that have a bearing on a course are identified and utilised to inform curriculum or course design (Schudel, le Roux, Lotz-Sisitka, Loubser, O'Donoghue & Shallcross, 2008:453). Such contextual complexities and factors are considered at multiple levels, ranging from the international and national to the local (ibid). Hall and Kidman (2004) also identify three different levels of contextualisation:

- The wider community contexts comprising the international, national and local;
- The institutional context, which refers to the organisation that designs the curriculum and its associated sub-contexts; and
- The teaching–learning contexts comprising the learner, the content and the teacher.

Contextual profiling also allows for policy transfer and translation at multiple levels while at the same time enabling response to environmental risks and issues in diverse contexts (Schudel *et al.*, 2008). The value of contextual profiling resides in increasing the congruence between learning and reality, and the effectiveness of what is learnt.

Learning needs identification is achieved through identifying the learning needs of potential learners by establishing the gaps between the knowledge and skills that they have and those that they need in order to perform their tasks effectively. Such needs often vary from place to place, and individual to individual. In this case study, the contextual profiling process identified some of the climate change-related learning needs of park managers, ecologists and community officers largely through a climate change dialogue workshop that was attended by TFCA and protected area leadership from most SADC Member States. At a later stage, the specific learning needs of the selected learners were identified through workshop expectations that were generated at the beginning of the course. This assortment of methods to generate data for curriculum design was intended to achieve the necessary depth of learning needs and contextual relevance.

Curriculum recontextualisation is based on Bernstein's theory of curriculum translation from the designed, to the implemented, and the enacted curriculum. Bernstein (2000) identifies three main levels of how curriculum is contextualised and re-conceptualised from the societal/ideological, to the curriculum, to the teaching and classroom levels; or from the transnational curriculum scripts, to the national, and local school (Daniel, Jan & Carl-Henrik, 2013). Recontextualisation refers to how knowledge substance and nature that is *produced* at one site – such as an environmental and environmental education policy-making body (for example, UNESCO, African Union or SADC) – and is *recontextualised* by curriculum designers at an educational institution such as SADC REEP/WESSA, and *reproduced* by teachers/trainers when they interact with learners. This process involves de-location and relocation of a discourse from the field of production to that of reproduction (Jenkins, 2007; Bertram, 2012).

In the process of curriculum recontextualisation, curriculum designers choose the content, pedagogy and sometimes how learning is to be assessed. Teachers and trainers on the other hand interpret the curriculum or course document and decide on the pedagogic practices and assessment tools to work with to reproduce what is intended by the curriculum or course. The whole process involves various stages of selective appropriation and ideological transformation (ibid.). Several African scholars have worked with the concept of curriculum recontextualisation and found it useful for enhancing curriculum coherence and educational relevance, effectiveness and quality (Nsubuga, 2006; Jenkins, 2007; Bertram, 2012; Hewlett, 2013). Accordingly, this paper uses recontextualisation lenses to examine the trajectory of a newly developed course on climate change adaptation and mitigation in SADC TFCAs. The trajectory starts from the contextual profile and ends at the end of the first series of one-week workshops because it was in this space that the major contextualisation and recontextualisation took place. Quality checks and improvements of the translation process were made at three levels, through: course coordination meetings that comprised SADC REEP/WESSA, GIZ and the course designer/facilitator; the change project mentoring team, which comprised trainers from SADC/WEESA and the course designer/facilitator; and course participants' feedback and evaluations.

Background

Studies that have been conducted in southern Africa have shown that climate change, climate variability and biodiversity are SADC priority sectors for capacity development (IRA, PASS & University of Dar es Salaam, 2007; Ziervogel, Taylor, Hachigonta & Hoffmaister, 2008; Chishakwe, 2010; Mukute, Marange, Masara, Sisitka & Pesanayi, 2012). Consequently, SADC REEP developed a GIZ-funded project called: *Stepping-Up to Trans-boundary Sustainability: Human Capacity Development for Climate Change Adaptation in SADC Trans-frontier Conservation Areas.* The objectives of the 16.5 months project, which went on for nearly one and a half years, were to:

- Identify trans-boundary capacity gaps, needs and development measures related to climate change adaptation in the 18 SADC TFCAs;
- Facilitate climate change adaptation learning and actions to contribute towards improved livelihoods; and
- Foster trans-boundary collaboration, networking and cultural understanding in a community of practice of climate change adaptation alumni to support climate resilience.

SADC REEP, which commissioned the contextual profiling, course design and implementation, works with a social learning approach that is practice- and solution-oriented (Mukute, Wals, Jickling & Chatiza, 2012). More specifically, SADC REEP works with an emergent, reflexive model of capacity development that seeks to achieve improved professional knowledge and changed institutional practices. This is achieved through: review of context of practice;

on-course interactions based on appropriating new knowledge and practice (that is regionally recontextualised); and subsequent site-based applications using the change projects (SADC REEP, 2012:49). SADC REEP's capacity-building approach is consistent with contextualisation and recontextualisation as discussed above because it takes account of realities that learners live and work in, is change-oriented and is designed to take place at the individual professional level, at institutional level, and at the environment–education–society nexus (ibid.). The approach works with situated learning ideas, which encourage learners to acquire and incorporate new ideas into their own social-ecological and workplace contexts through a change project.[1]

SADC REEP, through its programme manager, played the role of overseeing the contextual profiling process and coordinating the development and implementation of the course. An external consultant conducted the contextual profiling, designed the course and facilitated part of its implementation as workshop facilitator.

Contextual Profiling of Climate Change in TFCAs

Data generation for contextual profiling was done through document analysis and a literature review and a TFCA leaders' dialogue workshop that was attended by 19 SADC representatives. Document analysis and the literature review focused on policy and strategic documents that gave direction to climate change adaptation education as determined by international, Pan-African, SADC and Member States policy-makers. These documents carried the framework that was to shape the content and nature of the course material. Data generated from the TFCA leaders' dialogue workshop focused on the local, individual and institutional climate change issues in SADC TFCAs. These provided a map of the learning needs of prospective learners. The main international policies and treaties that shaped the content of the designed course were the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC), which provide for strategies to deal with biodiversity and climate change issues. Education for sustainable development (ESD) thinking and the United Nations Decade of Education for Sustainable Development (UNDESD) provide ideas on how education can contribute to a more sustainable world (UNESCO, 2009).

At Pan-African level, ESD is anchored in Education for All, the NEPAD Environment Action Plan and human resources development, which is underlined by the importance of context, which includes African cultures, knowledge systems and experiences (Lotz-Sisitka, 2006). The African Union (AU) decided to green its economies by tackling poverty, unemployment, food insecurity and environmental risks while tapping into its natural capital assets (UNECA, 2011). The AU's African Ministerial Conference (AMCEN) of 2007 prioritised the UNFCCC and recommended that regional economic communities (RECs) such as the SADC should develop and implement climate change programmes.

The main SADC biodiversity-related policy documents that informed the contextual profiling were the Wildlife Policy of 1997, the Wildlife Sector Protocol of 1999, SADC Regional Biodiversity Strategy, the SADC TFCA Programme and the SADC Regional Indicative Strategic Development Plan (RISDP) (SADC, 2003). These provide for using TFCAs as a means for regional cooperation and peace building, biological conservation and economic empowerment

of rural communities through tourism. The Southern African Regional Universities Association (SARUA), on the other hand, provides a *methodological argument* for a multi-disciplinary approach to research, learning and teaching of climate change and related matters while encouraging collaboration within and between universities, policy-makers and practitioners (Climate and Development Knowledge Network, 2012). The national policies that informed the profiling include the National Capacity Self-Assessment reports, the National Communications to the UNFCCC reports, and National Adaptation Plans of Action (NAPAs). These documents identified the priority issues and capacity development areas which informed the course.

The ideology that runs through the policies described above is that of sustainability. But it is also an ideology that is characterised by tensions between different interests and actors, between the social, economic and ecological. The dominant societal issue revolves around how to deal with the causes of climate change (mitigation) and its effects (adaptation). African states, including SADC Member States in which the TFCAs under review are found, argue that their contribution to climate change is low but they bear the burden or effects of climate change. Therefore, they should invest more of their energies in climate change adaptation.

Results and Needs Identification

The contextual profiling and needs identification process identified several topics for inclusion in the course. The course designer developed a coherent set of topics from these to produce a course curriculum. The selected topics were as follows:

- *Basics of climate change and related issues and concepts:* including climate change adaptation, mitigation, resilience, adaptive capacity, ecosystems-based adaptation, and scenarios (past, present and future);
- *Planning, managing and monitoring TFCAs in the context of climate change:* including ecological monitoring and evaluation for adaptation and mitigation, indicator species and trends, and associated data analysis;
- *Climate change adaptation and mitigation in TFCA sectors*: covering wildlife, forestry, water, agriculture, and marine and coastal areas;
- *Building social-ecological resilience in the context of climate change*: including livelihood strategies suited to the different settings, disaster risk reduction and management knowledge, habitat manipulation, climate proofing possibilities, and climate-sensitive income-generating projects;
- *Documenting and sharing best practices in climate change adaptation and mitigation across sectors*: including emerging best practices in TFCAs, and traditional coping mechanisms;
- *Facilitating multi-stakeholder linkages, joint planning, learning and action processes*: such stakeholders including TFCA structures, policy-makers, government institutions, education and research organisations, the private sector, NGOs and international development partners; and
- *Design and implementation of change projects*: these should be informed by the respective TFCA contexts.

The course designer used several criteria to select topics, which included topics that: provided the necessary conceptual foundation on climate change, climate change adaptation and mitigation; revealed the social, economic and ecological dimensions of climate change issues and responses; linked climate change, climate change adaptation and mitigation of TFCAs; fostered relationship-building among TFCA stakeholders with potentially different and conflicting needs; and developed practical and context-specific solutions that reduce human impact (mitigation) and enhance resilience (adaptation). His choice of topics was largely informed by recommendations on how climate change education curricula should be designed. For example, Vogel (2010) suggests that climate change curriculum development should weave together sustainability thinking, transdisciplinarity, and knowledge co-production that draws from different systems and perspectives.

The designed course curriculum had the following three objectives, to:

- Enhance SADC TFCA practitioners' awareness and knowledge on climate change, climate change adaptation and mitigation concepts, issues, policies and programmes;
- Develop TFCA practitioners' methodological knowledge and skills to incorporate climate change adaptation and mitigation in their workplaces and TFCA management plans and activities; and
- Deepen cross-border, multi-stakeholder collaborative work in SADC TFCAs through joint work among TFCA practitioners (through joint change projects and the development of communities of practice).

The process of designing the course curriculum from the contextual profiling and needs identification constituted what Bernstein (2000) calls: 'de-location' – selecting a discourse or part of a discourse from the field of production where knowledge is constructed; and 're-location' – where the original discourse(s) is/are transformed in the field of recontextualisation, which is found between the fields of production and reproduction respectively.

The process of recontextualisation of the curriculum involved negotiation between the consultant, SADC REEP and GIZ, through the course coordination structure. Sustainable development thinking, which is based on social justice, ecological sustainability and economic viability (see www.unesco.org/desd), was the 'ideology' that determined course content (SADC REEP, 2012). The political choice of what to include was partly shaped by the intentions of the project and the SADC's position of prioritising climate change adaptation measures over climate change mitigation. The course design's pedagogical coherence was achieved through a Cultural-Historical Activity Theory (CHAT) conceptualisation of learning, which includes acquiring knowledge from those who know more than the learner, linking everyday knowledge to concepts, and the creation of new knowledge (Engeström, 1987; Edwards, 2005).

Implementation of the Climate Change Education Curriculum

The course curriculum was implemented in two one-week workshops for each group of participants. The workshops were held at the national office of the Wildlife and Environment

Society of South Africa (WESSA), which has officially hosted the SADC REEP since its formation. Workshop trainers were mostly drawn from the WESSA office, which is also an SADC Centre of Excellence in Environmental Education.

Several tools were developed to aid curriculum implementation to foster the achievement of course intentions. SADC REEP produced and shared facilitators' notes, which prepared the trainers to implement the course in a coherent manner. The course designer drafted a workshop programme (for the first workshop), the content and flow of which was negotiated through the course coordination structure. The workshop programme was made available to trainers to help them contextualise their sessions. The workshop was structured such that the learning processes moved from theory to practice, from the concepts to concrete actions. For example, the concept of climate change adaptation was introduced and discussed, followed by practical examples of how communities in southern Africa are adapting to climate change. The workshop moved from relatively conceptual and abstract to more concrete and practical topics. The emphasis of the last part of the workshop focused on planning future-oriented actions such as developing climate change adaptation activities. At the same time, the workshop was structured to facilitate appropriation of new knowledge, for example through lectures and group exercises; and the externalisation or application of what was being learnt through the development of change projects. Participants brought change project ideas, which were enriched as they acquired new knowledge and skills during the course of the workshop.

Curriculum implementation was also shaped by participants' expectations. One of the two groups' expectations were summarised as follows (Box 1):

Box 1. Synthesis of participants' expectations

a. Learning about concepts and meanings of:
- Climate change, climate change adaptation and mitigation; and
- Change projects.

b. Acquiring information and knowledge about:
- Climate change issues and trends;
- Available financial support mechanisms for climate change adaptation and mitigation in TFCAs; and
- Sources of information on climate change adaptation and mitigation in TFCAs.

c. Learning about strategies and techniques regarding how to:
- Apply and integrate climate change knowledge in TFCAs;
- Identify climate change policies, issues and concerns and integrate them into TFCA strategies and plans and monitor climate change and its associated impact;
- Work with climate change adaptation and mitigation strategies in the context of TFCAs;
- Involve local communities, and stakeholders, including politicians, policy-makers and business people in projects that tackle climate change; and
- Mobilise resources to support the integration of climate change into TFCAs plans and activities.

d. Building relational agency
- Network and collaborate with TFCA practitioners from the same TFCA but different countries; and
- Plan for continued collaboration with one another, beyond the workshop and the project.

The above expectations, together with the needs that were identified through the TFCA leaders' climate change dialogue workshop and responses to a questionnaire, provided the bottom-up input to the designed course and workshop programme; while contextual profiling provided the top-down input into the same. The former provided the institutional and individual perspective, while the latter provided the international, Pan-African, SADC and SADC Member States perspective. Some of the issues revolved around environmental protection, community responsibilities, access to and benefit from the TFCA, and cross-border collaboration. Examples of mitigation issues included fire and fire control, and alternative energy, while adaptation issues included habitat change and the implications for some plant and animal species.

In summarising the net effect of multiple sites of sources for the course content, and consistent with challenges that are likely to be found in the process of recontextualisation, the course designer and workshop facilitator (Mukute, 2013:9) wrote:

> Inevitably, the different orientations and interests of the three sources [policy documents; GIZ resource materials on climate change; and participants' expectations] created some tension in the programme in terms of what to include and exclude […] This partly explains why the workshop was overloaded. The topics that were dropped are: Whole Systems Approach to Decision-making; Participatory Learning and Action; Integrating Climate Change Adaptation in TFCA Planning; and Proposal Development […] The main addition was an educational tour of the WESSA centre, which is implementing adaptation and mitigation measures that create co-benefits.

The trainers, who had diverse backgrounds because of the nature of the topics, used a range of teaching/learning methodologies to implement the course. These were:

- *Knowledge and information transfer:* through presentations to course participants;
- *Deliberative and dialogical interactions:* through group work and group assignments and mentoring sessions on change projects;
- *Investigative tasks:* through individual and group tasks to generate relevant data from selected documents and internet searches;
- *Experiential learning:* through a learning tour of the WESSA Centre and the uMngeni Valley Nature Reserve, which incorporate mitigation and adaptation practices; and
- *Learning by doing:* through joint development of change projects.

It is important to note that knowledge and information transfer did not only take place between the trainers and the learners, but it also took place among the learners. This was especially the case because of the range of topics covered and the diverse professional backgrounds of the participants, which created knowledge gradients. For example, ecologists took the lead on ecosystem and biodiversity topics while park managers took the lead on the development of park management plans and community development officers on multi-stakeholder involvement.

The educational methodologies were grounded in the contexts and realities of the trainees, that is, the TFCAs. The methodologies also recognised and built on existing knowledge, skills,

experiences and resources (capabilities); they were change- and practice-oriented; and were designed to cause change at individual and institutional levels. The change projects assisted participants to connect park conservation priorities with the collaborative integration of climate change adaptation/mitigation with both local and cross-border interests.

The change project approach was particularly central because it enabled participants to link the context of work and the context of learning iteratively: they generated project ideas at their respective workplaces; then they shared these with fellow learners who came from the same TFCA and agreed on the idea(s) to convert them into a joint change project idea; then they collaboratively developed strategies and action plans which were subsequently shared with colleagues back in the TFCAs, and shared again in the second course workshop.

Mandikonza (2012:4) defines a change project as:

> An EE/ESD project that one embarks on, together with colleagues in one's workplace, in order to respond to an environmental/sustainability issue […] In this way it supports one's practice as an environmental education practitioner. A change project may bring a totally new approach or it may enhance initiatives already in place.

According to the Sida-funded International Training Programme on ESD in Higher Education Change Project Guidelines (Rhodes University & Swedish International Centre of Education for Sustainable Development, 2012; Lotz-Sisitka & Hlengwa, 2013), change projects respond to the learner/trainees' professional development needs, organisational priorities and to the field of ESD. They should be relevant to institutional mandates and sustainable development issues and be theoretically and practically defensible.

Feedback from Learners and How It Informed Course Implementation

Learners in both groups had opportunities to give feedback on course implementation at the start of each day; and at the end of the workshop in the form of an evaluation, which was both quantitative and qualitative. For example, the feedback at the end of the first workshop of Group A (of 18) had dual purposes: it helped in the redesigning of the workshop for Group B (of 21), who were still to attend their first workshop; and in the design of the second and final workshop for the first group. Listening to learners' feedback appeared to have improved the recontextualisation of the implemented course. This was partly evidenced by better ratings of the workshops: Group A rated workshop achievement levels as: 53% Excellent, 41% Good and 6% Not Entirely Satisfied; and Group B's ratings were as follows: 80% Excellent and 20% Good.

The learners' ratings of how different topics were covered by different trainers also prompted the course designer to compile resource people's guidelines, and share these with the resource people ahead of Group B's first workshop. This process can be seen as part of the recontextualisation process. The other improvement arose from time allocation per topic, which was increased by using two strategies: covering even fewer topics than those covered by the first group; and starting the workshop 30 minutes earlier each day in order to have more time. The allocation of more time per topic also enabled the resource people to cover the conceptual,

policy-related and practical matters in one session and not to have them spread over a number of sessions. The blocks of time that were allocated per topic ranged from two to three hours, from an average of 30 minutes to 90 minutes. The additional time improved the coherence and flow of the workshop.

Conclusion

The contextualised curriculum design and recontextualisation of curriculum implementation journey discussed in this paper shows that potentially creative tensions emerge throughout the translation process; and that these have to be dealt with reflexively by multiple stakeholders. Tensions arise, for example, from having to engage with the international and the local, the abstract and the concrete, the socio-economic and the ecological, the short-term and the long-term, mitigation and adaptation. The prevalence of such tensions suggests the importance of working with conceptual, philosophical and theoretical frameworks that enable contradictions to be used to stimulate learning and action-taking. These frameworks are dialectics, as described in dialectical critical realism and CHAT, respectively.

The main educational lesson from this case study is that curriculum designs that are informed by contextual policy, theory and practice analysis and stakeholder needs-identification are likely to produce more adequate results than when one of them is used in isolation. For example, focusing on stakeholder needs analysis has the danger of overlooking what the potential trainees are unaware they need to know; while focusing on the latter is likely to leave out the more nuanced and specific training needs and lack the ethical credibility of participatory involvement of those who matter. Such a lesson is worth considering in the design of short and long course curricula as educators take forward the complex challenge of sustainable development in the context of climate change. The curriculum development process (and subsequent implementation) is likely to galvanise joint planning and action among stakeholders and contribute to learning that is more grounded in the strategic and practical needs of the learners, their institutions and society. The ability to recontextualise the curriculum effectively is enhanced when there is interaction and rapport between the curriculum designer, the institution of learning, the trainers and the learners.

The change projects that were jointly designed and progressively improved upon stimulated action research, and reflexive professional practice in situated learning – something that Schudel *et al*. (2008) encouraged as a way of building on the insights generated from the review of the Advanced Certificate in Environmental Education. Change projects also serve as an important mechanism for not only applying and reproducing what has been learnt, but also for mobilising the distributed cognition of learners and co-workers in creating innovations to deal with complex sustainability issues.

Notes on the Contributors

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Acknowledgements

The authors gratefully acknowledge the contributions of participants of the SADC CCA TFCA Leaders' Dialogue Workshop that was held in Johannesburg, South Africa in August 2013; and the financial contributions of GIZ, which sponsored the study.

Endnotes

1. A change project is a reflexive, action-oriented intervention through which course participants institutionalise and externalise new knowledge and practices with the aid of co-workers and supervisors.

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Advancing Green Economy through Technology Transfer
Experiences from Malawi

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Abstract

The transfer of green technologies to developing countries is often touted as a key green economy measure for alleviating poverty and improving welfare. This qualitative study explores the transfer of renewable energy technologies in Malawi with a view to (i) evaluating how green economy principles have been integrated in technology transfer projects, and (ii) highlighting how successfully implemented pilot and innovative solar energy kiosks and solar fish dryers can serve as case studies on enhancing environmental education efforts. Based on experiences from the projects, a literature review, site visits and key-informant interviews were conducted. A qualitative evaluation was performed based on intuitive judgment and a general framework of internationally agreed-upon green economy principles. The results show that the technology transfer projects integrated a substantial number of green economy principles, and that embracing local traditional knowledge in implementing modern green economy technologies in the context of helping local communities to alleviate poverty are key factors in encouraging innovation in environmental education, and improving project acceptability among local communities. We recommend increased knowledge-sharing to popularise the integration of green economy measures into poverty alleviation projects. This can be accomplished through both technical and educational study visits to the technology transfer projects, documenting practical, locally generated sustainable ideas, and disseminating information on successes and lessons learnt.

Introduction

The Rio+20 summit meeting outcome document *The Future We Want*, highlights poverty reduction as being central to the attainment of a socially, environmentally and economically sound world, supported by green economy policies (UN, 2012). Although constrained by several factors, among them the lack of appropriate human resource skills and inadequate financial resources (Hamdouch & Depret, 2012), transferring green economy technologies to developing countries is often touted as a key measure for alleviating poverty. In their 2009 study, Mog *et al.*, suggest that the transfer requires (i) adequate investments in enhancing user capacity; (ii) appropriate justification; (iii) institutions' engagement for maintenance and adoption; and (iv) emphasising the impartation of knowledge regarding correct usage of the technology.

What is the green economy?

Derived from the field of environmental economics, the 'green economy' concept was conceived 25 years ago in the widely quoted blueprint for a green economy report by Pearce, Markandya and Barbier (1989). The concept is now widely perceived as a potential mechanism for attaining sustainable development goals (Guo & Marinova, 2014), a solution to global economic and environmental crises (Ferguson, 2014), and the quoin of modern-day development policies (Newton & Cantarello, 2014). Certain schools of thought, however, contend that the term 'green economy' is still an emerging concept that has yet to get a consistent definition (Jeffrey *et al.*, 2014; Lorek & Spangenberg, 2014; Shear, 2014). Beyond this debate, the United Nations Environment Programme's widely used definition states that a green economy is,'one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities' (UNEP, 2013). Diverse lists of green economy principles emerged from a multiplicity of stakeholder contributions towards the Rio+20 summit (for example, 15 principles in Stoddart, Riddlestone & Vilela, 2012), but in this study we focus on nine broad principles in the UNEP (2013) outcome report that is widely considered a synthesis of the various stakeholder contributions from the summit. A summarised version of the nine internationally agreed-upon green economy principles is presented in Table 1.

There are divergent opinions on whether the green economy is a panacea for the challenges humanity is facing as a result of climate change and environmental and natural resource vulnerabilities. On the one hand, broad international consensus views the green economy as a route to poverty reduction and sustainable development (UNEP, 2011; Acey & Culhane, 2013; Burkolter & Perch 2014; Faccer, Nahman & Audouin, 2014; Musango, Brent & Bassi, 2014), and multilateral institutions such as UNEP and the International Labour Organisation (ILO) have been credited with the recent universalisation of the concept (Faccer *et al.*, 2014). On the other hand, critics contend that: (i) the concept is nothing new but just a re-emerging issue in the policy debate that does not account for political, economic and cultural constraints in trying to meet environmental and poverty reduction goals; (ii) the valuation of ecosystem services in monetary terms will result in the control and privatisation of natural resources by a few powerful players with financial capital, who will also unduly influence governments to the detriment of the rest of society's poor and vulnerable groups (IPACC *et al.*, 2011; Brand, 2012; Cock, 2014; Lorek & Spangenberg, 2014). The focus of this paper is not to wade into this debate; instead, we argue that based on the broad level of international consensus, green economy principles provide: (i) a useful and practical framework for integrating sustainability processes into technology transfer projects; and (ii) a comprehensive tool for evaluating whether or not implemented developmental projects have adopted green economy practices that can also serve as case studies to improve environmental education and awareness, and promote the implementation of innovative practices.

Table 1. The nine principles of green economy framework for evaluating technology transfer projects

Principle		Criteria for qualitative evaluation
1.	The Sustainable Principle	Economy is a means to deliver sustainability. It addresses all three dimensions (environmental, social and economic) and develops policy mixes that integrate and seek the best results across all of them.
2.	The Justice Principle	Economy supports equity between and within countries and between generations. It respects human rights and cultural diversity, promotes gender equality and recognises the knowledge, skills, experience and contribution of each individual.
3.	The Dignity Principle	Economy creates genuine prosperity and well-being for all, empowers people and alleviates poverty. It delivers a high level of human development in all countries and provides food security and universal access to basic health, education, sanitation, water, energy and other essential services.
4.	Healthy Planet Principle	Economy restores lost biodiversity, invests in natural systems and rehabilitates those that are degraded. It ensures an efficient and wise use of natural resources, including water, natural gas, oil and mineral resources, without compromising future generations' prospects.
5.	The Inclusion Principle	Economy is inclusive and participatory in decision-making. It is based on transparency, sound science and the visible engagement of all relevant stakeholders. It supports good governance, empowers citizens and promotes full and effective voluntary participation at all levels.
6.	The Good Governance and Accountability Principle	Economy is accountable and provides a framework to structure markets and production in consultation with all stakeholders. It achieves transparency and promotes international co-operation and defines international liability.
7.	The Resilience Principle	Economy contributes to economic, social and environmental resilience and supports the development of social and environmental protection systems, and preparedness against and adaptation for climate extreme events and disasters. It builds on local skills and capacities and develops these further.
8.	The Efficiency and Sufficiency Principle	Economy delivers sustainable consumption and production and seeks to ensure prices reflect true costs incorporating social and environmental externalities. It implements the polluter pays principle. It prioritises renewable energy and renewable resources.
9.	The Generations Principle	Economy invests for the present and the future and delivers inter-generational and intra-generational fairness. It prioritises long-term, scientifically sound decision-making above the short-term and promotes equitable education at all levels and sustainability education for children.

Source: Modified from UNEP (2013).

A Green Economy in Malawi

Achieving a green economy not only requires innovative solutions, but also the knowledge and wisdom of local people, backed by scientific understanding and technological foundations (Hosono, 2013). Similar to most southern African countries experiencing high levels of

poverty, Malawi faces an uphill battle to achieve green economy policy goals for improving the livelihoods of its poor and vulnerable population groups. Major constraints in achieving green economies include (Faccer *et al.*, 2014):

- Economic development relying heavily on natural resource extraction industries such as agriculture and mining that are destructive to the environment;
- High dependence on fossil-fuel-based energy sources such as coal for electricity, coupled with inadequate investment in renewables and other alternatives;
- Lack of appropriate skills and adequate policies to develop and commercialise green technologies;
- Loss of green economy related skilled labour to other world regions, leading to a reduction in the export of green market goods, and an overreliance on technology transfer;
- Overreliance on labour-intensive primary industries such as agriculture, making alternative green development routes risky and infeasible.

Despite these region-wide constraints, the green economy concept promises transformation to more environmentally friendly production methods and consumption patterns for the Malawian economy through green jobs, green industries, green production processes, safe and healthy workplaces, decent jobs for all, social inclusion and social development (Chiotha *et al.*, 2014). Thus, a green economy would remedy challenges arising from the prevailing economic model in Malawi, especially in the energy sector (Government of Malawi, 2014).

Overview of Malwi's energy sector

The energy mix for Malawi consists of biomass, petroleum, hydroelectricity, coal and renewables (Table 2). Biomass is clearly the most prominent source of energy (Table 3). Like most countries in sub-Saharan Africa, biomass is widely perceived as a retrogressive source of energy that degrades the environment and engenders poverty (Owen, Der Plas & Sepp, 2013).

Table 2. Total national energy demand by sector and fuel

Sector	Energy demand by fuel type (TJ/yr)					
	Biomass	**Petroleum**	**Electricity**	**Coal**	**Total**	**%**
Household	127 394	672	1 798	5	129 869	83.4%
Industry	9 664	3 130	2 010	3 481	18 285	11.7%
Transport	270	5 640	35	15	5 960	3.8%
Service	452	558	477	174	1 661	1.1%
Total	137 780	10 000	4 320	3 675	155 775	100%
	88.5%	6.4%	2.8%	2.4%		

Source: Malawi BEST (2009).

Table 3. Energy mix trends for Malawi, 2000–2050

Energy source	2000 (actual)	2010 (actual)	2020	2050
Biomass	93.0	80	50.0	30.0
Coal	1.0	4.0	6.0	6.0
Electricity	2.3	8.0	30.0	40.0
Liquid fuels	3.5	5.5	7.0	10.0
Nuclear	0.0	0.0	0.0	4.0
Renewable	0.2	2.5	7.0	10.0
Total (%)	100.0	100.0	100.0	100.0

Source: Gamula *et al.* (2013).

Sources of renewable energy in Malawi include solar, wind, solar-wind hybrids, natural gas and biogas (Kambewa & Chiwaula, 2010). Renewables made an actual contribution of only 0.2% to the total energy mix in 2000 (Table 3) but in 2010 the actual contribution had increased to 2.5 % (Gamula, Hui & Peng, 2013). Most people cannot afford renewable-energy-based facilities such as stand-alone solar home systems. The study by Zalengera *et al.* (2014) outlines additional major challenges affecting Malawi's energy supply industry, including shortage of trained human resources, increasing energy-demand, poor governance, weak legislation and a weak regulatory framework. The next section provides an overview of recent, successfully implemented technology transfer case studies.

Technology Transfer Case Study: The Solar Energy Kiosks Project

Rational use of appropriate technologies is a major prerequisite for attaining sustainable energy development (Mandelli *et al.*, 2014). Technology transfer, or its movement from its creator to end-user, often requires governments to be intricately involved in creating an enabling environment (Pisani, Erasmus & Hartzenberg, 2012). Technological transfer can reduce costs and increase competitiveness, and can occur through best practices, knowledge sharing, educational and technical exchanges, and promulgating norms and standards (JICA, UNOSSC &UNEP, 2013). It is not only a crucial mechanism for maximising sustainable development benefits (OECD, 2014), but also assists in mitigating impacts resulting from loss and damage due to climate change (Appleton *et al.*, 2014). In this section, we briefly present technology transfer projects involving (i) solar energy kiosks implemented from 2012 to 2013 by a consortium of partners funded by the Scottish government; and (ii) solar fish dryers in the Thyolo and Phalombe districts of Malawi implemented by a partnership funded by the Norwegian government.

The solar energy kiosks project was piloted to demonstrate an innovative and off-grid community electrification solution where batteries charged from the solar panels would be rented out to communities (RENAMA, 2012). Initially, 150 households in each community were able to rent out and charge a variety of appliances, including low-power televisions, mobile phones, light bulbs, radios and laptop charging kits. The rental and re-charging stations

were managed and staffed by the community. Some community members generated income from this by using batteries to charge cell phones in public market places for a fee.

Millions of people in Malawi are directly or indirectly dependent on fishing for a livelihood (Kafumbata, Jamu & Chiotha, 2014). Preserving fish involves drying and smoking, and traditional drying is done outdoors with nets spread between poles. This exposes fish to contamination by dust and flies, and the drying process is often incomplete in bad weather.

Solar fish dryers were constructed under the Lake Chilwa Basin Climate Change Adaptation Programme, implemented by a consortium of partners over four years from 2010. Demonstration solar fish dryers were constructed at Kachulu and Swangoma landing beaches by the World Fish Center, in collaboration with beach village committees.

Beneficiaries included self-formed women's groups, who were specially trained to use the solar fish dryers, as well as in the hygienic handling of food products, quality control, grading, brining and packaging of processed fish according to the Malawi Bureau of Standards. Packaging was done in 100g packets, enabling the women's groups to supply fish to supermarkets that brought in better returns. Eventually, the women's groups were linked to mobile banking services where they could conveniently save their income.

This paper draws on the experiences on the solar energy kiosks projects discussed above. The specific objectives of this study are (i) to evaluate how green economy principles have been included in technology transfer of solar energy kiosks and solar fish dryers in Malawi; and (ii) to highlight how successfully implemented, innovative, efficient and environmentally friendly solar energy kiosks and solar fish dryers can serve as case studies on enhancing environmental education efforts. Such an assessment is crucial for making recommendations on strengthening green economy policies that can potentially alleviate poverty through enhancing the welfare of poor and vulnerable populations in Malawi. This case study is particularly important because:

- Most donor funded projects in Malawi target villages where communities are mostly illiterate, and there is a need to document green economy initiatives implemented in such communities for environmental education purposes;
- Innovative entrepreneurship ideas that need to be captured can come out of these rural communities through technology transfer initiatives; and
- These technology transfer stories need to be told in order to promote further targeted assistance by replicating successful green economy projects in locations where benefits to intended recipients can be maximised.

The methodology involved a combination of a literature review, site observations and key-informant interviews with stakeholders selected to represent different interest groups in the technology transfer projects. Interviews were guided by questions meant to intuitively capture elements of the green economy principles. Interactions with different stakeholder interest groups included: (i) interviews with officers from implementing agencies for the technology transfer projects (RENAMA, Project Concern and LEAD for the solar energy kiosks, and World Fish Center and LEAD for the solar fish dryers project); (ii) open-ended in-depth interviews with five community members who were beneficiaries of the solar energy kiosks

project; and (iii) focus group discussions with 20 members of women's fish processing groups who were part of the solar fish dryers project. A total of three site visits were carried out – one during the implementation phase, and two after project completion.

Analysis of technology transfer projects and renewable energy in Malawi

International consensus is that the implementation of green economy measures covered by the nine principles (Table 1) will result in a better quality of life for all within the ecological limits of the planet (UNEP, 2013). This general framework of green economy principles and their characteristics was applied in the intuitive evaluation of the implemented technology transfer projects. Questions addressed during in-depth interviews and participant observations conducted during site visits were the basis for an intuitive judgment process that teased out the extent to which different aspects of the principles were captured by the technology transfer projects. The use of intuitive judgment in qualitative research is not new, and has been widely published across various disciplines, especially in attribution theory (see for example, Magnusson, Netz and Wästland, 2014; Miles & Sadler-Smith, 2014; Schmidt, 2014).

Results and Discussion

The results from our intuitive evaluation on the integration of the green economy principles in the technology transfer case study projects are presented in Table 4. A positive evaluation was given for each green economy principle where at least one criterion was considered to have been met. According to these findings, some elements of the green economy principles' evaluation criteria (see Table 1) covering seven out of the nine principles were addressed in implementing the solar energy kiosks project. The two exceptions were Principle 3: the Dignity Principle, and Principle 7: the Resilience Principle. The solar fish dryers project, however, appeared to have satisfied at least some criteria covering each of the nine principles for a green economy, although not in an exhaustive manner.

The solar energy kiosks project addressed elements of Principle 1: the Sustainable Principle, in line with green economy principles because the implemented technology is based on solar – a renewable and sustainable form of energy. Evidence gathered from our site visits also revealed that operational costs such as salaries for the kiosk manager and guards, as well as a maintenance and extension fund were being sustained by income from the solar energy kiosks. In targeting the remote Dzenje area in Phalombe District that previously had no access to any form of electricity supply and had very limited livelihood options for its low-income population, the project captured some elements of 'equity' and 'justice' that are associated with the Justice Principle (Principle 2).

The Inclusion Principle (Principle 5) was considered fully integrated in relation to this technology transfer project. The findings showed that the kiosks had adopted an inclusive approach with regard to who benefits from them, and communities had developed their own constitution covering various issues that include long-term legal status for memorandums of understanding with building owners and other service providers. In line with this principle, we also observed that women were very active users of the kiosks. An advisory board consisting

of members from the consortium of project facilitators, local government and local traditional leaders was formed to guide and support the development of a long-term strategy. This is in line with the Good Governance and Accountability Principle (Principle 6).

Table 4. Evaluation results for technology transfer projects

Solar energy kiosks project		
Principle	**Addressed**	**Not addressed**
Principle 1	X	
Principle 2	X	
Principle 3		X
Principle 4	X	
Principle 5	X	
Principle 6	X	
Principle 7		X
Principle 8	X	
Principle 9	X	
Solar fish dryers project		
Principle	**Addressed**	**Not addressed**
Principle 1	X	
Principle 2	X	
Principle 3	X	
Principle 4	X	
Principle 5	X	
Principle 6	X	
Principle 7	X	
Principle 8	X	
Principle 9	X	

Principle 4 (Healthy Planet) and Principle 8 (Efficiency and Sufficiency) both allude to the need for innovation as a way of achieving the goals of a green economy. Innovative actions were encouraged and promoted through an inventors' competition where participating local primary school children and communities proposed 'green' solutions, including using windmills and waste from pit latrines to generate electricity. Participants in the innovation competition were recognised at a public event attended by officers from the District Council and local traditional leaders that included the chief of the area. The Generations Principle (Principle 9) was also engrained in this innovation competition that saw the participation of primary school age children. The involvement of school children is a crucial step towards building a future skills base for ensuring intergenerational sustainability of the pilot projects, and a positive step towards incorporating environmental education into the school curriculum.

The solar fish dryers project not only presented a more sustainable method of processing fish that reduced post-harvest losses through efficient drying, but also targeted vulnerable groups such as women and raised income levels of the local project beneficiaries. Thus, it provided social, economic and environmental benefits that are enshrined under the Sustainable Principle (Principle 1). The project was also seen to embrace gender equality by benefiting women's groups, in line with the Justice Principle (Principle 2). By promoting the self-empowerment of women through training and linking them to more lucrative fish markets, and creating genuine prosperity and well-being for the local beneficiaries, the project contributed to poverty alleviation and improved the dignity of poor and vulnerable groups in Malawi (elements captured under Principle 3). Most importantly, the training sessions on new, efficient and environmentally friendly fish drying technology contributed towards environmental education and awareness among different stakeholder groups.

The introduction of a more efficient alternative method to open drying contributes towards better ecosystem health by minimising post-harvest losses (Principle 4: Healthy Planet), in comparison to those experienced under traditional open drying. Under the open drying technique, pollution of the local environment was very apparent through the dumping of foul-smelling rotten fish in water or on land. Participatory approaches and the adoption of local knowledge were an integral part of this project from conception to commissioning, and the engagement and voluntary participation of relevant stakeholders at all levels was instrumental in ensuring successful project implementation (the Inclusion Principle). For example, the innovation to alter the design of the solar fish dryers was credited to local communities.

The project contributed to capacity building by improving organisational, administrative and leadership skills among local communities in the Lake Chilwa Basin. Governance of the solar fish dryers was delegated to the self-formed women's groups, in accordance with the Good Governance and Accountability Principle (Principle 6). The improvement of skills through the project will improve climate change adaptation capacity and build the resilience of local communities against the shocks of climate variability and change (the Resilience Principle) in a region where climate change impacts are already being experienced.

In contrast to traditional fish drying techniques, the more efficient solar energy dryers clearly led to a rise in income levels, reflecting the integration of aspects from Principle 8 that focus on efficiency and sufficiency. Finally, we contend that long-term conservation of fish resources for the benefit of future generations could be realised through cumulative reductions of post-harvest losses as project beneficiaries strive to meet fish delivery targets to the market (Principle 9: the Generations Principle).

This study has revealed how technology transfer projects implemented in remote rural communities of Malawi integrated a substantial number of green economy principles, and also contributed to environmental education and awareness through the involvement of school children and stakeholder learning through training sessions. However, the study did have limitations and there is certainly scope for improvement. First, it is acknowledged that our qualitative evaluation against the set criteria is not exhaustive. Each green economy principle has several aspects associated with it as specified in Table 1. While deciding that a certain principle has been addressed, it is not practical for the project to have integrated every principle

in totality. In the long term, we recommend strengthening such a qualitative evaluation with quantitative indicators as well. Second, we acknowledge the possibility that our intuitive judgments could be prone to evaluator biases that can arise from the evaluators' understanding of the study area, the adequacy of collected evidence, the methods of analyses applied and assumptions used, among other factors. Lastly, there is a need to assess end-of-project lifespan sustainability issues and document how access to solar power from these technology transfer case studies actually changed lives over the course of the project, which should be a subject for future study.

Conclusions

This study revealed that the nine green economy principles have been substantially incorporated into the two technology transfer projects, although they are not explicitly referred to as green economy initiatives by the project implementation team. Substantial elements of environmental education are reflected in the study through stakeholder learning experiences, and the involvement of school children in promoting the implementation of new innovative technologies that are more efficient and environmentally friendly. The technology transfer case studies demonstrated that environmental education must be placed within the context of helping local communities to solve existing challenges, and integrating modern technologies with local traditional knowledge in order to improve project adoption and acceptability by local communities. We recommend increased knowledge-sharing as a way of enhancing environmental education and popularising green economy measures in Malawi. This can be accomplished through study and technical visits to these pilot solar kiosks and solar fish dryers, and disseminating successes and lessons learnt. Finally, it is critically important to engage continuously with all levels of stakeholders on these pilot technology transfer projects in order to identify and document practical, innovative and locally generated sustainable ways of integrating green economy principles through poverty alleviation projects.

Acknowledgements

The solar energy kiosks project was implemented by the International Resource & Recycling Institute (in Scotland) and Renew'N'Able Malawi (in Malawi) with funding from the Scottish government. Other partners were Eqnon Consultancy Ltd (Malawi), Concern Universal, Leadership for Environment and Development Southern and Eastern Africa (LEAD SEA), Airtel Malawi Mobile Money, the David Livingstone Centre for Sustainability at the University of Strathclyde (in Scotland) and the Centre for Water, Sanitation and Appropriate Technology Development (WASHTED). The solar fish drying project was implemented by LEAD SEA, the World Fish Center and Forestry Research Institute of Malawi, under the Lake Chilwa Basin Climate Change Adaptation Project, funded by the Norwegian government. The authors would like to thank Dr Anand Babu Prakasam for his contributions to this paper.

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Reviewing Some Implications of the Green Economy for Higher and Further Education Institutions

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Abstract

The world is set to apply green economy as a framework for achieving sustainable development, eradicate poverty and inequality and create jobs. This reality follows the consensus on green economy by global leaders during Rio+20 in June 2012. At the centre of the green economy is the need to address negative impacts associated with one of the global challenges of our epoch, climate change. Higher education (including further education) is viewed by many as an enabling platform for the generation and acquisition of green economy knowledge and skills for the future we want. The question this paper seeks to address is: are African institutions of higher education green economy ready? This question is not only limited to the curricula, but to broader impact areas in higher education that include the institutionalisation of green economy in policy, research and research management structures, in depth understanding of the green economy concept and the manner in which it links to existing paradigms like sustainable development as well as higher education–private sector partnerships. The paper shows that there are a number of emerging initiatives that can be seen to be developing green economy education and training in higher/further education contexts, but that much more needs to be done. The paper shows a 'slow awakening' to the green economy call as revealed by activities from the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the Environmental Education Association of Southern Africa (EEASA) and selected universities and private sector initiatives.

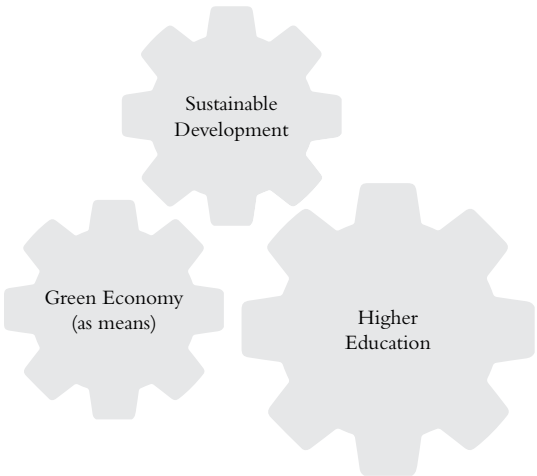
Introduction

Article 4(i) of the United Nations Framework Convention on Climate Change (UNFCCC) contains a promissory note by the Parties in terms of education, training and public awareness with regards to climate change (UNFCCC, 1992). Parties agreed that they would promote and cooperate in these aspects and encourage the widest participation in the process, including that of the involvement of non-governmental organisations. In fact, Article 6 is wholly dedicated to education, training and public awareness. Parties are reminded of their responsibilities to promote and facilitate such at the national and, as appropriate, sub-regional and regional levels. In accordance with national laws and regulations, and within their respective capacities, they should focus specifically on: 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 training of scientific, technical and managerial personnel.

Parties are also tasked to cooperate in and promote, at the international level, the development and exchange of educational and public awareness material on climate change and its effects; and the development and implementation of education and training programmes, including the strengthening of national institutions and the exchange or secondment of personnel to train experts in this field, in particular for developing countries.

Higher education (including further education) has a potentially critical role to play in green economy (including climate change) readiness globally. Higher education is viewed by many as an important knowledge generation and acquisition platform where skills can also be developed for the future we want. The world's higher education institutions have been involved in initiatives that include conservation education, environmental education, education for sustainable development and climate change education. If one is to portray a stronger relationship concerning higher education and the green economy, it will probably be represented as shown in Figure 1.

Figure 1. Higher education, green economy and sustainable development links



Source: Author.

Figure 1 indicates that higher education has a central role to play in both the emergence of green economy and sustainable development. This does not necessarily imply that green economy and the quest for sustainable development are dormant phenomena in this relationship as they too influence the manner in which higher education responds to the old and emerging challenges, driving changes in these institutions. Hence, it is inevitable that higher education 'gets ready' to engage the green economy agenda within the context of sustainable development, poverty eradication, equity and jobs creation. Jobs must not only be created but they must be sustained through the role of higher education in re-skilling and remaining on the cutting edge in terms of research and innovation that address issues at the heart of the green economy and sustainable development agendas. These are inclusive of, but not limited to climate change adaptation and mitigation as well as movement away from a world focused on resource intensive growth to

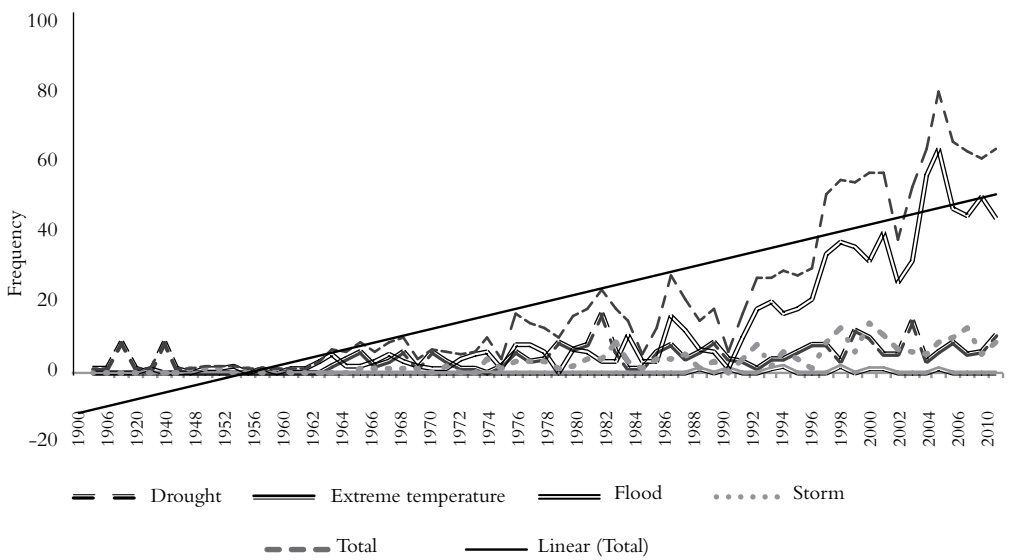
one that uses fewer resources. Hence, as the wheel of higher education turns in response to green economy transition and sustainable development phenomena, it triggers the wheels of green economy and sustainable development that will in turn signal continuous motion in the three wheels showing a contextually reflexive relationship between higher education and these development trajectories.

This paper is structured into four main sections. The first section looks at the central role of climate change in green economy transition. This is followed by a review of the emergence of the green global economy discourse, which is also often seen to be interchangeable with the green growth discourse. The third section narrows the focus to deliberations on green skills and green jobs, whilst section four presents emerging initiatives from African higher education and associated partners that feed into the central argument of the paper on higher education 'readiness' for green economy transitions and sustainable development.

Central Role of Climate Change in Green Economy

The United Nations Economic Commission for Africa (UNECA) (2012) advises that nations ought not to talk of transition to green economies without making reference to climate change – as this phenomenon is central to such debates. To get a better picture on Africa trends in relation to climate change induced natural disasters (that include droughts, floods, extreme temperature and storms), data were retrieved from a globally recognised source, the EM-DAT.[1] The findings are represented in Figure 2 and reveal that natural disaster trends in Africa are ever increasing.

Figure 2. African trends in selected natural disasters (1900–2011)

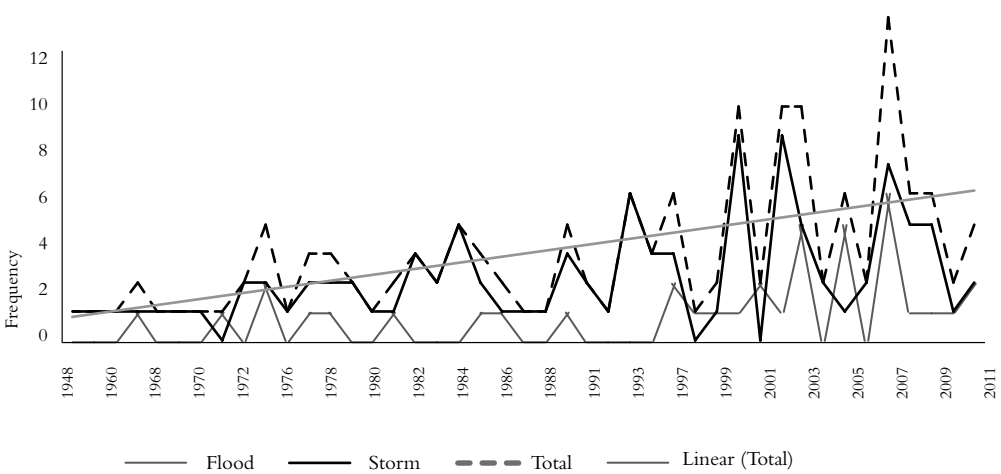


Source: Author (data from www.emdat.be – visited 6 April 2013).

The trend shows an increase in only one disaster recorded in 1900 to a peak of 80 disasters recorded in 2007. Other noticeable records of these disasters include 64 apiece for 2006 and 2011, 88 reported in 2008, 63 recorded in 2009 and 61 for 2010. Figures 2 and 3 reveal there has been a surge in floods. Floods by their nature are very destructive and can impact on livelihoods in a flash. Natural disasters are also increasing. Their recurrent periods are shortening and the intensity increasing. The damage caused by such is putting huge pressure on national budgets with many governments and organisations now taking the issue of disaster risk reduction (DRR) seriously.

To bring the disaster analysis closer to home, five countries known to be most vulnerable to floods and storms in southern Africa were sampled and data retrieved for further analysis. The countries included Madagascar, Mauritius, Mozambique, Reunion and Seychelles. The trend in floods and storms is presented in Figure 3. The picture shows that floods and storms are on the increase. Further analysis of loss of life shows that the year 2000 was the worst, with a total of 987 people dead. This is the year that Cyclone Eline struck the region, with Mozambique the hardest hit. Other years that recorded significant numbers of deaths include 1971 when 500 people lost their lives, 1977 with 313 reported deaths across the five countries, 1994 with 454 deaths recorded and 2004 with 395 deaths.

Figure 3. Floods and storms (Madagascar, Mauritius, Mozambique, Reunion and Seychelles)



Source: Author (data from www.emdat.be – visited 6 April 2013).

Emergence of a Green Global Economy

The history of the green economy can be traced from the need to address multiple global crises triggered by the financial crisis of 2008, but with increased insight into issues such as those reported above, and a suite of IPCC reports that were released before 2008 also shaping the

emphasis on green economy emergence. In response to the financial crisis of 2008, leaders then took a decision to have a comprehensive package that would stimulate growth and development addressing other crises that included among them, environmental degradation (especially climate change), energy and governance. Today, many definitions and conceptualisations have emerged regarding green economy.

Since 2008, global leaders have been promoting new sources of growth and according to the Organisation for Economic Co-operation and Development (OECD) (2012a), green growth is one of the many sources of new potential growth available. Green growth is viewed as addressing the twin challenges of poverty and environmental damage. To many developing countries, the main worry centres on potential trade barriers that green growth might present. Such barriers include aspects like aid for low-carbon development. Other challenges according to the OECD include questions like: will green growth efforts be impeded by high cost barriers and will green growth help address poverty and other development priorities? The OECD presents a green growth framework that could potentially be useful for higher education with regards to readiness (Box 1). Education and training is highlighted by the OECD as one of the six national green economy enabling conditions.

Box 1. Green growth framework

National enabling conditions
- Shift government expenditure
- More effective enforcement of legislation
- Education and training
- Resource and land rights regimes
- Creating enabling conditions for psychological and behaviour change
- Facilitating businesses to fully integrate sustainability and equity concerns

Mainstreaming mechanisms
- Public Environmental Expenditure Review
- Strategic Environmental Assessment
- Councils for Sustainable Development
- Greening Accounting/Alternative Development Measures

Policy instruments
- Certification of Sustainable Production and Trade
- Subsidy Reform
- Payments for Ecosystem Services
- Environmental Fiscal Reform
- Green Energy Investment Frameworks and Incentives

Source: OECD (2012a:12)

UNESCO paints a broad view of the green economy concept. Green economy societies, as stated by UNESCO (2012:1):

> … embrace the principles of social inclusion and equity, solidarity, mutual respect, gender-equality, human rights and peaceful coexistence, within the limits and thresholds of the natural system, which are fundamental ingredients for poverty reduction and sustainable development.

In working with Brazil, the Caribbean, India and Mali, the Green Economy Coalition (2011a) discovered that the green economy concept was understood in as many ways as there were stakeholders. Earlier, the Green Economy Coalition (2010) had presented their case for a green economy. In their narrative, a green economy was necessary, among other aspects, because global economic security and human wellbeing depend on goods and services provided by Nature. However, economic behaviour was damaging the environment, and the traditional economic growth model had failed to bring equity to the majority of society. Given the forgone, it came as no surprise in the Green Economy Coalition (2011b) Rio+20 submission that the group called for radical changes in the manner the world conducted its business. The Green Economy Coalition further called for action by 2015 that would result in the production of green economy roadmaps founded on the fundamentals of sustainable development (including decent jobs and decent work policies), and delivery of overseas development aid (ODA) commitments. The Green Economy Coalition further called for the mainstreaming of ecosystems values into central banks, international financial institutions, national planning and corporate accounting by 2020 as well as achieving the United Nation's objective for sustainable energy by 2030. Linked to the Green Economy Coalition views, the United Nations summarised its findings on the green economy as presented in Box 2.

Box 2. United Nations' common understanding on green economy

- The green economy can be an innovative pathway to sustainable development.
- Infrastructure investments today offer a promising entry point for launching transformative and dynamic green growth strategies.
- A green economy must be people centred and invest in both human and social capital
- A green economy requires the reorienting of public policies supported by improved information systems for tracking and communicating progress.

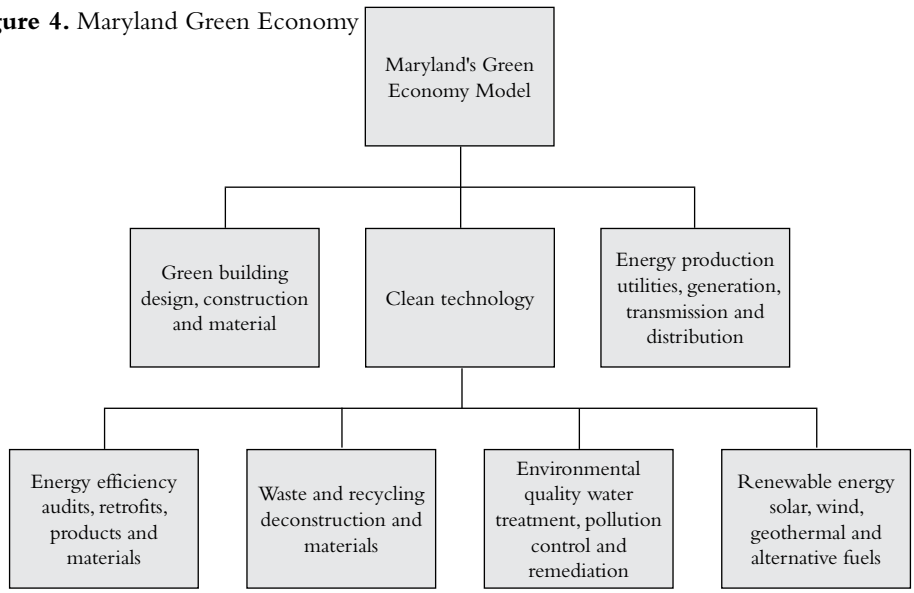
Source: United Nations (2011:171)

The African Development Bank (AfDB) (2012) identifies what they call 'low hanging fruits' projects in the area of green growth as those addressing access to renewable energy, energy efficiency, sustainable transport and sustainable cities. These are sub-sectors under the theme promoting sustainable infrastructure. Under the thematic area promoting sustainable natural resources management, it is recommended that governments focus on land (including agriculture, forests and other uses), water (including freshwater and marine) and mineral wealth. Building resilience of livelihoods under green growth considers climate change, economic and social aspects. All aspects raised herein challenge higher education to engage.

Barbier (2011:233), however, is not uncritical, and cautions that 'green growth will not ensure sustainable economic development as long as global ecosystem degradation and loss continues' unabated. This view is endorsed by Netzer and Althaus (2012:i) who believe 'the old way of doing business, based on finite fossil fuels and the exploitation of natural resources, is no longer possible'. In this regard, all countries must face the challenge of restructuring the dominant economic model so that it is ecologically more benign. Although biased towards mitigation, the Maryland's green economy model (see Figure 4 below) can assist in understanding the knoweldge and skills that are needed for the green economy in as far as the mitigation agenda is concerned

(Figure 4).

Figure 4. Maryland Green Economy



Source: Governor's Workforce Board (2009:7).

In discussing green economy success, Deloitte (2012) presents what they call the Results Management Approach (RMA) to engaging green economy projects. The RMA focuses on four pillars namely: (1) developing a strategic vision (aimed at aligning green economy initiatives with broader strategy); (2) technical expertise (for projects and consistent problem solving platforms); (3) operational excellence (for clearly laid down project governance, processes and procedures) and (4) organisational alignment (to assist in adequate stakeholder engagement and buy-ins). These four pillars could be helpful for framing higher education's engagement with the green global economy (critically or otherwise).

From the Maryland Green Economy Model and other earlier deliberations in the paper, one can extrapolate the emerging areas that require general and specialised green jobs such as: developing green buildings, clean technology, energy production, energy efficiency, waste and recycling, environmental quality and renewable energy. African higher education should take note, flagging that most of the areas highlighted in the Maryland Green Economy Model are biased towards climate change mitigation as opposed to adaptation. In as much as the climate change mitigation agenda remains alive in Africa, the main worry is adaptation. What this points to is the need for African Higher Education Institutions to consider not only mitigation (especially in countries such as South Africa that are high emitters), but also adaptation, and that careful thought needs to go into conceptualising these two main responses to climate change and how they relate to green economy, development and university education.

Green Skills in the Green Economy

There are numerous processes emerging that are foregrounding the need for development of green skills for the green economy. Berkshire Publishing (2011) suggests the following for higher education:

> As business leaders increasingly recognize the importance of sustainable development to their companies' futures, the greatest barrier they encounter is the shortage of a workforce with knowledge and training in sustainability. Higher education has a critical role to play by providing the programs and curriculum content that graduates need to help align the goals and actions of business with the values and practices of sustainability (www.berkshirepublishing.com).

UNESCO remains a key United Nations agency dealing with issues of education. In October 2011, an international consultation meeting on 'Transforming Technical Vocational Education and Training for Meeting the Challenges of the Green Economy' was organised in Bonn. The meeting deliberated on three main issues: policy and framework, curriculum and programmes and capacity development through networking (UNESCO, 2011). The key recommendation was that a formal guide document for greening Technical Vocational Education and Training (TVET) be developed with accompanying capacity building strategies.

In a position paper to Rio+20, the USA Partnership on the Decade of Education for Sustainable Development (DESD) maintained that education has the critical function of generating and supporting partnerships that are catalytic in nature in the context of the green economy. This is because education institutions are able to conduct research, be innovative, and share working models with industry leading to sustained green jobs. The same views are shared by the Bildungskoalition (2011) who suggest that further education training and green jobs qualifications are necessary for galvanising green jobs and addressing youth unemployment. It is said by these groups that higher education must provide scientific qualifications for academic related job opportunities in the green economy.

Utilising a system-wide approach, the United Nations (2011) proposes a conceptual framework for assessing progress towards a green economy which also provides insight into the scope of knowledge and skills required for the green economy. The conceptual framework puts indicators into three major thematic groups: green investments, jobs and sectors; decoupling impacts and resource efficiency; and aggregate indicators of progress and well-being. Decoupling impacts and resources has issues like materials and waste, energy, water, land use and ecosystem change. Indicators on progress and well-being include poverty alleviation, equity and social inclusiveness. Togo and Nhamo (2012) spoke to a need to have university graduates embedded in sustainability issues as a way of life. In Berkshire's view, the real challenge of this century is not to prepare graduates for the ever increasing numbers of green jobs but to prepare them for a labour market where each job will be green. In the realm of sustainability, the world cannot be just about solar panels, wind turbines, energy efficiency technologies etc. The world must change the way it runs its unsustainable pathways with businesses and government entities that embrace fully the relationship between the inter-related dimensions of sustainability highlighted earlier.

Examples of how this is to be done are beginning to emerge from around the world. For example a report on skills for a green economy in the UK (Department of Energy and Climate Change, 2011) identified four key sectors in which both generic and light green skills are necessary. The sectors include resource efficiency, low carbon industry, climate resilience, and natural assets. Earlier, Evans-Klock *et al.* (2009) noted that green jobs are found virtually across many sectors of the economy all of which have green skills demands.

In deliberating on the promotion of corporate social responsibility for a green economy and innovative jobs in the EU, Pop *et al.* (2011: 1020) notice that in order to sustain the green economy, education must contribute in developing the right type of abilities and competencies for greener "entrepreneurs, managers and employees". In their view, skills aligned to the green economy come in two major categories: generic and specific. Specific skills are particularly needed and scarce. The green economy dictates that specific skills be pulled together in multidisciplinary teams of managers, engineers, planners, architects, economists, financial specialists, environmentalist etc. However, grounding in the sciences that include engineering, environmental and biological is a necessity in the emerging greener economy. In fact, all disciplines need some 'greening' to address key issues in the green economy such as climate change adaptation and mitigation. Carbon and energy auditing, for example, are becoming huge impact areas for climate change mitigation in a green economy. Unfortunately, not many institutions of higher and further education in Africa are offering specialisation in these fields. Skills gaps exist for green industries jobs like energy technicians, waste recycling specialists, wind turbine technicians, biofuels, carbon markets specialists, green economy strategist, solar technicians, smart grids technicians, cross sector adaptation specialists etc.

Addressing participants during the Sustainability Education Summit in Washington DC in 2010, the Under Secretary in the US Department of Education spend some time on how the several states were in the process of greening their curricula under the new green economy thinking (Kanter, 2010). The states involved were Ohio, New Jersey, Oregon, Georgia and Illinois. The states embarked on a 2 year programme to come up with prototype models that integrated green economy learning programmes of from secondary to university level study. Each state was working on a different and unique focus with Ohio specialising in biotech and agriculture, Oregon on wind, solar and sustainable building. Georgia focused on energy management, construction and transportation. The programmes combined rigour in academic and technical content. In terms of a career path, Table 1 highlights this.

Table 1. Green career pathway

Time of training	Green career path
Sixteen hours of training	Students can launch a new green career as a certified solar PV installer
2-year Associate of Applied Science degree	Students can upgrade their knowledge, skills and salary as an energy management technician
A four-year Bachelor of Science degree in renewable energy, for example	Opens up careers in energy design, management or international sustainable development, to name a few
Further along the pathway	Students may continue through graduate school to become a climate scientist

Source: Based on Kanter (2010:3)

Addressing the skills mismatch in the American economy in relation to the new demands of the green economy, particularly the clean energy sector, Gordon *et al.* (2011:44) maintains that 'Americans also need to commit to building a workforce with the basic technical literacy, and the specific technical skills, to excel at the myriad occupations that this economy will produce'. The authors encourage institutions of higher and further education to go 'beyond the traditional educational and workforce system toward a more flexible, more integrated, and more industry-focused training system'.

There are many other examples of studies that seek to explicate and outline the nature of the knowledge and skills that are needed for the green (see for example, Kanter, 2010; Cai *et al.*, 2011; Gomez, 2009; Evans-Klock *et al.*, 2009; Pop *et al.*, 2011) and to detail them all here will lead to repetition. Suffice to say that the new occupations that are emerging, are also creating need for a range of new learning pathways such as the one modelled above by the Kanter (2010:3) study. The key point emerging in this section is that if the green skills gaps are evident in a country that is believed to be efficient in its education system such as the USA, the challenge to countries of the south, including Africa could well be huge. Furthermore, given the adaptation focus outlined above, there is need for African education and training systems to give attention to the particular learning pathways that are most suited to the emergence of green economies in these countries.

Emerging Green Economy Education Interventions in Africa: Focus on Higher and Further Education

As discussed earlier, the green economy is beginning to open up a range of new challenges for education and training systems, including higher and further education. Some of the emerging initiatives from African higher and further education regarding green economy in the context of sustainable development and poverty eradication, green jobs and green skills are briefly reviewed below to show what progress is being made in this regard. The short review of initiatives shows the scope of educational engagement that is possible in educational institutions as the focus on green economy is taken up. It shows that green economy education is more than just skills training for specific jobs, but that it is a more holistic educational process that involves different types of educational institution activities and structural interventions. These are demonstrated via the short case examples that are included here. These can of course be further extended.

Policy development and policy contributions

One area in which higher and further education institutions can contribute to the green economy is via policy and strategy development for education and training. In March 2013, Unesco organised a well-attended experts meeting on Climate Change Education for Sustainable Development in Africa in Mauritius. The three day meeting was attended by over 100 climate change and sustainable development experts from across Africa who deliberated on issues pertaining to the meeting theme. What emerged from the meeting was that climate change education is now a key concern that should be addressed in the mix of general

education, and within green economy and sustainable development related education and training at all levels of the system. Box 3 contains 18 abridged key recommendations from the meeting.

Box 3. Key recommendations from the climate change education experts meeting

1. Use the concept of Education for Sustainable Development (ESD) as a common framework for climate change education (CCE).
2. Integrate CCE into teaching and learning at all levels and in all areas of education (formal, non-formal, informal) and throughout life.
3. Link the global and local perspective.
4. Address climate change adaptation but also mitigation through African education systems.
5. Take into account the complexity and interdisciplinary nature of CCE.
6. Consider the integration of values which support the ethical and spiritual appreciation of the environment as an integral part of CCE.
7. Learn from and respect different knowledge sources such as local and indigenous knowledge.
8. Encourage the development of pedagogies that support interactive participatory and future oriented learning for CCE.
9. Advocate for CCE in Africa in international mechanisms and processes.
10. Stress the importance of national policy support and policy development for CCE.
11. Include CCE competencies and skills into assessment frameworks.
12. Engage with youth in CC actions, discussions and peer to peer learning.
13. Develop group specific education and outreach programmes.
14. Integrate skills development for green jobs and employment in Technical and Vocational Education and Training (TVET) institutions and support sustainable livelihoods.
15. Develop, share, disseminate and up-scale good practices as a means to promote CCE regionally.
16. Develop indicators and monitoring tools and frameworks to measure the impact of CCE programmes, activities, and projects.
17. Promote the inclusion of CCE into international funding mechanisms.
18. Seek collaboration and partnerships for CCE.

Source: Based on UNESCO (2013:1-3).

To achieve the UNESCO recommendations from Mauritius, one is tempted to suggest that an array of short, medium and long term green learning pathways must be initiated in higher and further education settings across Africa, and in this sense the policy recommendations made at the UNESCO meeting can be further developed into curriculum development initiatives.

Curriculum development and development of specific degrees at postgraduate level

Another key area that is necessary for developing green economy education in higher education is development of curriculum, and especially new curricula for specialisation in new green economy areas. There are many such examples emerging in Africa, but for the purposes of this illustrative paper, an example here is drawn from the University of Nairobi in Kenya which now offers Master's and Doctoral degree programmes in Climate Change Adaptation. The programmes are offered in the Institute for Climate Change and Adaptation (ICCA). The ICCA has as its vision: 'To be the institution of choice for innovative climate change and adaptation research and training'. The ICCA focuses on five thematic areas addressing climate change and adaptation (www.icca.uonbi.ac.ke, visited 20 August 2013) namely: climate risk management and food security; human dimensions and heath; policy and communication; technologies; and water, environment and ecosystems. The Master of Climate change Adaptation programme has a key objective of imparting trans-disciplinary knowledge to candidates on the issues related to climate change and adaptation. On the other hand, the doctoral programme focuses on specialised in-depth research in the specified focus areas of the ICCA with the hope of finding lasting solutions related to climate change and adaptation, especially in Africa. Some of TVET programmes in Kenya are also re-orienting to include a focus on green economy, showing also the influence of higher education on curriculum development at other levels of the system.

Campus interventions to offer demonstrations for green economy learning

Another area for green economy education development in higher education institutions (HEIs) and TVET institutions is campus management interventions that offer real life learning sites. The Africa Green Campus Initiative (AGCI) is one of the innovations that is facilitating green economy mainstreaming on campuses (Africa Green Campus Initiative, 2013). Case studies show how higher education institutions from a number of countries in Africa are engaged with the AGCI and how green economy issues such as energy and water management in these institutions are being taken up at campus level, offering strong demonstration sites for such learning.

Conference developments offering opportunities for peer review of knowledge

Conferences also provide a means for developing higher education knowledge as academics produce their research for peer review and feedback. In the southern African context, the 31st Environmental Education Association of Southern Africa (EEASA) Annual conference that took place in Lilongwe, Malawi was dedicated to the theme 'Green Economy: Insights and Perspectives for Environmental Education in Southern Africa' (EEASA, 2013). The call for abstracts and papers identified nine sub-themes, among them: mainstreaming green economy in southern African Education institutions; Role of education and technology in developing green economy skills, government policies and green economy, green economy and low carbon emission development strategy, workplace based learning and the role of industry in green economy, green economy communities of practice and innovations, green economy: what does the future hold for Southern Africa?, the role of labour movements in green economy, and green economy: towards wealth creation and poverty alleviation in Southern Africa. This shows some of the scope for green economy knowledge production out of higher education institutions.

Research and knowledge development

Exxaro Resources Ltd (through its Chairman's Fund) is sponsoring four university research chairs at the University of South Africa (Unisa), University of Pretoria and University of the Witwatersrand. The Exxaro Chair in Business and Climate Change at Unisa is the oldest having been established in 2008. The Chair is involved in academic research in the fields of business and climate change, green economy transition, green jobs and international climate policy (Nhamo, 2012). At the University of Pretoria Exxaro Resources Ltd sponsors two Chairs namely: Energy Efficiency and Business and Biodiversity Leadership (Exxaro Resources Ltd, 2012). The last chair at the University of Witwatersrand focuses on Global Change and Sustainability. At the University of Cape Town, there is the African Climate and Development Initiative (ACDI) (University of Cape Town, 2012). In addition, the Energy Research Centre at the University hosts the Southern African Journal on Renewable Energy that has been in existence for many years. The ACDI offers a multidisciplinary year long masters in Climate and Development. The masters comprise four core modules focusing on (1) Earth System Science, (2) Development and Climate Change Economics, (3) Climate Impacts and Adaptation, and (4) Energy and Climate Change. In addition, there is a three months long mini research project and three optional modules. The optional modules are drawn from the following areas: International Climate Law, Sustainable Urban Systems, Climate Variability and Prediction, and Climate change and Biotechnology (University of Cape Town, 2012). The Energy Research Centre staff members have been instrumental in modelling during the development of South Africa's Long Term Mitigation Scenarios and are still active today (Ibid). Through the chairs and initiatives highlighted, the green economy agenda in higher education is becoming more and more visible. There are many other similar programmes and initiatives which have recently been reviewed by SARUA (2014, www.sarua.org) which show an encouraging trend reflecting responsiveness to green economy and climate change from within all of the southern African universities reviewed.

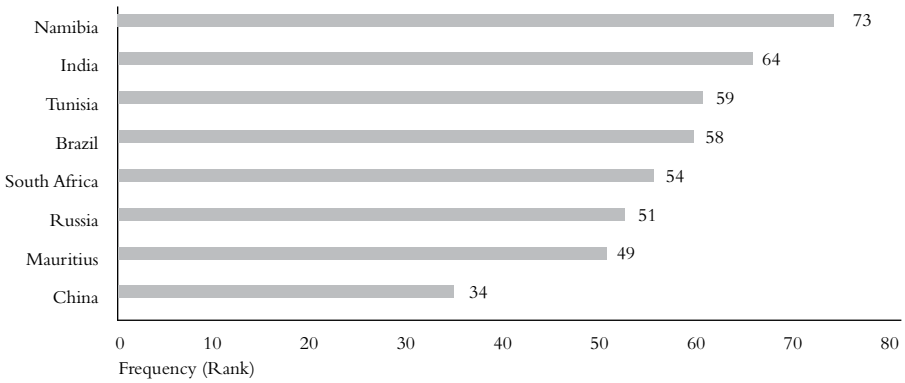
Whole institution development

Another means of engaging with green economy education and training development is strategies to strengthen whole institution development. To network into the growing green economy and sustainability agenda, Unisa approved on 22 January 2013 a proposal for the Green Economy and Sustainability Engagement Model (GESEM) (Nhamo, 2013). The GESEM responded directly to many *ad hoc* initiatives that were taking place within Unisa both from the administrative and academic perspectives aimed at addressing issues pertaining to the green economy, sustainable development, poverty eradication and jobs creation. The GESEM is championed by the Principle and Vice Chancellor's Office, the Vice Principal: Advisory and Assurance Services. The GESEM draws directly from existing and proposed initiative and thematic focus areas that include among them: Green Economy and Sustainability Policy Development and Incubations; Energy and Carbon Management; Waste, Pollution, Water and Biodiversity; Reporting and External Liaison; Records, Procedures and Awareness; as well as Complementary Initiatives.

Research system development

Closely related to and important for enabling knowledge production in higher education for a green economy is research system development. Behind every technological innovation (both successful and/or failure) there is a lot of work invested in research and development. By way of example, it is possible to see how a country, South Africa is used as case here, can intentionally drive green economy research via a system of interconnected research institutions that work closely with universities and also feed knowledge into TVET systems. The country finances a number of higher education related research councils and institutes enacted through acts of parliaments including: the Council for Scientific and Industrial Research (CSIR), Africa Institute of South Africa (AISA), Medical Research Council (MRC), Human Sciences Research Council (HSRC), National Research Foundation (NRF), The Agricultural Research Council (ARC), Water Research Commission (WRC), and South Africa Institute of International Affairs (SAIIA). A number of these are developing green economy and global change research programmes. It comes as no surprise that South Africa is ranked highly on the continent (coming in second place) after Mauritius in terms of innovation development (although not all of this is oriented towards the green economy). The country compares favourably with its emerging economies trading block partners of Brazil, Russia, India and China commonly abbreviated BRICS (Figure 5). Readers must note that in Figure 5, the lower the figure the higher the rank. A total of 141 countries were involved in the ranking.

Figure 5. Global Innovation Index 2012 ranks



Source: Author (data from Dura, 2012: xvii–xix).

Conclusion

This paper has reviewed the emergence of the green economy, scoping some of the key concepts associated with it. It further looked at some of the emerging developments internationally as educational institutions are called upon to re-orient towards a green economy and low carbon development in response to climate change. In Africa, there is a need to focus on adaptation. The paper indicated some of the scope and dynamics of the challenges that are being posed to higher and further education in response to the emergence of the green economy.

The paper then went on to review selected examples of practice from the African continent that are showing the dynamics and dimensions of educational re-orientation and green economy uptake, showing that within the educational system there are a range of ways of responding to and developing education and training for the green economy, that reaches beyond a simplistic view of training people for jobs only.

The paper was interested in scoping 'readiness' of institutions in Africa for responding to the emerging green economy. While only selective, the examples used reveal that there are policy and practice developments emerging in response to climate change and the green economy. However, there is still much room for further development of these, and of course these types of interventions would need to be present in all institutions across the continent, not only in some institutions only.

The 2013 UNESCO meeting that took place in Mauritius confirmed that one of the key ingredients to green economy transition, climate change education was still in its infancy in Africa. The National Environmental Skills Summit held in South Africa in 2012 declaration further confirms that more needs to be done to engage higher education in South Africa with green economy concerns. Insights from the USA further cement the view that skills needed to satisfy the green economy are still in short supply. Specifically, specialised green economy skills will take time to develop. The paper scoped a range of economic sectors that require specialist green economy skills like renewable energy and energy efficiency, natural resources management, waste management, green transportation and urban infrastructure programmes. Overall, green economy skills are demanded across each and every sector of the economy.

Institutions of higher and further education are therefore challenged to review existing practices (such as the few case examples alluded to above) and to expand these into more systemic efforts to remain relevant in an ever changing skills and jobs environment.

Overall, technical and vocational skills remain key in the green economy and this may also demand a revision of university programmes within a framework of green economy learning pathways as outlined in the example from the USA above in which technical and vocational training can be expanded into areas of ongoing specialisation and lifelong learning in higher education.

In sum, to support a holistic higher education system for a greener future, governments and other institutions tasked with developing policy must do so in order to prepare stakeholders that include both business and labour for the new global challenge, and that do so within a whole institution and whole system approach to educational development.

Note on the Contributor

Professor Godwell Nhamo is a Chief Researcher and Chair for the Exxaro Chair in Business and Climate Change hosted by the Institute for Corporate Citizenship at Unisa. Some of Professor Nhamo's research work has been in the broader environmental policy field. Professor Nhamo has published a number of papers addressing various policy perspectives on the Kyoto Protocol and the green global economy. Email: nhamog@unisa.ac.za.

Acknowledgements

The author thanks *Exxaro Resources Limited* for sponsoring the Chair in Business and Climate Change run under Unisa's Institute for Corporate Citizenship.

Endnotes

1. Known as the International Disaster Database and is maintained by the Centre for Research on the Epidemiology of Disasters (CRED) at the School of Public Health of the Université catholique de Louvain located in Brussels, Belgium.

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Southern African Journal of Environmental Education, Vol. 30, 2014

Exploring a Knowledge-focused Trajectory for Researching Environmental Learning in the South African Curriculum

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Abstract

This paper explores the past twenty years of environmental learning in the South African curriculum in order to consider how one might best research a knowledge focus within the Fundisa for Change national teacher education programme. In exploring this knowledge focus, the paper draws on international literature. It also extensively, but not exclusively, draws on two key publications which informed the 2002 and the 2011 curriculum changes in South Africa. The paper draws on social realist curriculum theory, underpinned by critical realism. This theoretical perspective, which includes Bernstein's pedagogic device and particularly recontextualisation of knowledge across the pedagogical landscape, provides a language of description for critically reviewing knowledge and environmental learning. In particular, the review develops five perspectives on environmental knowledge as it pertains to curriculum which include:

- *Perspective #1) new environmental knowledge in the curriculum;*
- *Perspective #2) environmental knowledge in local and global contexts;*
- *Perspective # 3) dynamic knowledge for open-ended and futuristic thinking;*
- *Perspective #4) depth and complexity of environmental knowledge; and*
- *Perspective #5) combining discipline-specific core knowledge and skills with a systems perspective.*

The paper argues for a re-emphasis and review of new environmental knowledge and learning support materials. It suggests a consideration of context-rich but not context-bound explorations of local and global environmental issues and the need for adopting open-ended and futuristic thinking in the context of the dynamism of environmental knowledge. This involves exploring systems of meaning and structures of knowledge in dealing with the complexity of environmental knowledge and acknowledging the challenges of a transformative ideology within such a complex knowledge system. Additionally the paper argues for creative ways of working across disciplines to develop better understanding of discipline-specific concepts and their potential to contribute to meaningful learning. The paper concludes by suggesting a research trajectory for future environmental education research in the context of the new South African Curriculum and Assessment Policy Statement (CAPS) *extending the emphasis in this paper on the official recontextualising field, to fields across the entire pedagogic device.*

Introduction

Le Grange (2002) reports that ecology was introduced into the South African curriculum in the 1970s, which for many years was the key entry point for environmental learning activities in South African curriculum work, primarily in the natural sciences. This ecological foundation lent itself to approaches to environmental learning consistent with 'nature study' and 'conservation education'. Such approaches to environmental learning focused on nature at risk for which 'ecology provided the symbolic capital of concepts' (O'Donoghue, 2007:147) and these approaches were often driven by state conservation agencies and associated with outdoor, hands-on, in-nature activities (ibid.). At this time many environmental learning activities facilitated within the formal school curriculum were not designed to challenge the socio-economic or political fabric of society and their emphasis on natural resources and their management or 'wise-use' (Irwin, 1990; Stevenson, 1987) were comfortably incorporated into the goals and structural organisation of schools. Provincial outdoor education programmes such as the racially exclusive ex-Transvaal's 'VeldSchools'[1] (for white children only) and outdoor education programmes in Bophutatswana (a former Bantustan established under apartheid in South Africa) and similar programmes run by the National Environmental Awareness Council in Soweto operated in co-operation with education departments (Irwin, 1990), mostly on the periphery of formal curricula. It was only in post-apartheid times (after 1994) that an inclusive and national curriculum set the scene for mainstreaming environmental learning (as will be detailed in later in the paper) in schools. An additional significant change in school-based environmental learning at the end of the apartheid era was brought about by national environmental education curriculum and policy initiatives (discussed below) which brought a human rights/social justice orientation to environmental work into the post-apartheid policy space (NEEP-GET, 2005b). Hence, it is this post-apartheid era, with an inclusive, integrated, social justice approach to environmental education, which is the time frame chosen for this exploration of the South African curriculum.

Environmental learning in the curriculum is explored in relation to three phases of the post-apartheid (post 1994) South African curriculum: The 1997 Curriculum 2005 (C2005), the 2002 Revised National Curriculum Statement (RNCS) for General Education and Training together with the National Curriculum Statement (NCS) for Further Education and Training, and the 2011 Curriculum Assessment Policy Statement (CAPS).

The paper explores a particular aspect of curriculum – namely a knowledge focus – which has been identified by a South African national network of environmental educators, the Fundisa for Change network, as a key research interest (Lotz-Sisitka *et al.*, 2013). Thus one key purpose of this paper is to serve as a positioning paper for the Fundisa for Change research programme. I have a particular interest in this programme, being the appointed research programme co-ordinator and since I have long been involved in the design of teacher professional development programmes that have led to the Fundisa for Change model and approach (Schudel, 2013). Drawing on a variety of sources, the paper will illustrate that the question of knowledge is central to the crisis of curriculum in South Africa, as captured particularly in two publications edited at the time of, and influential in, the transition from

Curriculum 2005 to the RNCS/NCS and then later in the transition from the RNCS/NCS to the CAPS. These publications with papers and input from leading academics in the country were: 'South African Curriculum for the Twenty First Century: Report of the Review Committee on Curriculum 2005' (Chisholm, 2000) and the 'Report of the Task Team for the Review of the Implementation of the National Curriculum Statement' (Dada *et al.*, 2009) respectively. To understand the knowledge-centred issues in the curriculum context, it is helpful to work with a social realist view of knowledge.

A Social Realist Knowledge Interest in Environmental Education Curriculum Research

One of the key interests of curriculum sociologists is the development of a social realist view of knowledge in and for curriculum research. Social realists argue that a realist approach to understanding knowledge in the curriculum is necessary to replace outmoded distinctions between traditional and progressive approaches which fail to highlight and give insight into the knowledge question (Moore, 2000) and subsequently result in the marginalisation of knowledge in curricula (Wheelahan, 2007). This concern is raised particularly in relation to the marginalisation of content knowledge in the outcomes-based iterations of the South African curriculum as well as the challenge of selecting and developing resources for teaching 'new' environmental knowledge to support curriculum work in South Africa (see Perspective #1 below).

A social realist view of knowledge requires a focus on epistemic relations. Maton describes two types of epistemic relations, the first being 'discursive relations between knowledge and other knowledges' (Maton, 2014:175). I draw on this notion of discursive relations to explore the relationship between local, indigenous and everyday knowledges and abstract discipline-specific knowledge (see Perspective #2 below).

The second type of epistemic relation as referred to by Maton (ibid.) involves the role of curriculum knowledge in providing access to the nature of the world (Wheelahan, 2010), that is, the intransitive world. This interest in the nature of the world, the intransitive world, or the 'objects' of the world are described by Maton as – the 'ontic relations between knowledge and its objects of study' (Maton, 2014:175). In this regard, this paper reflects on challenges presented to South African environmental educators as mediators of coming to know the nature of the object of environmental learning. Environment as 'object' of environmental learning is dynamic, changing and open-ended and thus knowledge emerging from this object displays these same properties (see Perspective #3 below). Additionally environment as object, and knowledge of environment requires systems of meaning and structures of knowing in the face of the depth and complexity of the object 'environment' (see Perspective #4 below).

The emphasis on epistemic relations (ontic and discursive) is an extension of the work of sociologists such as Bernstein whose work focused on socially powerful knowledge (Wheelahan, 2010) and its associated concerns with inequality and oppression. So, in addition to the role of providing access to the nature of the world (in the form of epistemic relations) as described above, Wheelahan describes a second key role of knowledge namely to provide

access to 'society's conversation' (Wheelahan, 2010:122). In acknowledging a critical realist view of curriculum as a moral/political entity, while at the same time neither viewing curriculum as ontologically essentialist, ethically prescriptive, nor ahistorical/atemporal; the paper, in Perspective #4 below, explores the ideological underpinning of the South African curriculum and its role in guiding curriculum conversations.

Finally, in the section discussing Perspective #5 below, social realist interests in both systems of meaning as well as ensuring strong discipline-specific knowledge and skills is explored in relation to the South African curriculum's changing knowledge structure. This is especially related to inter-disciplinarity and the fluidity of learning area/subject/learning programme boundaries which are often required for a full understanding of environmental histories, systems, concerns and environmental solutions or solution-oriented knowledge.

Before the different interests and challenges of the South African curriculum are discussed in detail in relation to the above-mentioned social realist and critical realist perspectives, a brief summary of the development of an environmental focus in the South African curriculum since 1994 is outlined.

A Brief Summary of the Development of an Environmental Focus in the South African Post-Apartheid Curriculum

The main instigation for the post-1994 mainstreaming of environmental education in the education and training sector was the call for inclusion of environmental education across the education and training system in the 1995 *White Paper on Education and Training* (Lotz-Sisitka & Raven, 2001). This arose from the ANC environmental desk, who actively supported an environmental focus in educational deliberations for post-apartheid curriculum transformation in the early 1990s in association with the Environmental Education Policy Initiative and its follow up structure, the Environmental Education Curriculum Initiative (Lotz-Sisitka, 2002). Resulting from this political engagement with curriculum and in relation to the emergence of an environmental rights clause in the post-apartheid Constitution, the earliest policy response in schooling to this call was the inclusion of 'environment' as a cross-curricular phase organiser[2] in Curriculum 2005. Curriculum 2005 was based on an outcomes-based curriculum design, and was introduced to South African schools in 1998. A key mechanism for integration of knowledge in this curriculum design was the use of these 'phase organisers' (ibid.).

When phase organisers were discontinued in the next curriculum revision four years later, environmental concerns in the RNCS/NCS were acknowledged in a guiding principle concerned with the 'relationship between human rights, social justice, a healthy environment and inclusivity' (South Africa. Department of Education, 2002b:10). Like Curriculum 2005, the RNCS/NCS was an outcomes-based curriculum and an environmental interest was integrated explicitly in critical outcomes and specific learning outcomes defined by the curriculum. Additionally it was also highlighted in the role and features of learning areas and in core knowledge foci of the Social Sciences, Natural Sciences and Economic and Management Sciences (Schudel, 2013; Lotz-Sisitka, 2002). These core knowledge foci included topics such as biodiversity and sustainable use of resources. This extensive and comprehensive attention to environmental concerns across all these

design features of the curriculum was testimony to the intensive policy engagement amongst environmental educators at a national level during the development of a curriculum for the new South Africa (Reddy, 2011; le Roux & Maila, 2004; Lotz-Sisitka, 2002).

In the 2011 change to CAPS nine years later, the principle described above has been retained and an explicit environmental interest is also evident in its general aims. For example it aims to develop learners that can 'use science and technology effectively and critically showing responsibility towards the environment and the health of others' (South Africa. Department of Basic Education, 2011b:5). This aim reflects the original 'critical and developmental outcomes' that guide all qualifications, teaching and learning in South Africa, and this has been retained since first developed in 1996 and applied to C2005 (see below in Perspective #4). Environment is also evident in the CAPS in the 'specific aims' of some subjects. For example the CAPS Life Skills subject (Grades 1 to 3) has as one of its specific aims that learners need to develop 'an understanding of the relationship between people and the environment' (South Africa. Department of Basic Education, 2011b:8). Furthermore, in the CAPS, environment is integral to the curriculum in the form of specific content knowledge in environmental concepts such as the notion of sustainability, environmental issues such as pollution and climate change, and concepts such as ecology and biodiversity which are foundational to understanding the biophysical dimensions of environmental issues and risks.

Perspectives on Environmental Knowledge Pertaining to Curriculum

Perspective 1: New environmental knowledge in the curriculum

The introduction of the outcomes-based Curriculum 2005 in South Africa was an attempt to 'shift away from a rote and transmission-oriented learning approach' to curriculum (Sayed, 2004:257) – a conservative curriculum tradition in which 'concerns are with social order and appropriate relations of deference rather than inducting students into the controversies and debates with the academic disciplines and in society' (Wheelahan, 2010:106). The new outcomes-based system undermined knowledge in a different way as suggested in an early critique of Curriculum 2005 by Sayed who stated that there was 'a risk that providers might focus only on teaching methods, and ignore the need to provide trainee teachers with the content knowledge they also require' (2004:257). This indeed became the case and was exacerbated by curriculum policy where 'the proper and comprehensive use of textbooks was discouraged and undermined by Curriculum 2005' (Dada *et al.*, 2009:9). Environmental educators responded to this 'textbook' gap at the time by emphasising 'resource-based learning' which focused on the provision of contextualising learning and teaching materials elaborating on environmental themes and providing pedagogical guidance on the use of these (Lotz-Sisitka & Russo, 2003; NEEP-GET, 2005a; Russo, 2003; Schudel *et al.*, 2008).

An early post-apartheid response to the environmental content knowledge challenge in South Africa was the Science and Sustainability Project based at the University of Stellenbosch which contemplated the problem of how to present 'new'[3] environmental knowledge through searching for relevant principles or themes. This was during the development of the *Windows on the Wild* educational materials focusing on biodiversity in South African ecosystems. Besides

biodiversity, this project identified themes related to resource use, carrying capacity of the environment, recycling, ability of the environment to self-heal, and roles played by different species in ecosystems. These were all seen as significant knowledge foci under an umbrella theme of sustainability (Schreuder, Reddy & le Grange, 2002). Another early response to the need for new environmental knowledge was the development of a set of South African-centred *EnviroFacts* (Paxton, 2001). This set of fact sheets focused on key concepts relevant to environmental learning such as sustainability and development, sustainability practices such as permaculture and recycling, environmental issues such as pollution and biodiversity, special and endangered species such as cycads and rhinos, habitats such as wetlands and rivers, biomes such as the fynbos, and more. These fact sheets were intended to be used in environmental learning programmes 'in response to a growing need amongst South Africans for information about their environment' (ibid.).

Even with a re-emphasis on content knowledge in the RNCS, this curriculum revision was still criticised for knowledge that was 'thin, interspersed and inconsistently presented' (Dada *et al.*, 2009:45). This concern is consistent with reports from environmental education research that teachers experienced difficulties with finding relevant content knowledge (Schudel, 2010) and unfamiliarity with environmental concepts new to their frame of reference (Lotz-Sisitka, 2009). It might also be ascribed to the dichotomising of new and old curricula resulting, for example in 'outcomes' being favoured over 'content' (Chisholm, 2000; Harley & Wedekind, 2004).

In the curriculum review which lead to the development of the CAPS, Dada *et al.* reported that 'the intention is to streamline the curriculum documents into single documents for each grade and each subject in which content and assessment are specified' (2009:6). Such curriculum imperatives are a central concern of social realist researchers such as Wheelahan (2010) who argues for discipline-based theoretical knowledge to be the core aim of education (see also Muller, 2000; Young & Gamble, 2006; Allais, 2007; Bertram, 2009). Spearheading engagement with CAPS foundational knowledge in the environmental field is the work of the Fundisa for Change Programme which has identified that 'environment and sustainability content permeates a wide range of subjects' (Lotz-Sisitka, 2011:7). In response to this new curriculum content, this programme has developed topic, phase and subject-specific materials for teacher professional development seeking to address issues of knowledge progression, conceptual development, scope and depth of knowledge at various phase levels, and expanded knowledge of teachers (that is to expand teachers' knowledge beyond the specific curriculum content of the CAPS) (Fundisa for Change Programme, 2013).

Earlier on, when critiques of OBE first became more substantive, Moll (2002) offered an insight into the problems being experienced. He suggested that part of the problem was a naïve interpretation of constructivism in which group work was over-emphasised and in which learners were left to construct their own meaning of new concepts without teachers acknowledging the need for the mediation of new knowledge (Dada *et al.*, 2009). This may partly be ascribed to the dichotomisation between the new and old curricula with 'learner-centred' pedagogy being favoured over 'teacher-centred' pedagogy (Chisholm, 2000; Harley & Wedekind, 2004). This challenge to content knowledge was also raised through research in the Learning for Sustainability Project,[4] which reported evidence that learners were working

in a knowledge vacuum due to an over-emphasis on group-work which actually distracted learners from core conceptual learning, and from 'consolidating knowledge and developing new understandings' (Lotz-Sisitka, 2000:108). This led to what Lotz-Sisitka described as 'learner-centred emptiness' (2002:114). This naïve approach to constructivism undermined the development of knowledge in a different way to the pre-1994 conservative tradition as described above, this time via an over-emphasis on 'processes of meaning-making that focus on the tacit, contextual and applied at the expense of disciplinary knowledge' (Wheelahan, 2010:113).

Perspective 2: Environmental knowledge in local and global contexts

Wheelahan's critique of an over-emphasis on the tacit, contextual and applied is a crucial critique for environmental educators in South Africa who historically have foregrounded the development of knowledge in local contexts as emphasised by 'local enquiry, problem solving and action learning' (O'Donoghue, 2007:150). This interest in South Africa was supported through learning and teaching support materials such as the ShareNet Hands-On Series (Rosenberg, O'Donoghue, & Olvitt, 2010) which support fieldwork activities in different South African ecosystems. Two interventions described in the following two paragraphs – one a course and another a set of materials – illustrate that environmental educators in South Africa are conscious of critiques such as Wheelahan's and are focusing their energies on developing activities and materials that ensure that the tacit, contextual and applied nature of local knowledge is used in ways that strengthen rather than weaken disciplinary knowledge.

In the first intervention – a course-based intervention – Schudel (2013) explored the role of local enquiries in different disciplines. Through case studies of this course-based intervention in six Foundation Phase classrooms, she identified a number of specific 'modes of enquiry' used in different learning areas in the RNCS. These included asking questions, finding information, and organising, analysing and synthesising information (Social Science – History); exploring issues with representation methods such as graphs, tables, maps, photographs and images in order to support this (Social Science – Geography), experimental modes of enquiry with data representation methods such as posters, pie charts, graphs, concept maps and diagrams (Natural Sciences); collecting, sorting, describing and explaining collections of objects with pictographs as a dominant data representation (Mathematics).

The second intervention discussed here is the recent Handprint Series (O'Donoghue & Fox, 2009) – an intervention featuring comprehensive materials which explore local sustainability practices, providing scientific and technical explanations and associated local culture and heritage stories. These materials are illustrative of the publisher – ShareNet's – valuing of 'contextual responsiveness, social relevance and curriculum validity' (Olvitt, 2002:26, in Olvitt, 2004). Again, environmental educators' concerns for the integrity of disciplinary knowledge is highlighted in this quote. In working with sustainability practices the Handprint Series illustrates how strongly grounded scientific knowledge can be used in situated ways that are not just focused on technical acquisition. They also respond to a particular challenge highlighted in the NEEP-GET pilot research report that, with the imperative to do something 'environmental' within the curriculum framework (in Curriculum 2005 when environment was a phase

organiser), teachers may develop activities that only superficially respond to environmental issues and do not serve learning area requirements (Lotz-Sisitka & Raven, 2001; Schudel, 2006).

Another potential problem with a focus on local enquiry is that of local conservatism (Lotz, 1999) where an over-emphasis on local sustainability practices fails to position learners and learning in the broader societal context or where activities are 'mostly reliant on what learners [know or can] deduce from a particular environment' (Lotz-Sisitka & Raven, 2001:47) or practice. Such research indicates why it is important that environmental learning activities respond to the CAPS call for 'grounding knowledge in local contexts, while being sensitive to global imperatives' (South Africa. Department of Basic Education, 2011c:3). For example how does making a water filter relate to issues of water quality and wetland loss at national and global level? Or, how does growing indigenous plants relate to biodiversity loss in specific threatened biomes and in relation to international threats to biodiversity? This relational perspective between the local and global in environmental learning can ensure that a focus on solely the local does not lead to a situation where knowledge becomes 'an epiphenomenal outcome of practices that is ephemeral and context bound' (Wheelahan, 2010:113) and therefore not useful outside of a particular context.

Furthermore at both the local and global level attention needs to be paid to 'discursive knowledge' (Maton, 2014, see above) so that, for example, harvesting of indigenous wild plants and livelihoods in a local community (indigenous and local knowledge) as well as species extinction or food security at national or global level (everyday knowledge found in many news items of today) can be related to abstract concepts in specific disciplines. The Fundisa for Change programme has begun to do this work in its subject-specific explorations of environmental topics in the curriculum, for example these local and global challenges have been related to the three levels of biological diversity, namely genetic, species ecosystem biodiversity; or to the relationship between biodiversity and human well-being in the Life Sciences (Shava & Schudel, 2012). Thus, I am proposing that local, indigenous and everyday knowledge of local and global significance plays an important role in developing discursive epistemic relations and in developing 'systems of meaning' as highlighted by Wheelahan (2010:119).

Perspective 3: Dynamic knowledge for open-ended and futuristic thinking

So, if the above section has argued that context bound knowledge has limited use to a learner (with emphasis on the limitations of boundedness rather than on the limitations of contextualizing knowledge), then a further question would be: How can we prepare learners in order to use and develop their knowledge in new and unexpected contexts? Knowledge for all contexts can't be predetermined because of the critical realist contention that, no predictions can be made of a society which is open-ended, contingent and contextually dependent. Bhaskar argued that 'there are no explanatory significant empirical regularities yielded by social science, so the social domain is *de facto* open' (1993:156). Archer elaborated in arguing that social systems are both extrinsically and intrinsically open. This means that it is impossible to attempt to definitively describe society even with the proviso of excluding external influences because systems are peopled by creative and innovative agents whose reflexivity will ensure constant engagement in thought experiments and constantly changing practice (Archer, 1998).

This understanding of open systems is consistent with a view of the environmental crisis as expressed by the South African National Research Plan which states that 'a complex system of non-linear interacting factors incorporating time-lags and spatial heterogeneity is unlikely to change in a smooth and predictable fashion when nudged in a particular direction' (South Africa. Department of Environmental Affairs, 2010). Indeed, it is also consistent with the scientific enterprise whose main objective is ongoing discovery of new knowledge of human and natural systems and processes. When this gets translated into curriculum however, it tends towards representing knowledge as fixed, static and already discovered.

Environmental educators are accustomed to working with the open-ended nature of the social world. For example, Wals describes our world as one of 'continuous change and ever-present uncertainty' (2007:37). The uncertain and contested nature of environmental knowledge has been identified as a core challenge within the Fundisa for Change network (Fundisa for Change Programme, 2013). In response to this challenge Wals calls for a 'systemic and reflexive way of thinking and acting' (Wals 2007:37) and Lotz-Sisitka argues that knowledge should be developed in a way that is 'expansive and critically constructed in relation to its basic tenets' (2011:55). A further challenge of this complexity is that it demands of students 'considerable tolerance for ambiguity and uncertainty, autonomy for making judgments, and the confidence and insight to challenge conventional wisdom' (Stevenson, 1987:77). This means working with CAPS-based environmental knowledge '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' (Lotz-Sisitka, 2011:28). For example one particular topic in the Life Sciences of the Further Education and Training Band of the CAPS requires learners to investigate 'human impact on the environment: Current crises for human survival: Problems to be solved within the next generation' (South Africa. Department of Basic Education, 2011e:51).

Drawing on a critical realist ontological position that the world is not reducible to what we experience or the events that take place (Bhaskar, 1978), Wheelahan argues for an open-ended perspective on the future that 'there is much that could happen and understanding this is necessary if we are to think the unthinkable and the not-yet-thought' (Wheelahan, 2009:230). However, thinking the unthinkable could become a challenge in a country that has struggled with freeing itself from pre-apartheid authoritarian ideologies, consistent with a performance-based curriculum model of tight control (Taylor, 1999). Such authoritarian approaches to education can be related to behaviourist/mechanical pedagogy which emphasises pre-determined behaviours at the expense of learning processes (Jensen & Schnack, 1997; Jickling, 1997).

A critical realism perspective rejects 'essentialist views of human nature, deontological ethical prescriptiveness, and ahistorical/atemporal justifications for particular ways of life' (Scott, 2000:112) which are associated with such behaviourist approaches to curriculum. A problem with pre-determined behaviours could be seen for example in an assessment standard in the RNCS which expected that a learner 'participates in a recycling project and explains how recycling contributes to environmental health' (South Africa. Department of Education, 2002a:17). Here there appeared to be an assumption that recycling was 'good' and critical

engagement was a distinct 'gap' in this proposed activity (Schudel, 2013). However, at the same time, the South African RNCS appeared to be seeking an alternative to an authoritarian approach to learning through its commitment to a 'lifelong learner who is confident and independent, literate, numerate and multi-skilled, compassionate, with a respect for the environment and the ability to participate in society as a critical and active citizen' (South Africa. Department of Education, 2002b:8). This tension between critical and behaviourally driven intentions has been a concern amongst environmental educators for some time as is evident in Stevenson's argument that: 'whereas a curriculum in environmental education is emergent and problematic in that the content arises as students are involved in specific environmental problems, most school curricula are predefined since they are designed to serve predetermined behaviourally specific ends' (Stevenson, 1987:75). Stevenson argues furthermore that in the 1980s, (in the United States of America) a conflict arose between the 'ideological and political enquiry' central to environmental learning and the 'dominant practices in schools, which emphasise the passive assimilation and reproduction of simplistic factual knowledge and an unproblematic "truth"' (1987:69). This conflict was also evident in South Africa during the implementation of Curriculum 2005. The conflict was underpinned by a persistence of transmission and rote learning teaching methods and implied authoritarian ideologies (to which teachers had been exposed as learners in schools and as student teachers during the apartheid era), which contrasted with the democratic and rights-based approaches in new curriculum policy (Chisholm, 2000).

A potentially useful notion for understanding how such ambivalence arises in curriculum situations is illustrated in work by Lotz-Sisitka who explored tensions between a curriculum intention to enable 'generative power for social change' and an emerging governmentality, that is, 'government instituting techniques and concerns for self-government' (2005:15). A further example of such tension between generative and governmental intentions was evident in the RNCS with the uncritical promotion of economic growth in the Environmental and Management Sciences curriculum while ignoring possibilities for alternative economic models and highlighting the role of schools in preparing citizens for a role in a capitalist economy (Schudel, 2013).

The envisaged 'active and critical' citizen discussed above is also taken forward in the CAPS, which calls for an 'active and critical approach to learning, rather than rote and uncritical learning of given truths' (South Africa. Department of Basic Education, 2011b:8). The coupling of the words 'active' and 'critical' implies an intention that curriculum interpretation should not simply be the 'internalisation of the foundations of knowledge' but one that promotes a 'more reflexive society that is able to critique and overturn existing routines, values, norms and interests which we (can) know or intuitively feel are deeply unsustainable (Wals, 2007:43). The new CAPS appears to be promoting a reflexive approach throughout all phases in the languages. These incorporate reflection on values, for example, in the Foundation Phase a learner in an English class 'reads books and discusses the main idea, the characters, the "problem" in the story, the plot and the values in the text' as one part of regular daily reading (South Africa. Department of Basic Education, 2011a:26). In higher grades the languages also enable a view of values as contestable, complex and not always liberating as evident in the Senior Phase Home

Language call for learners to 'reflect on stereotyping and other biases' (South Africa. Department of Basic Education, 2011f:16). Such critical perspectives on curriculum are important from a critical realist perspective as they enable forward and creative thinking and because, as Bhaskar argues 'if one is to act at all, there must be grounds for preferring one belief … to another' (1979:58). This insistence on understanding that 'some claims to knowledge are less valid than others are' (Muller, 2000:163) is consistent with the social realist critique of interpretations of constructivism where knowledge becomes simply 'the reflection of differently positioned actors or voices' (Wheelahan, 2010:113).

Perspective 4: Depth and complexity of environmental knowledge

The previous section discussed the importance of the role of curricula in developing active and critical thinkers who can do more than simply internalise knowledge, however the 2009 curriculum review of the RNCS/NCS instigated an intensive content knowledge coverage prescribed in the CAPS. The challenge here will be to ensure that depth of learning is not sacrificed for the sake of breadth so that 'students know very little about many things [without] developing high-level thinking skills' (Taylor, 1999:122). The CAPS curriculum has varied responses to assessment across the different subjects which highlight the importance of such high-level thinking skills. Some subjects distinguish between lower, medium and higher order thinking skills in assessment processes; for example, English Home Language requires learners to comprehend, reorganise, infer, evaluate and appreciate (South Africa. Department of Basic Education, 2011a). Other subjects such as the Further Education and Training History CAPS specify different cognitive levels (South Africa. Department of Basic Education, 2011d). Essentially though all subjects specify particular verbs that are important for developing depth and complex understandings, all of which need to be considered in the planning of environmental learning. Dealing with complexity is highlighted in one of the new CAPS curriculum principles calling for 'progression [where] content and context of each grade shows progression from simple to complex' (South Africa. Department of Basic Education, 2011c:6). This is important from a social realist perspective which highlights the importance of 'systems of meaning and structures of knowledge' (Wheelahan, 2010:119).

A further challenge of complexity in the South African post-1994 curriculum has been that of equality and redress in response to past oppression (Dada *et al.*, 2009). Harley and Wedekind's description of the mission of the post-apartheid curriculum, namely that of 'uniting all citizens as equals in a democratic and prosperous South Africa' (Harley & Wedekind, 2004:195), can be related to a reaction against an apartheid curriculum agenda to 'prepare different groups for dominant and subordinate positions in social, political and economic life' (ibid.:195). This curriculum interest is an explicit example of critical realism's insistence that the learning environment is a moral/political entity being 'in part normative, [and] meaning it entails decisions about what could or should be the case' (Brown, 2009:26).

An explicit transformative ideology was also implied in the RNCS principle discussed in summary of curriculum transition above. This principle was reiterated in the CAPS as an interest in 'human rights, inclusivity, environmental and social justice' (South Africa. Department of Basic Education, 2011c:6). Constitutional imperatives were highlighted and

endorsed in both the RNCS and the CAPS, which both committed to democracy, social justice and human rights and explicitly healing past divisions and improving quality of life for all (South Africa. Department of Basic Education, 2011b; South Africa. Department of Education, 2002b). In support of transformation in society, one particular teaching resource that presented a rights-based approach to the RNCS was *Hadeda Island* – a set of materials designed to explore freedom of speech, listening skills, respect for others' opinions, and voicing needs in a community – paralleled with an exploration of the adaptation, biology, diversity and behaviour of birds (Olvitt, 2003 in Olvitt, 2004).

The rights-based approach made explicit in the RNCS was elaborated by critical outcomes expressed across all learning areas, for example the learning outcome discussed in the in summary of curriculum transition above that required learners to 'use science and technology effectively and critically showing responsibility towards the environment and the health of others' (South Africa. Department of Education, 2002b:11). This was further elaborated as open-ended learning area-specific learning outcomes such as in the Natural Sciences that: 'the learner will be able to make informed decisions regarding personal, community and environmental health' (South Africa. Department of Education, 2002a:5). These learning outcomes are no longer the dominating educational objective as they were in the RNCS. These ideologies are now explicit in the general aims of the curriculum (the above-mentioned critical outcome is now labelled a general aim in the new CAPS curriculum). Furthermore environmentally significant ideologies can be found in the explanations of the purpose of the specific subjects, for example the Further Education and Training Life Sciences CAPS requires learners to 'understand the contribution of science to social justice and societal development as well as the need for using scientific knowledge responsibly in the interest of ourselves, society and the environment' (South Africa. Department of Basic Education, 2011e:12).

With a focus on both social relations (in the rights-based curriculum principle) and epistemic relations (central to, but not exclusive to the principle concerned with progression of content), there is potential in the new CAPS curriculum to develop understanding of 'the socially mediated basis of our access to knowledge and its relationship to its referent (its aboutness) [making] it possible to critique knowledge producing social practices that contribute to privilege and power while at the same time valuing the epistemic insights such knowledge provides' (Wheelahan, 2010:116).

Perspective 5: Combining discipline-specific core concepts and skills with systems perspective

The previous section dealt with the complexity of knowledge. A further knowledge question is the degree of fluidity of discipline boundaries in helping to provide varied perspectives on the complexities while at the same time keeping the integrity and strength of discipline-specific knowledge and skills intact. Across the three curriculum changes, South African environmental educators sought different ways of approaching an environmental interest in the curriculum. Explorations of cross-curricula integration in Curriculum 2005 and the RNCS suited the re-organisation of the South African curriculum into 'learning areas' instead of 'subjects'. A learning area was defined as 'a field of knowledge, skills and values which has unique features

as well as connections with other fields of knowledge and learning areas' (South Africa. Department of Education, 2002b:9). This meant a curriculum structure with more fluid boundaries and opportunities for integration across different 'fields of knowledge'. Integration became a key feature of lesson planning and teachers were expected to integrate across learning outcomes (within learning areas) as well as across learning areas (ibid.).

However in practice, in South Africa, a problem with the integrated cross-curricular approach to environmental learning (as promoted by environment as phase organiser as well as the principle of integration across learning areas in the RNCS) was that the lessons developed for cross-cutting themes were not furthering the aims of the learning area nor deepening knowledge or process skills from specific learning areas (Lotz-Sisitka & Raven, 2001). Similarly the 2009 curriculum review raised the concern that the RNCS failed to 'adequately provide the coherent, systematic content and knowledge to satisfy the specific aims of the curriculum' (Dada *et al.*, 2009:13).

Wheelahan's circumspect perspective on some interpretations of inter-disciplinarity, can help navigate this problem with the explanation that 'rather than negating disciplinary boundaries, the explicit negotiation of these boundaries helps us to understand when we are drawing on one discipline to develop another and to develop a better understanding of the complexity of these concepts and their contribution' (Wheelahan, 2010:82). From this point it can be argued that inter-disciplinarity requires first the development of strong discipline-focused skills before these can be usefully employed in cross-curricular or inter-disciplinary endeavors. In South Africa, such a move amongst environmental educators to a primary emphasis on strengthening the discipline was evident in an explicit emphasis on working with the environmental focus *integral to* each learning area in the RNCS, rather than over-emphasising the cross-curricular opportunities in environmental education (Lotz-Sisitka & Raven, 2001).

While inter-disciplinarity has less emphasis in the new CAPS, it has had relevance in the Foundation Phase across all three iterations of the curriculum. That is, through the phase organisers in Curriculum 2005, as well as through integration across the three Learning Programmes in the RNCS (Life Skills, Mathematics and Language). In addition the RNCS Foundation Phase Life Skills Learning Programme[5] integrated learning outcomes internally – that is an integration of the main learning area, Natural Sciences, with Social Sciences, Technology, Economic and Management Sciences, and Arts and Culture. Currently, within the CAPS Foundation Phase Life Skills subject, teachers are expected to use 'topics … as a means to integrate the content from the different study areas where possible and appropriate' (South Africa. Department of Basic Education, 2011b:14). For example, the Grade 3 Life Skills CAPS topic of waste (South Africa. Department of Basic Education, 2011b:55) requires learners to understand:

- 'What happens to our waste [supporting a Natural Science understanding of issues of land pollution in informal dumping, air pollution in burning, and issues of space and leaching in burying]
- Re-using, Recycling, Reducing and knowing what can't be recycled [supporting a Social Science understanding of resource use]
- Recycling at home and at school [supporting a Life Orientation interest in citizenship]

- Making compost out of things that rot [supporting a Natural Science understanding of 'living soil'].'

If such topics are approached with a clear understanding of the discipline specific core concepts and skills needed to give meaningful insight into real world problems then it enables possibilities – as with interdisciplinary research described by Bhaskar (2010) – for enabling empathy, understanding and creative employment of concepts, models, analogies and insights across fields and disciplines. Additionally, by focusing on topics in this way, learners can develop important systems perspectives on knowledge, such as understanding the patterns of change, discovering how living things fit into their surroundings, cause and consequence, conservation action to make the world a better place, interrelationships and interdependence, diversity, and place (Lotz, 1996).

In the CAPS, from Grade 4 upwards, subject boundaries are drawn more tightly and the danger is no longer so much one of 'watering down' core knowledge and skills but one of preventing a reductionist and atomistic presentation of curriculum concepts. The challenge for curricula is that knowledge should not become 'little more than the "construction of meanings" or "a conversation" – regardless of what these meanings are, what the conversations are about, or whether they give learners any reliable understanding of the world, or power over it' (Young, 2008:191). The CAPS general aim which requires that knowledge is used to 'demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation' (South Africa. Department of Basic Education, 2011e:5) highlights the importance of not losing sight of the integrated and applied potential of knowledge.

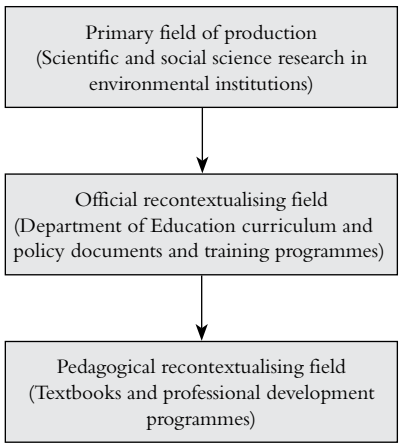
Essentially knowledge needs be seen as a 'causally important objective in its own right because of the access it provides to the nature of the world and to society's conversation' (Wheelahan, 2010:106). This means ensuring that core knowledge and skills are developed in such a way as to promote understanding of issues, and 'social innovations that provide ways forward and "out of" or "in response to" the issues presented in the CAPS' (Lotz-Sisitka, 2011:55). For example, issues such as pollution, climate change, or biodiversity loss which are presented as explicit environmental challenges in the CAPS curriculum. This requires still emphasising a systems perspective while employing the ever-more specialised enquiry skills and sophisticated understandings offered by subject specialisation.

Implications of this Review for Further Research

The social realist and critical realist commentary on the development of, and associated potential and challenges with, environmental learning in the South African curriculum over the past twenty years has suggested the value of considering the curriculum knowledge questions for environmental learning from a range of perspectives. The perspectives outlined above, could help to guide curriculum research in environmental education for those that are interested in the knowledge-curriculum relation. What was also evident from the review above, but not discussed as such, is that the knowledge that appears in the curriculum (via

various curriculum designs and policies e.g. OBE, phase organisers, CAPS, etc.) is knowledge that is recontextualised from the field of production (where knowledge is first produced). For example, biological scientists and ecologists produce knowledge of biodiversity, which is then recontextualised by curriculum developers, textbook authors, teacher educators and teachers themselves. Bernstein (1990), also a social realist, provides a model of the 'pedagogic device' (see Figure 1 below) which allows one to see that knowledge is not just constructed in the mind of the learner in pedagogic interactions, but that knowledge arises from years of scientific practice in the field of production. Education systems then have various strategies for recontextualising this knowledge.

Figure 1. Production, recontextualisation and reproduction of environmental knowledge across Bernstein's pedagogic device



Source: Adapted from Bernstein (1990).

As I move towards concluding this paper, I draw on Bernstein's recontextualisation theory, to suggest potential research trajectories for the ongoing Fundisa for Change work with the new CAPS curriculum, drawing on the insights developed through this thinking process. Reflecting on the analysis provided above in Perspectives #1–5, drawing on a Bernsteinian (1990) perspective, it is possible to suggest that the discussions on knowledge above are limited to the way environmental knowledge has been recontextualised in the official recontextualising field (Bernstein, 1990). As noted above, the perspectives offered in the review are limited to a consideration of environmental knowledge as visible in changing curriculum policy documents and reviews of these. Some of the examples drawn on also show how such knowledge has been recontextualised into the pedagogical recontextualising field (ibid.) with some reflections on textbook use and the development of supplementary environmental education materials, particularly by environmental educators. The proposed research trajectories below will also include suggestions for extension of research in these fields as well as propose research in the field of production (the scientific work of environmental institutions internationally, nationally

and locally) and the field of reproduction (the realm of environmental learning in the classroom) in order to further explore the knowledge challenges across the 'entire pedagogic device' (ibid.). The latter, the field of reproduction is particularly pertinent to a critical realist insistence that 'the learning environment is partly but not wholly linguistic, and the creation, reproduction and sharing of meanings are core activities of the learning environment' (Brown, 2009:31). The field of reproduction, with its emphasis on the mediation of knowledge, is also pertinent to the critical realist understanding that while we 'may lack unmediated access to external reality, we do have mediated access to it' (Benton & Craib, 2001:74).

- Based on the above analysis, and the perspectives on curriculum recontextualisation offered by Bernstein, and discussed briefly above, I suggest the following potential research trajectories for further exploration within the CAPS curriculum environment: A subject and phase specific audit of new environmental knowledge in the CAPS curriculum will extend the Fundisa for Change exploration of the extent of new environment and sustainability content (Perspective #1) and the extent to which it is coherently and systematically represented (Perspective #5). This same question can be extended to textbooks used to support the teaching of the CAPS curriculum as well as used to explore the how this new knowledge relates to the knowledge of teachers and the recontextualisation of this knowledge in classroom practice.
- An exploration of key international and national science and social science reports dealing with environmental concerns can provide an analysis of the relationship between the field of production of environmental knowledge and the new environmental knowledge as presented in the official recontextualising field (in the curriculum) and in the pedagogical recontextualising field (in textbooks specifically) (Perspective #1).
- Particularly, but not exclusively in classroom contexts, situated learning processes can be explored for their potential to link local and global contexts in ways that are not context bound but context rich and which have the potential to strengthen systems of meaning (Perspective #2) and the respond to open-ended, contingent and contextually dependent situations (Perspective #3) in ways that draw on progressive development of the understandings of the complexity of environmental issues and which are founded on coherent and structured knowledge (Perspective #4).
- Research in the official and pedagogical recontextualising fields (curriculum design and textbooks) as well as in the field of reproduction (classrooms) can explore the mechanisms influencing reflexive spaces for critiquing unsustainable practices and the learning processes that emerge from these spaces. Such research could also explore how these do or do not develop the unthinkable or the not-yet-thought, and whether or not these are presented in ways that are neither ontologically essentialist, ethically prescriptive or ahistorical and/or atemporal (Perspective #3).
- Further exploration of the CAPS curriculum and textbooks can include a study of the nature of disciplinary boundaries in the different phases and subjects in the CAPS curriculum and reflection on how these influence systems perspectives and the coherence and systematic representation of discipline-specific knowledge and skills

(Perspective #5).

- All fields across the pedagogic device can be explored in terms of the extent to which environmental knowledge is engaged in a way that acknowledges its dynamic nature – allowing for open-ended, active and critical engagement (Perspective #3) as well as the development of higher order thinking skills (Perspective #4).

Conclusion

As can be seen from the above discussion, this paper has focused on the curriculum as a guiding document for 'setting the scene' for working with environmental content knowledge in teacher education and schools. The paper has provided a social realist analysis of environmental knowledge as found over time in the three iterations of the post-apartheid national curriculum. It shows both continuities and discontinuities in the recontextualisation process, but also shows up an ongoing concern for deepening and strengthening the way in which knowledge is worked with in curriculum. It has provided a number of perspectives on environmental knowledge which, I have argued, could provide a useful framework for opening up further research, specifically in the Fundisa for Change programme which seeks to strengthen teachers' knowledge in and through teacher education in ways that also contribute to transformative environmental learning (Lotz-Sisitka *et al*.; 2013). However, the framework and insight offered above may also be used in other curriculum research contexts.

Importantly, while it is possible to undertake research into curriculum knowledge as outlined above, researchers should ideally work on this in teams or with an integrated approach to avoid a reductionist approach to researching curriculum knowledge. Engaging the full range of perspectives within a social realist frame, and working with Bernstein's pedagogic device can assist researchers not to fall into the trap of 'picking one perspective' and researching it in isolation.

Having focused on content knowledge specifically in this paper, a logical further interest is on **pedagogical** content knowledge and the capacity to think about 'the most regularly taught topics in one's subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations - in a word, the ways of representing and formulating the subject that make it comprehensible to others' (Shulman, 1986). This would be an important extension of the knowledge question if drawing on these insights, for example, in teacher professional development programmes. Ongoing reflexive review of the relationship between curriculum knowledge, its representation, use and engagement from pedagogical and societal perspectives, as well as from the perspective of the rapidly changing nature of environmental knowledge itself would also be needed to ensure reflexivity and 'renewal' of discourses on knowledge and curriculum to avoid static, reductionist and technicist views of curriculum knowledge.

Notes on the Contributor

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Endnotes

1. Veld schools were part of the formal curriculum during the apartheid era in what was then known as the Transvaal Province. Only white children were included in this programme and most children experienced two of these trips during their school career. A veld school trip included a few days away from home in an 'outdoor' environment and through a series of 'nature' experiences and lectures was designed as a rite of passage to 'prepare the learners for the spiritual, moral and socio-economic threat that was lodged against the youth of South Africa as perceived by the government of the day' (Swart, 2009).
2. Phase organisers were a curriculum design tool to deal with significant cross-cutting issues in society and which were intended to be integrated into lesson plans across all learning areas.
4. 'New' is presented here in inverted commas because environmental knowledge was not new to science at the time, but 'new' to the school curriculum.
5. Learning for Sustainability was one of the first teacher professional development programmes operating at a provincial level to strengthen environmental learning in Curriculum 2005. It operated in Mpumalanga and Gauteng from 1997–2000.
6. In the RNCS Foundation Phase, a learning programme was structured by the requirements of a main learning area integrated with other relevant learning areas.

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Does Formal Environmental Knowledge Inform the Everyday Practices of Senior Secondary Biology Learners in Lesotho?

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Abstract

This paper explores the link between formal environmental knowledge encapsulated in the University of Cambridge International Examination Curriculum and learners' ability to translate this knowledge into everyday practices in Lesotho. The paper reports on research undertaken in three secondary schools in Lesotho based on an interpretive paradigm. Data was collected through questionnaires, followed by focus group interviews with learners. The findings suggest that learners have sound theoretical knowledge and awareness of environmental problems, but are not action competent with regard to such problems. In the context of this study, formal knowledge therefore does not inform everyday practices. Possible reasons for this may be due to a de-contextualised curriculum and a teaching and learning environment where 'action competence' is not nurtured.

Introduction

Rapid population growth has put pressure on land and other resources in many parts of Lesotho, resulting in severe environmental degradation (Lesotho Ministry of Finance and Economic Planning, 2005; Lesotho Ministry of Development Planning, 2012). Numerous organisations are engaged in efforts to develop a world population that is environmentally action-competent. Lesotho has joined this endeavour and ratified several environmental protocols. Since education is a vital factor in promoting environmental responsibility, this study focused on the way learners respond to the school curriculum and its implementation in the classroom.

The purpose of the study was to determine whether learners in Lesotho secondary schools make links between their formal environmental knowledge and everyday practices. The study focused on learners in Form D. This is the first year of the senior secondary phase of schooling and the average age of learners in this year is 16. The curriculum for this phase is that of the University of Cambridge International Examination (CIE). The national curriculum of Lesotho, which encapsulates both the local and the CIE curricula, envisages learners with characteristics that would enable them to change the state of the environment in Lesotho. The research questions addressed by this study are:

- What formal environmental knowledge do senior secondary biology learners from three schools in Lesotho acquire from the implemented curriculum?

- How do senior secondary biology learners from three schools in Lesotho use this knowledge to respond to environmental issues?

Contextual and Theoretical Framework

In Lesotho, the inclusion of environmental issues is part of the national curriculum and environmental literacy as a goal of science education is mentioned. Environmental literacy refers to an individual's knowledge about the environment as well as the individual's attitudes toward environmental issues. It emphasises the development of appropriate skills and motivation to work towards the resolution of environmental problems, and active involvement in working towards the maintenance of dynamic equilibrium between the quality of life and quality of the environment (Hsu & Roth, 1998). According to Loubser, Swanepoel and Chacko (2001), environmental literacy is essentially the capacity to perceive and interpret the relative health of environmental systems and to take appropriate action to maintain, restore or improve the health of those systems. Roth and Lee (2002) further note that stewardship of our environment requires knowledge, attitudes and skills which are based on a commitment to shape the world in which we live through thoughtful and active participation. This view of environmental literacy espouses an educational approach that has a strong reflective component. Therefore, it can be said that an environmentally literate person meets the objectives of awareness, knowledge, attitude, skills and participation (Loubser *et al.*, 2001). Cutter (2002) describes three levels of environmental literacy and argues that at the lowest level, everyone has some awareness and understanding of basic relationships in the environment. However, the level of environmental literacy of a person or a society can be dependent on factors such as cultural, social and political context, as well as on education.

While the above objectives are very much part and parcel of most curricula dealing with the environment, the outcomes in terms of what learners have achieved appear to be less successful. Gurevitz (2000) argues that curricula often take a singular approach to the analysis and solving of environmental problems by placing too much emphasis on scientific understanding of environmental issues without considering the importance of engaging in real-life environmental problems. This means that learners often have formal knowledge which is not applicable to everyday life encounters. This mismatch between the intended and the implemented curriculum produces learners who have knowledge but fail to be action-competent. Aikenhead (1996) is also of the view that environmental responsibility is not correlated with knowledge of the environment. What is required is a deeper assimilation of environmental values as learners take ownership of the responsibility towards the environment. Similarly, Hungerford and Volk (1990) argue against the view that making human beings more knowledgeable about the environment and its problems will motivate them to act responsibly.

An increasing body of research points to the importance of learners' socio-cultural knowledge as well as their personal frameworks, which should be linked to formal learning to make learning relevant and to motivate learners (see for example Jegede & Aikenhead, 1999). The use of everyday experiences in science classes to help learners learn scientific ideas is an aspect of contextualisation that has been referred to as a 'context-to-science' teaching and

learning approach (Holman, 1987) and we are of the view that this approach may well be applied to the learning of environmental topics, as well as to enable learners to link their formal environmental knowledge and everyday practices (Stears, Malcolm & Kowlas, 2003).

Environmental learning has been identified as having three dimensions: learning about, learning in and learning for the environment (Cutter, 2002). To provide a holistic approach to environmental learning, all three components should be available through teacher-directed and unguided experiences throughout children's schooling (Hsu & Roth, 1998; Tranter & Malone, 2004). Learning about the environment focuses on key environmental knowledge and understanding of the ecological functioning of the environment (Gough, 2002; Tranter & Malone, 2004). Learning in the environment encourages interactions and experiences in the environment (Hsu & Roth, 1998). This enables learners to develop positive attitudes and values towards stewardship of the environment (Gough, 2002). When learning in the environment, it is envisioned that learners develop sensitivities towards the environment and this fosters values for taking action to conserve the environment (Gough, 2002; Tranter & Malone, 2004).

In education there is often the assumption that the instruction learners receive in the classroom translates into their learning (Hungerford & Volk, 1990). Similarly there is an assumption that learning about environmental issues has the potential to change learners' attitudes and behaviour towards the environment. The approach to environmental education is often focused on behavioural change where children are influenced to change their behaviour in a desired direction (Jensen & Schnack, 1997) without a change in their thinking. However, it has become clear that knowledge does not necessarily lead to behaviour change (Aikenhead, 1996; Gurevitz, 2000). As a result, the behaviour modification model has to a large extent been replaced by the 'action competence' approach where education aims to educate learners who are able to acquire the courage, commitment and desire to become involved in societal issues (Jensen & Schnack, 1997). The 'action competence' approach has gained support for many reasons, some of which are: the opposition to an overly strong emphasis on science knowledge and less on practical application; a realisation that a moralising approach in teaching does not work; and a need for authentic learning instead of simulated learning (Jensen & Schnack, 1997). The fundamental difference between the behaviour modification model and action competence is that a learner who is action competent has made a conscious decision to take action, whereas behaviour modification does not guarantee that any action will be taken (Jensen & Nielsen, 1996). As this study investigated learners' environmental practices, action competence was used as a theoretical frame.

Background to the Study

Previous research found that the intended curriculum of Lesotho recognised and took into account global and national sustainable development aspirations (Molapo, Stears & Dempster, 2012). Unfortunately, guidelines as to how these goals may be achieved are not articulated clearly in the learning outcomes which are meant to clarify how the content in the curriculum should be addressed. This particular structure of the intended curriculum had an impact on the implemented curriculum in that it influenced the way teachers interpreted and implemented the curriculum. Teachers placed a high premium on factual content and were of the opinion

that learners needed knowledge of the environment more than anything else and once they had knowledge, they would be able to act on the various environmental problems they were faced with. They held the belief that taking learners into the environment would make very little or no difference as they are already aware of problems in their environment (Molapo *et al*, 2012). It could therefore be argued that the teachers focus only on learning about the environment (Molapo, *et al,* 2012). It is in light of these findings that this research was conducted. We were aware of the solid grounding learners received with regard to knowledge about the curriculum and we wanted to determine if the knowledge acquired informed their everyday practices.

Methodology

This study is located within an interpretive paradigm as we wished to understand and explain learners' actions and practices. Such insight enabled us to understand how they link their formal environmental knowledge to their everyday practices. The methodological approach is qualitative and the research design for the larger study (Molapo *et al*, 2012, described above) was a case study of a number of participants at a certain period in time (De Vos, Strydom, Fouché & Delport, 2002). This paper reports on the way in which learners enact the intended curriculum. The participants were located in three schools in Maseru, Lesotho. For ethical reasons, the schools shall remain anonymous.

While the research reported here obtained data from two sources, that is, questionnaires and focus group interviews, the larger study utilised a number of methods to obtain data. These were individual teacher interviews, classroom observations and document analysis. The findings from this part of the study revealed that the way in which teachers implemented the curriculum was quite different from that envisaged by the intended curriculum as teachers focused mainly on knowledge of the environment. We were then able to build on this understanding of the implemented curriculum to find out what exactly learners had learnt and how they were able to use this knowledge.

The type of sampling may be described as convenience sampling as one of the researchers had access to the schools. One teacher from each school who taught Senior Secondary Biology agreed to participate. A total of 138 learners were present in these three classes.

As already mentioned, the methods used to collect data were a questionnaire and focus group interviews. A group of learners not involved in the study agreed to answer the questionnaire to enable us to identify ambiguities in the instructions, clarify wording, and alert us to omissions or unanticipated answers. The necessary amendments were made prior to launching the questionnaire to the research population.

All questions in the questionnaire were open-ended and data were analysed qualitatively. We believed this was the best option as much of the data required was about views, attitudes and beliefs. The questionnaire was completed by 120 learners. The questionnaire was used to obtain insight, not only into learners' knowledge about environmental issues, but also their views, attitudes and beliefs, making it an appropriate instrument for this kind of data (Denscombe, 2004). Learners' views and perceptions of environmental issues were analysed, producing a number of categories.

The learner interviews served largely to gain greater clarity about the responses obtained from the questionnaires. The questions were therefore similar to those included in the questionnaire. The advantage here was that we could ask further probing questions to responses that required more clarity. Two group interviews were conducted at each school, resulting in six interviews in total. Participants volunteered for the interviews. They were divided into two groups based on teachers' advice as to which of the learners were confident and which were less confident. Each group consisted of four learners. We chose four learners as we believed that this was an ideal number to stimulate discussion around issues raised in the questionnaire. The interviews were conducted after school on the school premises. Questions from the questionnaires that required clarity were posed to each group and learners were asked to discuss them amongst themselves with the interviewer recording the conversations. When necessary, the interviewers would ask a question to prompt further discussion.

Analysis of the questionnaires and interviews provided insight into the ways in which learners behaved in relation to the environment. The questionnaire had 12 questions with sub-questions where learners were asked to explain their answers. These 12 questions formed four themes. Learner responses to each theme were then grouped into categories and the percentages of students who responded in each category were calculated. During the interviews learners were asked to expand on their knowledge of environmental issues. This produced a fifth theme. After due consideration, it was decided not to include one of the themes that emerged from the data as it did not relate directly to the research questions in this study. This research therefore reports on four themes that emerged:

- Learners' knowledge of environmental issues;
- Knowledge of the causes of an environmental problem;
- Learners' participation in solving environmental problems; and
- Their views on other peoples' attitudes towards solving environmental problems.

Findings and Discussion

The first theme represents information only obtained during the interviews, and therefore represents only a sample of all the learners who completed the questionnaires. Results of the analysis of the questionnaires are presented in Tables 1–4. The tables show how each theme was subdivided into categories and includes quotations as examples of responses from learners. The percentage of learners whose responses fell into a particular category is indicated. The discussion of each theme further includes findings from the interviews as well.

Knowledge of environmental problems among learners in Lesotho

During the interviews, learners were asked to give examples of environmental problems in Lesotho. A number of examples were provided. These examples were grouped into three categories, i.e. social problems, local environmental problems and global environmental problems (based on theoretical knowledge).

The responses indicate a variety of individual opinions about environmental problems which are influenced by formal knowledge. For example, a number of examples of pollution were given, some of which are not common in Lesotho. Examples of conservation practices and endangered wildlife unfamiliar to Lesotho were also mentioned. When asked to rank the environmental problems in order of their severity, pollution was ranked first, followed by soil erosion and then wildlife destruction. While problems in the natural environment were ranked first, second and third, 44.2% of the responses covered problems in the social and economic environment. Socio-economic problems were not raised in the Biology classes, where only the biophysical environment was discussed. Responses illustrated a deep sense of socio-economic problems and this may be indicative of learners' priorities with regards to environmental problems that have an impact on humans.

Knowledge of the causes of environmental problems (specifically littering)

This theme focused on littering as an example of an environmental problem. Learners' responses in the questionnaire as well as during interviews, did not reflect any blame on themselves for littering. Instead, other people and lack of facilities were mentioned as the cause for littering. Learner responses conveyed a sense that littering was more a symptom of an undisciplined community than an environmental problem. Their responses are presented in Table 1.

Table 1. Knowledge of the causes of environmental problems

Question	Categories and percentages	Examples of responses
What causes the problem?	Authorities lack action 41.7%	'no cleaners, Maseru City Council have no cleaners to pick up waste; food sellers' litter; teachers not punishing those who litter; government people do not punish those who litter; police do not check waste pipes'
	Poor attitudes 35%	'children do not care, they can't even clean the surrounding around their desks in classes, they just feel it's a free country everyone should do whatever they will, they are also reluctant to apply what they have learned from school in their everyday life'
	Lack of facilities 23.3%	'no dust bins with lids, dogs spread things all over, no sewage pipes, damaged pipes'

Learners' participation in solving environmental problems

Learners' responses from both interviews and the questionnaire indicated that they participated in activities to address some environmental problems. The responses in Table 2 show ways in which learners participate in solving environmental problems. The different examples given were grouped into categories indicating possible reasons for participating in the way they do.

The responses in the questionnaires were mostly descriptions of what learners did at school. They did not mention what they did at their homes. The majority of learners who said they participated in these activities appeared to do so for extrinsic reasons (payment; fear of punishment) rather than from a desire to act 'for' the environment. Teachers may foster cleanliness at school but, at home and out of school, there may be no enforcement of good habits.

Table 2. Learners' participation in solving environmental problems

Question	Categories and percentages	Examples of responses
How do you assist in solving the problem?	Acting on changed attitudes 37.5%	'students [referring to themselves] are very concerned about the dirty school environment and they participate in collecting pieces of paper throughout the school campus on Friday, then burn them, clean toilets and burning rubbish, it is important to clean to avoid disease'
	Using available facilities 27.5%	'throwing waste in dustbins; place lids and bricks to stop dogs getting into bins'
	Making money 18.3%	'collecting cans for sale for recycling, egg trays and other paper and things like scripts to recycle'
	Complying with school rules 16.7%	'plastics not used in the school yard'[to avoid littering]

During the interviews, learners were asked to elaborate on how they participate in solving environmental problems. The responses revealed some actions at home and these actions were informed by what we classified as formal knowledge (that is, knowledge learnt in the formal schooling context) or actions informed by informal information, which we classified as everyday knowledge (that is, knowledge obtained from the local environment and from anyone in that environment).

A total of 55.7 % of the responses fell into the formal knowledge category, illustrated by the example below.

'make garden of endangered species';

'I have collected some of the litter for recycling and using them in making some project at school'

Both actions above are based on knowledge obtained at school. Learners learn about endangered species and recycling in biology.

A smaller percentage (48.3%) fell into the everyday knowledge category as illustrated by the following example:

'weeds can always be removed and gardens ploughed to keep the environment attractive'

'by collecting rubbish and burning it; burying rotten waste'

The actions above are informed by what they see family and community members doing and is therefore categorised as environmental actions informed by everyday knowledge.

Learners' views of other people's attitudes towards solving environmental problems

An aspect that emerged from the questionnaires that generated this theme was learners' tendency to blame other people for the problems observed in the environment. They believed that some people did not care enough and neglected their duty (see Table 3).

Table 3. Learners' sense of other peoples' attitudes towards solving environmental problems

Question	Categories and percentages	Examples of responses
How do other pupils in your school take part in solving the problem?	No education (lack of awareness) 58.3%	'ignorant people those who do not care, they don't fight against pollution but continue to pollute the environment, they throw plastics everywhere they like'
	Neglected duty 41.7%	'it is the responsibility of cleaners', 'teachers must punish those who make the place dirty'

These responses demonstrate how learners shifted the responsibility for preventing and solving local environmental problems to other people. Other people are blamed for environmental problems. Some learners even suggested that some people were ignorant and had to be punished for littering. When asked to explain, they seemed to think the answer lay in instructions or punitive action from a higher authority.

During the interviews, participants were asked if learners, not from their school, participated in curbing environmental problems. While the majority gave responses that were similar to those presented in Table 3, a small number of participants acknowledged that some community members were engaged in such activities:

'They work together to collect plastics and papers to burn them'

'They began to make handmade mats out of the waste'

The majority of participants were convinced that most members of the community have little regard for the environment and gave reasons for this as presented in Table 4. Answers to this question confirmed the trend that emerged from the previous question – that participants knew what the problems were, but did not take responsibility and regarded other people as responsible for them.

The responses showed that learners have sound knowledge of the environment. This is to be expected as the curriculum implemented by the teachers places emphasis on learning 'about' the environment. Some learners wrote that they take action for a sustainable environment, but no concrete evidence of this emerged from either questionnaire or interview responses. Most of them mentioned learning from science only, yet the curriculum analysis conducted in a related study (Molapo *et al.*, 2012) showed that a number of subjects at primary level have environmental content as well.

Participants' knowledge of the environment is mostly linked to the effect of environmental degradation on people, rather than on biodiversity in general. For instance, water pollution was

described as affecting humans but no mention was made of the effect on aquatic organisms. Forty-four percent (44%) of the responses with regard to listing environmental problems were of a socio-economic nature related to poverty, HIV and AIDS and lack of sanitation. Participants' understanding of the environment is not limited to the biophysical environment as their examples included both the economic and social dimensions of environment. The fact that many of them listed social problems is an indication of the importance they attach to these problems, rather than the problems of the biophysical environment. This finding raises the question of what kind of environmental learning occurs in the formal schooling context. Hart (2002) is of the view that socially critical issues should be included in curricula to make such curricula more relevant.

Table 4. Reasons for persistence of environmental problems

Reasons	Percentage	Examples of responses
Attitudes- poor attitudes were responsible for environmental problems	51.7%	'they seem to have inherited those attitudes from their parents; maybe they do not care about their environment as I do; some of them are careless so they are not worried about after effects of what they do, like urinating everywhere'
Community support; little support from community	33.3%	'this problem is general and affects most of the citizens, as a matter of fact no attempt is made more basically by us as students because we are also facing the same problem'
Knowledge and skills transfer; inability to translate knowledge and skills into action	15%	'they are also reluctant to apply what they have learnt at school in their everyday life most importantly, it is because we are not engaged in agricultural studies so the other pupils are unable to participate in any of the tasks of taking care of plants'

The findings also showed that learners placed a high premium on environmental knowledge pertaining to global issues. They were eager to demonstrate their knowledge of global warming and deforestation. While knowledge of global issues is important, learners should be able to act in their own environments and for this, knowledge of their local environment is required. Gurevitz (2000) believes that contexts where learners are taught formal knowledge not applicable to everyday life, will not allow them to become citizens who are able to reflect on their values and personal behaviour. Knowledge of their local contexts will assist in empowering learners as future citizens (Jenkins, 1992).

Conclusion

The learners in this study are not action competent. In spite of adequate knowledge, participants do not appear to have the necessary attitudes to initiate action-taking, irrespective of the nature of the environmental problem. They are inclined to blame authorities for not keeping the environment clean. Reference was made to solving environmental problems, but these were all related to the school environment and were either linked to teachers instructing learners to clean and pick up litter or when they receive money for recycling. This raises the possibility

of external agents driving their behaviour in a certain direction rather than on internal convictions. This is supported by our observation that in one school, which was without litter, the principal and teachers were very strict in maintaining clean surroundings.

While participants indicated that education is important, they simultaneously shifted responsibility to the school and the community. The notion that punishment can be used to solve environmental problems enforces the view that learners do not really view education as an option for solving environmental problems. Statements such as 'we are taught to care' point to an awareness only rather than the ability or will to take action. This attitude speaks to the type of environmental education learners receive, as Steele (2010) is of the view that the way in which education prepares learners to act in the world influences their actions. Environmental issues have to be addressed through a comprehensive, learner-centred approach (Hawtrey, 2007) which does not aim at teaching about the right solutions to environmental issues but at focusing on enabling the learners to construct their own understanding of the issues based on their previous knowledge and acting on them. While Jensen and Schnack (1997) hold similar views, previous research in Lesotho has shown that this is not the case (Molapo *et al*., 2012) because formal learning focuses on information about the environment, rather than action for the environment. The keys to the translation of knowledge into action are ownership and empowerment. While learners in the context of this study demonstrated that they have knowledge, they have not taken responsibility and are not empowered by this knowledge.

In conclusion, the findings show that action competence was not attained through formal schooling in the studied context. Studies in other contexts have produced similar results (Lakin, 2006; Prokop, Tuncer & Kvasničák, 2007). Previous research had indicated that the Lesotho curriculum has the intention of stimulating action in learners (Molapo *et al*., 2012); however, this is not happening. This suggests that a stronger focus on education for personal relevance and consideration of societal needs is required (Eisner, 2002). There is a need for 'empowerment', developing a sense of 'ownership' and improving the capacity of learners to address environmental issues in their own communities by becoming action competent.

Notes on the Contributors

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Southern African Journal of Environmental Education, Vol. 30, 2014

Environmental Concerns in the Geography Curriculum
Perceptions of South African High School Teachers

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Abstract

As the United Nations Decade of Education for Sustainable Development (DESD) (2005 to 2014) ends, a lot of progress has been made at policy level in re-orienting geography education at Further Education and Training (FET) (Gr 10–12) level in South Africa, towards the teaching of environmental education (EE) and education for sustainable development (ESD). However, there is limited research on conceptual issues facing geography teachers, regarding the meaning of EE and ESD. This paper, based on my PhD research, seeks to address this gap. The PhD project focused on how geography teachers from diverse contexts in Western Cape secondary schools are implementing EE and ESD through the geography curriculum at FET level. In this paper, I use the qualitative data generated from my PhD study to show how three of the geography teachers grapple with the meaning of environmental education, sustainable development and education for sustainable development. The data reveals that the three teachers have conceptual difficulties regarding these terms. I argue that unless these conceptual difficulties are addressed through pre-service teacher training and in-service professional development programmes, the implementation of EE and ESD through the geography curriculum is not likely to be effective.

Introduction

In a subject-based school curriculum, geography is regarded as an important vehicle through which environmental education can be taught (IGU-CGE, 1992). Geography deals with human-environment relationships and it is interdisciplinary: overlapping between natural sciences, social sciences and humanities (Holloway, Rice & Valentine, 2003). Its interdisciplinary nature can provide a holistic approach to teaching EE and ESD as stipulated by UNESCO (1978). The International Geographical Union Commission on Geographical Education (IGU-CGE) recognises the contribution of geography to environmental and development education in *the International Charter on Geographical Education* (IGU-CGE, 1992). More recently, the IGU-CGE articulated and reaffirmed its commitment to support ESD implementation through geography education in a document entitled *Lucerne Declaration on Geographical Education for Sustainable Development* (Haubrich, Reinfried & Schleicher, 2007). The document provides guidelines to geography educators on how geography education can incorporate ESD 'at all levels of education and in all regions of the world' (Reinfried 2009:229).

The geography National Curriculum Statement (NCS) (Department of Education, 2003) and the recently revised version, the Curriculum and Assessment Policy Statement

(CAPS) (Department of Basic Education, 2011), provide an enabling policy framework for implementing EE and ESD through the geography curriculum in the South African context. The sustainable development concept is central in the two geography curriculum documents. The curriculum documents clearly articulate that one of the goals of geography education at FET level, the last phase of schooling (Gr 10–12), is to teach knowledge, skills, attitudes and values required for more sustainable lifestyles (DoE, 2003; DBE, 2011). Given the enabling curriculum policy framework, it is necessary to explore the teachers' experiences of implementing EE and ESD through the geography curriculum. This was the focus of my PhD study (Dube, 2012). A starting point was to investigate the geography teacher participants' perspectives on EE and ESD.

In the following sections I cover the theoretical framework in which I deal with the concepts of environmental education, sustainable development and education for sustainable development. I then highlight research on practising teachers' perspectives on EE and ESD. This is followed by a section on methodology that also provides the profiles of three of the teacher participants. I then use interview extracts to show how these teachers grapple with the three concepts; environmental education, sustainable development and education for sustainable development. There is a discussion section followed by the conclusion.

Theoretical framework

Environmental education

The early conception of EE was narrow because it was based on a concept of the environment that was viewed as mainly consisting of the biophysical component that disregarded the human dimension. According to Reddy (2011), the definition of the concept of environmental education has changed with time depending on how people conceived of the meaning of the term *environment*. The narrow conception of EE is evident in the way the field was defined by environmentalists in the 1960s. This is illustrated by Stapp *et al.*'s definition which is based on a narrow view of the environment – the biophysical component that downplays components comprising the human dimension (see Figure 1). According to Stapp *et al.* (1969:34) 'environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution'. The definition further suggests that EE activities should focus on the protection of the biophysical component through conservation education.

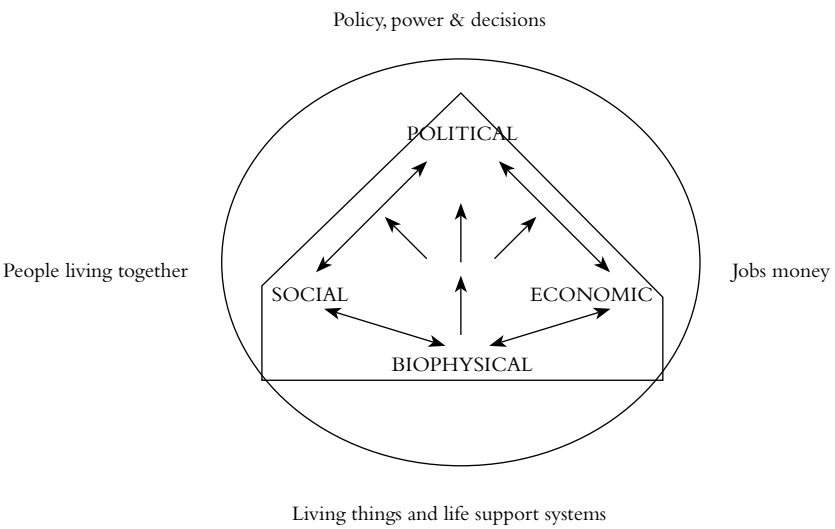
Drawing from Di Chiro (1987), Reddy (2011:11) argues that the term 'environment is a complex social construct'. Di Chiro contends that

> 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*.

Di Chiro makes it clear that conceptually we view the environment as interactions taking place between the biophysical component with the human dimension comprising the social, economic and political components. O'Donoghue (1993) clarifies the broad concept of the environment succinctly in a diagram (see Figure 1). Following the realisation that the environment is much broader as it consists of a number of dimensions that interact, the scope of EE eventually widened.

Figure 1. Components of the environment



Source: O'Donoghue (1993).

Further clarification of the EE field has been provided by Lucas (1972), who proposed a framework to classify environmental education activities into education *about, in* and *for* the environment. These categories have helped educators to reflect on the goals of EE as well as on appropriate pedagogical approaches when they incorporate environmental learning activities in the teaching and learning programmes in school contexts. A number of academics (Robottom, 1987; Huckle, 1993; Fien, 1993) support the view that the EE field will only make a meaningful contribution towards reducing environmental problems through education *for* the environment whose goal is transformation towards more sustainable practices through a socially critical approach. According to Huckle (1993), education *about* the environment focuses on environmental management and control while education *in* the environment focuses on environmental awareness and interpretation. Robottom (1987) argues that little or no improvement in the state of the environment can result from the continued use of

education *about* and *in* the environment without incorporating elements of education *for* the environment.

A number of events have shaped the EE field such as the Intergovernmental Conference on Environmental Education which was held in Tbilisi in 1977. At this conference the nature, goals, objectives as well as approaches of EE programmes were stipulated in the *Tbilisi Principles* (UNESCO, 1978) in order to provide guidelines for environmental education practitioners and educators. Some of the main principles include the fact that EE should be based on a broad perspective of the environment that encompasses the four dimensions; focusing on its totality as illustrated earlier (see Figure 1). EE aims to create awareness of environmental issues and risks, and to create opportunities for the teaching and learning of knowledge, skills and attitudes. A participatory pedagogy is encouraged which involves the active involvement of learners in resolving environmental problems. Additionally, it is suggested that teaching and learning programmes should involve active learning, problem-solving, practical activities, experiential learning and the development of critical thinking. The adoption of these approaches would involve a radical shift from traditional approaches that focus on the development of the cognitive domain and limited skills through transmission of environmental knowledge more than the affective domain in the form of attitudes and values (see Stevenson, 1987).

As Gough (1997) traces the history of EE, she observes that the field was increasingly influenced by the sustainable development discourse in the 1980s in that the goal of EE began to be linked to sustainable development. There has been a gradual shift from EE to the ESD discourse.

Sustainable development and education for sustainable development

The concept of sustainable development was popularised by the World Commission on Environment and Development (WCED) through the publication of the Brundtland Report, *Our Common Future,* where the term is defined as 'development that meets the needs of the present without compromising on the ability of future generations to meet their own needs' (WCED, 1987:48). The United Nations Conference on Environment and Development also known as the Rio Earth Summit, held in Rio de Janeiro in 1992, recognized the link between environmental education and sustainable development. The role of education in promoting sustainable development was made explicit in Chapter 36 of *Agenda 21* (UNCED, 1992). Drawing from the contents of *Agenda 21* where the goals of EE are outlined, Irwin & Lotz-Sisitka (2005:42) observe that EE is described as being concerned with those practices that involve teachers and learners in 'promoting sustainable development and improving the capacity of people to address environment and development issues'. According to Wals (2012:8–9), Chapter 36 of *Agenda 21* dealing with education, training and public awareness focuses on four main goals:

- *Promote and improve the quality of education:* The aim is to refocus lifelong education on the acquisition of knowledge, skills and values needed by citizens to improve their quality of life;

- *Reorient the curricula:* From pre-school to university, education must be rethought and reformed to be a vehicle of knowledge, thought patterns and values needed to build a sustainable world;
- *Raise public awareness and understanding of the concept of SD:* This will make it possible to develop enlightened, active and responsible citizenship locally, nationally and internationally;
- *Train the workforce:* Continuing technical and vocational education of directors and workers, particularly those in trade and industry, will be enriched to enable them to adopt sustainable modes of production and consumption.

Education for Sustainable Development was the main outcome of the Rio Earth Summit through articulations of Chapter 36 of *Agenda 21* summarised by Wals (2012) above.

According to UNESCO (2005), ESD entails an increased focus on sustainability issues in various contexts in the three pillars of sustainable development – the environment, society and economy. Drawing from UNESCO (2005), Firth and Smith (2013:171) explain that:

> ESD is an evolving approach with the key characteristics of holism and interdisciplinarity, critical thinking, participatory decision making, applicability, local relevance, pluralism of pedagogies and fostering values that underpin sustainable development. Its main aims are social empowerment and to build personal capacities for future-oriented thinking and action. It builds on the triple 'bottom line' of society, environment and economy for its scope and content, with culture as the dimension where the three link.

One of the outcomes of the World Summit on Sustainable Development (WSSD), held in Johannesburg in 2002, was the proposal on the declaration of the United Nations Decade of Education for Sustainable Development (UNDESD) to run from 2005 to 2014. According to (UNESCO 2005:6) the overall goal of the DESD was to 'integrate the principles, values, and practices of sustainable development into all aspects of education and learning'.

Some academics welcome the advent of ESD which they view as being broader than EE (Fien, 2001; Gough, 2006). According to Gough (2006), ESD includes environmental education which is contextualized within 'socio-cultural factors and the socio-political issues of equity, poverty, democracy and quality of life as well as a development perspective on social change and evolving circumstances'. Other academics such as Robottom (2007) claim that the shift from EE to ESD did not involve any substantive changes; 'EE has been rebadged'. The literature reveals that the sustainable development concept is complex and highly contested (Bonnett, 2002; Jickling, 1994; Chapman, 2004) and so is the concept of education for sustainable development (Robottom, 2007; Scott & Gough 2003). It is difficult to achieve sustainability in a balanced manner in the three components encompassing the economy, society and the environment; for example, the achievement of economic sustainability may not necessarily be accompanied by both social and environmental sustainability. Some academics (Jickling & Wals, 2008; Robottom, 2007) fear that ESD could be hijacked by the economic sector to the detriment of the environment.

According to Lotz-Sisitka (2011:62), ESD in the South African context 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'. She observes that the society pillar of ESD encompasses issues of social justice, poverty, democracy, human rights and reflects the unique history of the prolonged struggle by the majority of people against oppression during colonial rule and the apartheid era. These issues fell within the scope of EE discourse in South Africa.

Teacher perspectives on EE, SD and ESD: Literature

Practising teachers' perspectives on EE have been revealed in research conducted in different contexts and levels of education. In the primary school context, studies by Kimaryo (2011) in Tanzania, Chatzifotiou (2006) in England and Ham & Sewing (1988) in the US are noteworthy. At secondary school level, some studies focus on geography teachers, for example Ballantyne, Oelofse & Winter (1999) in South Africa and Raselimo & Wilmot (2013) in Lesotho while Ko & Lee (2003) focus on science teachers in Hong Kong. The prevailing view of school teachers concerning EE revealed by the research literature is that it involves education *about* the environment which mainly focuses on teaching knowledge of environmental issues and limited skills. The affective domain in the form of attitudes and values tends to be neglected (Ham & Sewing, 1988). EE may also be viewed as education *in* the environment that encompasses outdoor education programmes or as education *for* the environment which focuses on improving the environment (Lucas, 1972).

Other researchers have revealed practising teachers' perspectives on sustainable development and ESD (Dube & Lubben, 2011; Summers, Childs & Corney, 2003; Taylor *et al.*, 2002). More than halfway through the United Nations (DESD), some teachers for example in Swaziland (Dube & Lubben, 2011) had not yet encountered the concept of ESD. Research by Summers *et al.* (2003) in the English context, revealed that some of the primary school teachers' conceptions of ESD were mainly based on frameworks provided in some of the curriculum documents 'emphasising in particular the importance of taking responsibility, human action and "making a difference" (the citizenship/stewardship dimension of the framework)'. The improved subject matter knowledge of ESD was attributed to professional development activities provided by the researchers prior to the interviews. In the Australian context, Taylor *et al.* (2002) found that all the 13 teacher participants were familiar with the concept of sustainable development. However, most of them had an uncritical and unproblematic view of the concept of sustainable development.

Methodology

The larger project on which this paper is based followed a qualitative interpretivist and a multiple case study research design (Dube, 2012). One of the ontological assumptions of interpretivist research is that realities are apprehendable in the form of multiple, intangible mental constructions, socially and experientially based, local and specific in nature … and dependent for their form and content on the individual persons or groups holding the constructions' (Guba & Lincoln 1994:110). The geography teachers as research participants hold different realities from myself as

the researcher. Another assumption is that the subjectivist view of knowledge is acknowledged and that knowledge is socially constructed by the research participants (Newman, 2011). Additionally, in the research process the knowledge is co-constructed by myself as the researcher together with the participants through interactions in the process of generating of data. Interviews or conversations with the geography teacher participants provided opportunities for deeper probing in order to elicit their understandings and meanings attributed to social phenomena.

The main aim of the research was to investigate how EE and ESD are being implemented through the geography curriculum. The research context is FET level (grades 10–12) geography in five high schools in the Western Cape Province of South Africa. The sample schools, selected through purposeful sampling, were representative of the socio-economic and the sociocultural context of public schools in the province. Two most senior geography teachers were invited from each selected school to participate in the research project. All the invited teachers agreed to participate including the heads of department, making a total sample of ten teachers. Data were generated using a number of research instruments such as biographic questionnaires, semi-structured interviews, lesson observation and document analysis. Data were analysed through thematic analysis which involved initial coding and categorisation into major themes.

In this paper I use some of the questionnaire and interview data from the research project from three of the teacher participants. The three teachers, whose data is used in this article, offer contrasting and interesting lived experiences and nuanced perspectives on the environmental concerns in the curriculum, especially regarding their understanding of the concepts of environmental education, sustainable development and education for sustainable development. The participants have been given pseudonyms so as to observe ethical considerations of anonymity. It is for the same reason that the identity of the schools has not been revealed. This paper tackles the following question:

> What are the geography teachers' perspectives on environmental education, sustainable development and education for sustainable development?

In the next section, I describe the profile of each of the three teacher participants. The data on the teacher profiles was captured in 2010.

Maggie**,** one of the only two female teacher participants, had nearly 24 years teaching experience at secondary school level. She held a Lower Secondary Teaching Diploma (LSTD) and was initially trained to operate at lower secondary school level (grades 8 and 9) but she was eventually assigned FET level classes (grades 10–12). As the head of Department of the Social Sciences, she supervised six members of staff; two geography and four history teachers. Maggie was concerned about water pollution in the local river that runs next to her school. She, together with a group of pupils, used to regularly clean a section of the river. She used the activity to teach water pollution to her grade 11 class. In 2010 she had stopped the activity due to challenges such as shortage of time and safety issues.

Hilton had 20 years teaching experience at secondary school level. He held a Bachelor's degree with a major in geography and a Postgraduate Certificate in Education (PGCE). He is a

passionate animal rights activist. In 2010 he was involved in a Save the Rhino campaign which was run through canvassing for support for the cause using the internet. Furthermore, in 2011 he participated in another project that involved speaking against the practice of canned lion hunting which is growing in popularity in South Africa.

Lloyd had 15 years teaching experience at secondary school level. He held a Bachelor's degree with a major in geography and a Higher Diploma in Education (HDE). As the head of the Social Sciences Department, he was responsible for supervising three geography, two history and two tourism studies teachers. Any initiatives that Lloyd could have taken to protect or improve the condition of the environment were not explicit during the research process.

The teacher participants' perspectives on EE, SD and ESD

The teachers were asked questions on their understanding of each of the concepts *environmental education*, *sustainable development* and *education for sustainable development*. Their responses were probed in order to clarify misunderstandings and to elicit more responses. The account that follows is an interpretation of the interview data and part of the questionnaire data.

Maggie

She feels that geography contributes to the protection of the environment. This shows her awareness that environmental concerns are integrated into the FET geography curriculum (DoE, 2003; DBE, 2011). Additionally, she argues that as a geographer, she has to care for the environment and must display responsible behaviour towards it. She also feels that she has a duty to teach the learners to care for the environment. She observed that:

> As a geographer I have got to be mindful of what is going on in the environment and I have to teach the learners about the environment … I have to be careful how I behave towards the environment and I also have to tell the learners about the environment.

According to Maggie, teaching *about* the environment involves transmission of environmental knowledge as observed by Lucas (1972). She is likely to neglect teaching skills, attitudes and values required for more sustainable lifestyles. Additionally, she mentions that she has to *tell* the learners about the environment. The discourse of telling implies that she knows everything and that she is likely to use transmissive approaches to teaching.

Maggie expresses frustration at her apparent failure to change the attitudes of the learners. She feels that the school is fighting a losing battle in trying to change the attitudes of the learners towards the environment. She commented:

> It is difficult [to teach the learners about caring for environment] because they do not appear to care for the environment. This is shown by the littering that occurs in the school grounds after the intervals. In spite of the fact that bins are provided all over the school grounds, the learners still leave the school grounds littered with waste. These learners do not respect the environment.

The above comment reveals her narrow view of the concepts of environment and environmental education. She places more emphasis on the local school environment as shown by her concern with litter in the school premises and the issue of pollution of the local river mentioned earlier in the description of her profile. The environment, to her, is the biophysical component that excludes the human agent consisting of the economic, social and political components. Her view of environmental education is that it focuses on protection of the biophysical environment in the form of the school premises and its environs. According to Maggie, environmental education is synonymous with conservation education.

Despite her narrow conception of environment and environmental education, Maggie believes that action should be taken to improve the environment. This is illustrated by her concern that the learners should keep the school premises clean by removing litter. Additionally, she has involved a group of learners in cleaning a portion of a river closest to her school in the past as described earlier.

Maggie's view of sustainable development is the one promoted by WCED (1987) and according to her, environmental education is closely linked to sustainable development. She points out that:

> We speak about the fact that their children [learners' children] should not be deprived of the resources [concern with future generations]. Environmental education and sustainable development cannot be separated because the one is dependent on the other.

Regarding how she makes sense of the term 'education for sustainable development', Maggie responded:

> I basically do the terms with them [the learners] and ask them to be mindful of what they are doing in the environment because whatever they are doing in the environment has an impact on the sustainability of a resource.

In the above statement Maggie does not appear to be clear of the meaning of the concept of education for sustainable development. She says '*I basically do the terms with them'* (the learners), perhaps, making the learners memorise definitions, for example that of sustainable development, without understanding the meaning of the term.

Hilton's view, like that of Maggie, reveals a narrow conception of the environment and environmental education.

Hilton

The concept of environment revealed is that of the biophysical component (*biodiversity*) that excludes some of the other human components noted earlier. According to Hilton environmental education consists of conservation education that focuses on protection of the biophysical environment. This is illustrated in the following comment:

> Environmental education is the teaching and learning about the biodiversity and how it needs to be managed.

The above statement implies that the geography teacher has to focus on providing the knowledge about biodiversity and how it should be managed using transmissive approaches. Although this view seems to emphasise teaching environmental knowledge or developing the cognitive domain, Hilton also observes that the geography curriculum promotes the development of the affective domain (attitudes and values). He comments that:

> One central golden thread that goes straight through [the geography curriculum] is the issue about environmental education and changing peoples' attitudes, views and values about the environment.

Additionally, Hilton displays an anthropocentric view towards the natural environment in the statement *'but obviously the natural environment is the source that provides us with natural resources that we need to provide for ourselves'*.

Hilton also shows the links between environmental education and sustainable development (Sauvé, 1996). However, he shows a technocentric perspective that accommodates development as revealed in *Agenda 21* (UNCED, 1992) adopted at the Rio Earth Summit. According Gough (1997), EE was given an instrumental role in *Agenda 21* where it is used to achieve development goals. Hilton argues:

> Obviously you cannot separate environmental education from sustainable development because the healthiness of the environment is going to determine whether you will be able to sustain yourself and develop and grow.

Furthermore, Hilton has an interesting view of education for sustainable development:

> Education for sustainable development is necessary because the problem that we have with development is that you always have the risk when you develop that you exhaust and deplete your resources. It is necessary that we have environmental awareness about the way we use our resources so that we can modify our behaviour so that we can develop at a sustained rate; that we always have resources or alternatives at our disposal to keep on developing.

In the above statement, the goal of education for sustainable development is to promote awareness of environmental issues resulting in positive behaviour towards the environment. Hilton does not appear to realise the problematic nature of the concept of sustainable development because he believes that as long as there is sustainable development, economic development can go on forever.

However, he believes that the issue of poverty needs to be addressed in education for sustainable development as illustrated in the statement below:

> But the important thing that I want to stress about education for sustainable development is that it [development] should not only benefit the rich. Sustainable development can

> achieve the objective of getting a more even distribution of economic growth and economic wealth so that poverty in the process can be reduced. So the whole issue of poverty should also, in my understanding, be addressed in education for sustainable development.

Additionally, Hilton believes in engaging in initiatives to improve the quality of the environment as noted earlier.

Lloyd

Lloyd's view is that the environment consists mainly of the biophysical component. According to him, the aim of environmental education is to promote awareness of the biophysical environment. He conceives of environmental education as focusing on conservation education. He argues that one of the aims of geography education is:

> … to make the learners sensitive to the physical environment so that they can first of all notice it. I have lived in this town for 30 years. Do I still see the mountain [located just outside the town]?

According to Lloyd, the learners should be taught to care for the environment. Lloyd's discourse on peoples' relationship with the natural environment is that of awareness, appreciation, respect and a caring attitude. This discourse excludes an exploitative relationship. He seems to prefer an ecocentric, non-consumptive view of the natural environment. This is illustrated below by what he perceives should be some of the aims of geography education:

> So at the end of the day as part of the [aims of the] geography syllabuses [curriculum], the learner should be able to:
> - appreciate the environment;
> - handle the environment with respect; and,
> - look after it because it is part of the ecosystem.

Additionally, Lloyd emphasises the concept of interdependence by stating that the natural environment is '*part of the ecosystem*'. Geography education that integrates environmental concerns, according to Lloyd, should promote not only the development of the cognitive domain but also the affective domain (appreciation of beauty of the environment, caring attitudes and stewardship of nature).

Lloyd's view of sustainable development is that:

> Sustainable development talks about an on-going process to secure life, to secure the future and that what we do today impacts tomorrow.

This is the view promoted by WCED (1987) as observed earlier.

Concerning the relationship between environmental education and sustainable development,

Lloyd observes that the two are closely intertwined. However, Lloyd displays an uncritical and unproblematic view of the meaning of the concept of sustainable development. He argues:

> You cannot have one without the other [referring to environmental education and sustainable development]. A solution means you find an answer and that means that the issue will be solved for future generations. Sustainable development is the answer to environmental issues.

According to Lloyd, education for sustainable development can be looked at from two perspectives:

> The focus can be on education as a process or education in terms of what is the learner or receiver taking with him/her. It can also be on what is being taught or how it is being taught.

According to the above statement, it appears as if Lloyd has not encountered the term education for sustainable development.

Discussion

The narrow perspective on environment and environmental education shows that the three teachers (Maggie, Hilton and Lloyd) lack training on the meaning of the concepts. The narrow perception differs from the holistic view stipulated in Tbilisi Principles (UNESCO, 1978). Lack of training could also explain why two of the teacher participants have not come across the concept of education for sustainable development which resonates with Dube & Lubben (2011) in Swaziland. The problem of lack of training has been identified as one of the major barriers to the effective implementation of environmental education not only in South Africa (Ballantyne *et al.*, 1999; Reddy, 2000) but also in other contexts such as Tanzania (Kimaryo, 2011) and the US (Ham & Sewing, 1988).

The curriculum document text does not provide enough information to assist the teachers with clarifying conceptual issues that have been noted in the above discussion. The terms environmental education and education for sustainable development are missing from the curriculum document (DoE, 2003), contributing to the conceptual difficulties that have been noted. The curriculum document only contains definitions of the terms environment and sustainable development. The environment is defined as

> Surroundings; the totality of things that in anyway may affect an organism, including physical and cultural conditions; a region characterised by a certain set of physical conditions; the physical, built and social environment … (DoE, 2003:69)

Both the (bio)physical and human dimensions are mentioned in the above definition but the notion of interaction between the various components of the environment is excluded,

making it inadequate. Despite this inadequate definition, Lloyd's view of the environment implies interdependence or interaction between the different components of the biophysical environment because he observes that people should 'look after it [nature] because it is part of the ecosystem'. In the revised CAPS document (DBE, 2011) there is no glossary section with definitions of the above terms. Corney (2000:305) reiterates the view of UNESCO (1978) that the environmental subject matter deals with 'inter-relationships between ecological, social, economic and political factors'.

Referring to the English primary school context, Chatzifotiou (2002) argues that lack of clarity in the definition of terms such as environment, sustainable development and education for sustainable development in the national curriculum documents can contribute to confusion among teachers as illustrated here by the three teachers in the South African context. The three teacher participants seem to focus more on the biophysical environment that excludes the human dimension (social, political and economic components) when trying to make sense of the meaning of environmental education. It is likely that the teacher participants have probably not paid attention to the above definition provided by the curriculum document (Dube, 2012).

Furthermore, the teacher participants seem to focus on 'fostering awareness by communicating information about environmental issues' as observed by O'Donoghue (1993:29). The aim is to change the behaviour of the learners towards the environment. Maggie's view is that she has to 'teach' or 'tell the learners about the environment' because she disapproves of their uncaring behaviour towards the physical environment (the school premises). Her conception of environmental education is that it mainly focuses on modifying behaviour towards the biophysical environment through imparting environmental knowledge. According to Maggie, teaching or telling about the environment implies that she is likely to use teacher-centred approaches to transmit environmental knowledge in the form of 'hard facts' (O'Donoghue, 1993:29). While Maggie seems to focus only on the cognitive domain, Hilton and Lloyd explicitly state that the geography curriculum should foster the development of the affective domain related to instilling attitudes and values of caring for the biophysical environment. The teachers such as Maggie appear to be unfamiliar with EE and ESD pedagogy of participatory approaches and experiential learning underpinned by social constructivism as suggested in literature (UNESCO 1978, 2005).

Hilton's anthropocentric versus Lloyd's ecocentric views (O'Riordan, 1999) are explicit in how they make sense of the concepts of environmental education and sustainable development. Furthermore, the three teacher participants appear to accept the definition of sustainable development provided by the Brundtland Report uncritically. I have argued elsewhere (Dube, 2012:197), that 'this uncritical stance could be derived from the way the concept is represented in the policy document. The geography NCS document does not advise the teachers about the problematic nature of the idea of sustainable development so as to promote deeper-level sense-making about the concept'.

While Maggie and Lloyd seem to struggle with making sense of the concept of education for sustainable development, Hilton is clear on what it entails. Although his thoughts indicate a consistent anthropocentric view as noted earlier, he interestingly, argues that it is necessary to focus on development issues such as poverty. Winter (2007:349) in (Dube, 2012) underscores

the need for policy documents to highlight the fact that teachers should critically reflect on current popular meanings of sustainable development and education for sustainable development. She draws attention to the need for policy implementers to engage with the 'fundamental incompatibility between the concepts sustainability and development' noted above.

Conclusion

This paper is based on my PhD research project which focuses on how geography teachers are implementing EE and ESD through the geography curriculum. I have discussed the findings from three of the teacher participants on the question: what are the geography teachers' perspectives on EE and ESD? The teacher participants reveal conceptual difficulties in their perspectives on environmental education, sustainable development and education for sustainable development. They still regard environmental education as referring to conservation education which mainly focuses on protection of the biophysical environment but excludes the human agent that comprises the social, economic and political components. One teacher consistently reveals an anthropocentric view of nature while the other reveals an ecocentric view. Although the teachers are familiar with the meaning of sustainable development, they are uncritical of the problematic nature of the concept. One teacher believes that education for sustainable development should encompass development issues such as poverty while it appears that the other two have not come across the concept of education for sustainable development. The teachers reveal that EE and ESD should be taught through transmitting environmental knowledge in order to inculcate positive attitudes and values towards the environment. Because of the conceptual difficulties that the teachers face, it is not likely that they will implement EE and ESD effectively through the geography curriculum.

However, with better support, these teachers could be effective change agents in their schools because two of them have taken action in their personal capacity to protect the environment. The third teacher displays a positive attitude towards the environment through his ecocentric view of nature.

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ISBN 978-1-920677-54-1

9 781920 677541

ISSN: 1810-0333